

# Survey in the Christmas Canyon Subbasin, Searles Valley, California: Observations on Tools and Toolstone

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## Abstract

A 2002 survey of a 1000-acre area within the Christmas Canyon subbasin southwest of Searles Dry Lake, San Bernardino County, recorded 33 archaeological sites, including lithic scatters, cairns, geoglyphs, and rock shelters. Patterning in site distribution and differences in flaked stone artifact technology may reflect use of the area during different time periods. Sites containing only rhyolite debitage are located in the northern part of the survey area, closest to the main Searles Valley basin and at lower elevations, while sites with chert only or both rhyolite and chert are found in other areas. Artifacts collected during the survey suggest a correlation of technology with material type and the possibility that large, percussion-shaped tools of rhyolite may have been used for processing plants that are no longer present in the study area.

## Location and Environment

The Christmas Canyon subbasin is located at the southern edge of the Searles Lake basin in the western Mojave Desert of California (Figure 1). Searles Dry Lake lies between the Argus and Slate ranges, prominent features within the Basin and Range province.

Prehistoric use of the Searles Lake basin required adaptations to an environment that has changed dramatically over the past 15,000 years. Today, the western Mojave Desert is one of the most arid areas in North America. During the cooler and moister Late Pleistocene, however, Searles Lake was part of a system of lakes that began in the Mono basin and included Adobe Lake, the Owens River, Owens Lake, and China Lake to the north. The overflow from China Lake filled Searles Lake. When the water reached about

200 m in depth, Searles Lake and China Lake became a single body of water, which in turn overflowed into Panamint Lake in the Panamint Valley. Lake Manly in Death Valley was the end of the chain, receiving the overflow from Panamint Lake (Grayson 1993:100).

Reconstruction of the history of Searles Lake, which is based primarily on the work of Smith (1979), suggests that the lake reached its highest elevation by 16,000 to 15,000 years ago and remained high until after 14,000 years ago, when it began to decline sharply. This part of the chronology correlates well with the high stands and declines of Lake Lahontan and Lake Bonneville to the east. According to Smith's chronology, the subsequent history of Searles Lake is unique in that it rose again about 13,000 years ago and remained high until about 11,300 years ago when it began to decline again. A final rise in the level of Searles Lake occurred between 11,000 and 10,500 years ago at the same time as a rise in Lake Bonneville (Grayson 1993:102). Ramirez de Bryson (2004) proposed a somewhat different sequence for the past 30,000 years using lake shoreline data rather than cores from the lake. She posited a series of 10 alternating moist and dry phases with corresponding changes in the lake level that includes a final rise to a depth of 164 m and a shoreline elevation of 656 m at 6,600 years BP (Ramirez de Bryson 2004:92). Geologists have identified a beach ridge that formed during the earlier high stands of the lake, separating the embayment in Christmas Canyon

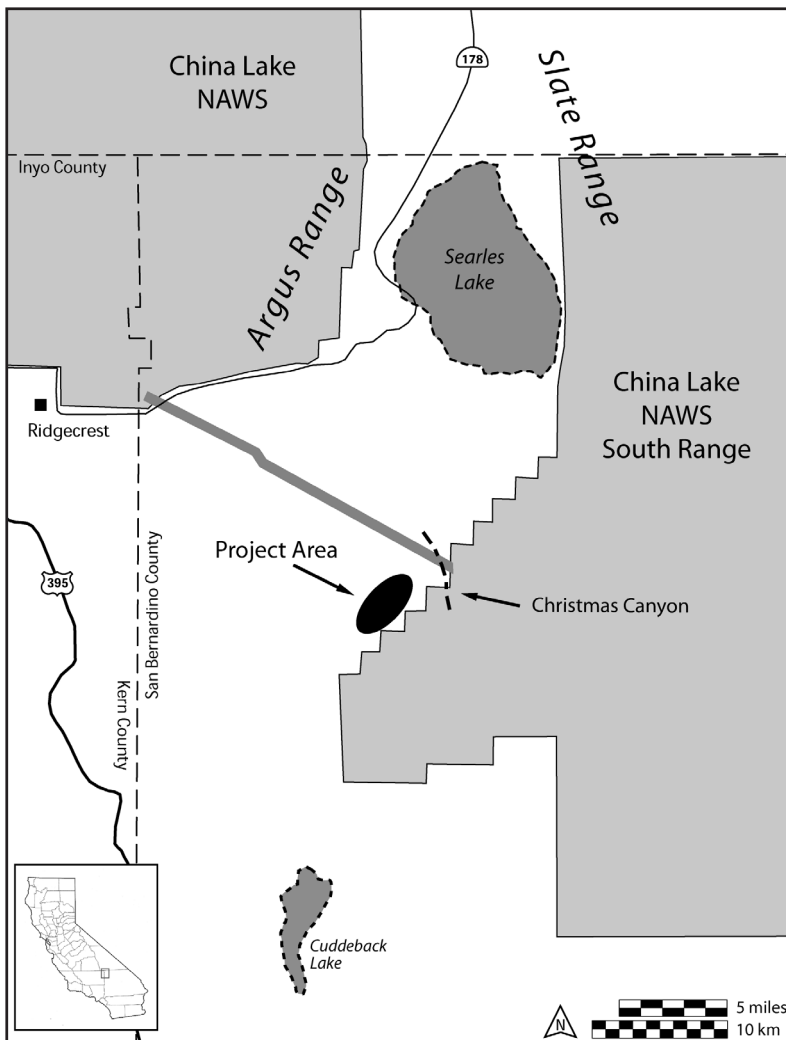


Figure 1. Area surveyed, Christmas Canyon ACEC.

from Searles Lake basin as a whole and resulting in the creation of the Christmas Canyon subbasin. (Whitley et al. 2006:209).

During the Late Pleistocene and Early Holocene, the vegetation of both the Great Basin and Mojave deserts was strikingly different from that of today. Marshes flourished at the edges of the shrinking lakes, even in areas where the lakes themselves were saline. Areas of abundant plant and animal populations may have surrounded the Christmas Canyon subbasin. Juniper as well as Paiute cypress (*Cupressus nevadensis*) grew at lower elevations throughout the Mojave Desert, where

creosote scrub now dominates. Tufa encrusted woody plants on the western shore of Searles Lake have recently been identified as *Juniperus*. This indicates that juniper was growing as low as 670 m asl on the Searles Lake shoreline during the late Pleistocene and implies both higher moisture and cooler temperatures (Erwin and Schorn 2006). Neither creosote (*Larrea divaricata*) nor white bursage (*Ambrosia dumosa*), both of which are now common below 915 m asl, was present in the Mojave Desert until the Middle Holocene. It was only after the juniper and pinyon retreated to higher elevations that creosote bush scrub began to cover the lower areas of the desert (Grayson 1993:126,199).

Vegetation in the Christmas Canyon subbasin today is creosote bush scrub, dominated by creosote bush. Other plants observed in the study area include golden cholla (*Opuntia echinocarpia*), beavertail prickly pear (*Opuntia basilaris*), cottontop cactus (*Echinocactus polycephalus*), bristly fiddleneck (*Amsinckia tessellata*), salt bush (*Atriplex* sp.), and various grasses (Poaceae family). Fauna observed in the Christmas Canyon subbasin during the survey included desert tortoises, coyotes, lizards, and rabbits.

### History of Research

In connection with development of the California Desert Plan (United States Department of Interior 1999), an overview of the early prehistory and archaeological resources of the California Desert Conservation Area was prepared in 1980 for the Bureau of Land Management (BLM) by Emma Lou Davis and her colleagues at the Great Basin Foundation (Davis et al. 1980). Davis and pioneering archaeologist Sylvia Winslow visited the Searles Valley and were the first to recognize the importance of Christmas Canyon to the study of Paleoindian archaeology in the California Desert. As a result, BLM archaeologists worked to create the 3,444-acre Christmas Canyon Area of Critical Environmental Concern (ACEC) (Kaldenberg 2002; Reed 2006). Following a reconnaissance by BLM archaeologists in 2002, the agency sponsored a series of investigations of the ACEC and adjacent public lands (Walsh and Clewlow 2003; Wells 2003; Reed 2006; Whitley et al. 2006; Giambastiani 2009). More recently, the Navy surveyed the area under its jurisdiction directly east of the ACEC, thereby expanding our knowledge of the archaeology of the southern Searles Valley (Becker 2007).

In 2002 Ancient Enterprises, Inc. completed the first of the BLM-sponsored inventories, an investigation of 1,000 acres (Figure 1) (Wells 2003; Wells et al. 2004). This paper describes the findings of that first systematic survey of the Christmas Canyon ACEC and

observations of site distributions, the use of toolstone resources, and the attributes of a small assemblage of flaked stone tools that were collected.

### Site Types and Locations

The primary landforms within the 1,000-acre survey area are alluvial fans with elevations ranging from ca. 610 to 855 m. Bedrock outcrops of volcanic origin rise above some of the fans at the upper elevations, forming rock shelters. Extending outward from the fans are low ridges separated by small seasonal drainages and some broader washes. Soils in the washes are alluvial sand and silt. Most of the ridges, in contrast, are covered with desert pavement formed of compacted aeolian sand and silt covered with cryptocrystalline and volcanic rocks. As expected, almost all of the sites are located on low ridges covered with desert pavement or are associated with major outcroppings of bedrock. All are situated at elevations above the highest elevation of Lake Searles, which reached 690 m asl after 16,500 BP. No sites were found in the alluvium filled washes and small basins below the ridges. Evidence of prehistoric human activities in these lower areas would have been washed away or buried under waterborne silt. Many of the prehistoric deposits on the ridges and rock outcrops may represent human activities that occurred when water was available in the basins and washes.

During the 2002 survey, 33 sites were recorded or rerecorded. These include two rock shelter sites, two geoglyphs, two chert quarries, two possible trails, and one rock ring. The majority of the sites are flaked stone scatters. Cairns, at least some of which may be prehistoric, were recorded both within and outside the boundaries of the lithic scatters, where they occur both singly and in groups. One group forms a linear pattern that appears to be aligned with a possible aboriginal trail associated with a rock shelter site. Another group of four, located within a lithic scatter, is arranged in a pattern that approximates magnetic northwest, northeast, southwest,

and southeast. These and other enigmatic rock features of the Christmas Canyon ACEC have been described by Clewlow and Walsh (2006).

Almost all artifacts observed on the survey are flaked stone, mainly debitage. Toolstone acquisition appears to have been an important activity. Two outcrops of chert were quarried, and many of the ridges were also sources of lithic raw materials in the form of rhyolite, chert, and other cobbles that can now be seen in and on the desert pavement. Ground stone was observed at only two sites: CA-SBR-1013, a rock shelter, and CA-SBR-10836, where pieces of ground stone had been reused in the construction of a cairn. Fire-affected rock was observed at five lithic scatters and at one rock shelter.

### *Quarries*

The two chert quarries show evidence of intensive use. CA-SBR-10835 is a prehistoric quarry situated on the west slope of a low ridge at the edge of a north-south trending wash. The elevation ranges from 802 to 807 m. This site, which measures 40 m by 25 m, contains more than 20,000 pieces of chert debitage, varying in color from red to yellowish-brown, which derive from the bedrock. At the western edge of the site, two rectangular scars in the bedrock appear to have been made with modern tools. The second quarry, CA-SBR-10842, extends over a 150 m by 200 m area. It is situated in desert pavement on a low ridge at an elevation of 818 to 826 m. The material quarried is from a chert outcrop on the upper slope of the southeast section of the site. It is associated with more than 600 flakes and other debitage. The material is similar in appearance to the chert at SBR-10835. The associated lithic scatter that extends over the ridge includes five concentrations. Two tools were observed, a chert scraper and a rhyolite biface. A rock cairn consisting of twelve or more medium-sized cobbles, possibly marking the location of the outcrop, was observed on a large boulder upslope from the site.

### *Geoglyphs*

Two geoglyphs are among the most striking cultural features in the Christmas Canyon survey area. CA-SBR-10839 is situated in desert pavement and includes both a lithic scatter extending over an area 800 m by 425 m and a geoglyph. The geoglyph consists of 30 to 40 granitic and basalt rock cobbles in a linear arrangement with three to four extensions that suggest an anthropomorph to some observers (Figure 2). This rock feature was first identified by the BLM as a probable geoglyph and was named the "Running Man." The two "legs" are extended at approximately right angles to each other and appear to be more or less intact. The arrangement of the "arms" has been disturbed; the presence of the left "arm" is only suggested by a few boulders which are not in a linear arrangement. The right "arm" is indicated by three large boulders in a line and a few others that appear to have been displaced from their original position. The maximum length of this feature, measured from its left "foot" to the end of its extended right "arm," is approximately 4 m.

Jay von Werlhof might have questioned this anthropomorphic interpretation of the SBR-10839 geoglyph. He attributed much of the earthen art of the Mojave Desert to efforts to restore a "shrinking biome amidst an increasingly arid climate" in the Early Holocene. The geoglyphs symbolize water and certain animals, but "man is never portrayed in North Desert earthen art. Apparently, his is the last in the chain of dependency, and the shaman is not calling upon spiritual forces to save him" (von Werlhof 1987:30–31).

Whether the SBR-10839 geoglyph dates to the Early Holocene has not been determined, but the accumulation of alluvium around the cobbles and its location away from the jeep and motorcycle trails that criss-cross the study area argue for a prehistoric age. An early date was obtained from one of its constituent cobbles and is discussed below.

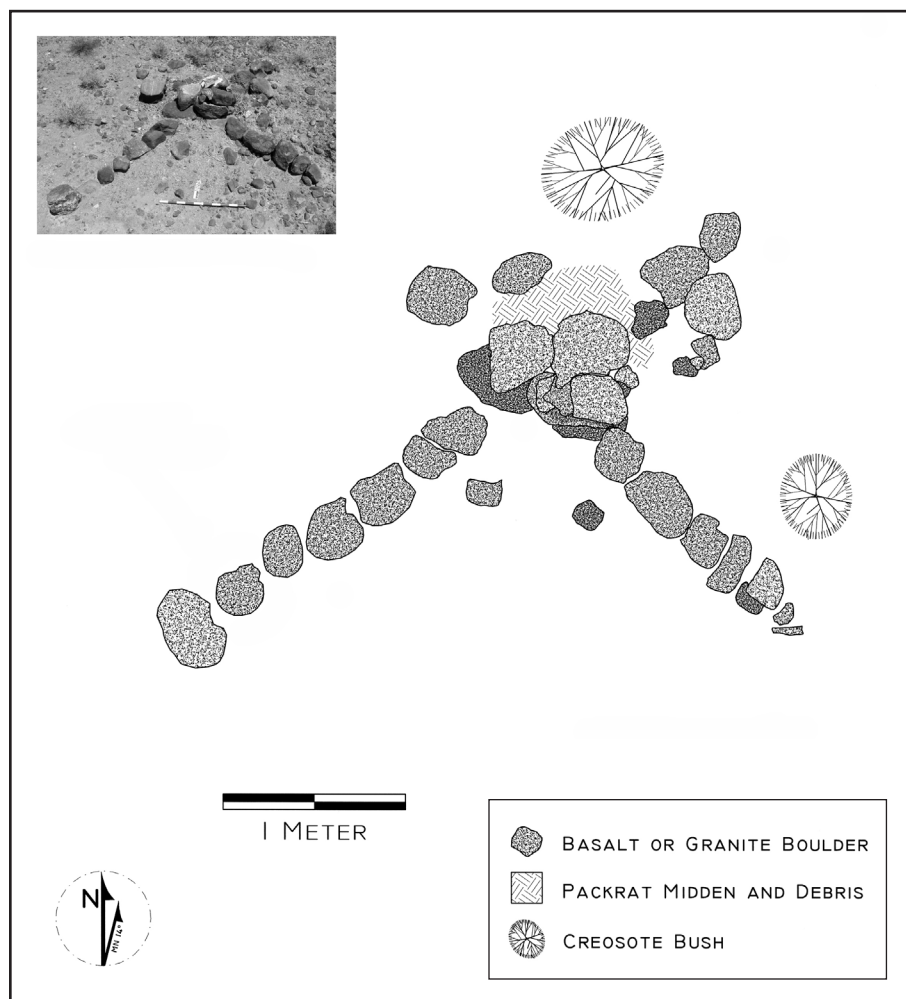


Figure 2. Rock alignment, CA-SBR-10839.

The second geoglyph is a linear rock alignment that has been designated CA-SBR-10838. It is situated on desert pavement on a ridge extending from an alluvial fan at an elevation of 841 m asl. The site consists of the rock feature (Figure 3), which measures 203 cm in length, 63 cm in width, and 40 cm in height, with no associated artifacts. It has been constructed of approximately 20 cobbles of basalt and granite that range from 15 to 50 cm in diameter. Because of its curvilinear shape, this feature is referred to as the “Snake.” The arrangement of the rocks is broader at the north end, suggesting the snake’s head. It is not possible to determine the age of this feature using survey data, but its location, which is not visible from the jeep and motorcycle trail, suggests

that this feature is probably prehistoric. Geoglyphs with similar shapes have been found elsewhere in the Mojave Desert. Davis (1980a:309–310) argued that these represent snakes and that they are powerful religious symbols that have their roots in Paleolithic shamanism. Von Werlhof (1987:30) argued that water was the predominant symbol in Early Holocene earthen art, followed by water-associated creatures, including snakes, birds, fish, and possibly insects.

**Rock Shelters**

Several natural rock shelters occur in the study area, but only three contained cultural material, of which

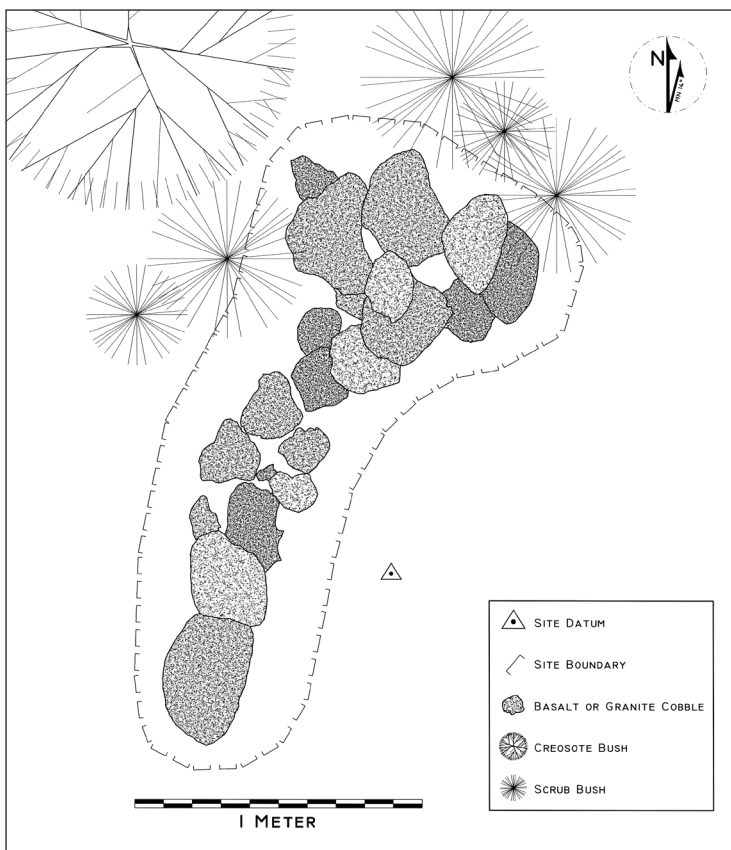


Figure 3. Rock alignment, CA-SBR-10838.

two were recorded as a single site, CA-SBR-1013. The other, CA-SBR-10836, is part of a complex site that includes a rock wall, a lithic scatter, and 23 rock cairns. Most of the cairns follow the alignment of a trail that is associated with the site. Situated on the upper part of an alluvial fan at an elevation of 820 to 824 m, the area in front of the rock shelter offers a broad view of the valley and the dry lake to the northeast.

During the 2002 survey, subsurface investigation was limited to a single 1 m x 1 m unit that was excavated in SBR-10836. The unit was excavated in 10 cm levels to a depth of 40 cm; a shovel test pit was then placed in its southwest corner and excavated in 10 cm levels to a depth of 70 cm. All levels contained lithic artifacts and charcoal. One chalcedony flake and three obsidian flakes were recovered. Two obsidian flakes submitted

for hydration analysis were sourced to West Sugarloaf in the Coso Volcanic Field. The results of the hydration analysis are discussed below. The remaining test unit material was chert, most of which is visually identical to that from the two quarry sites, SBR-10835 and SBR-10842. The chert debitage from the excavated unit included more than 300 flakes, three cores, and a substantial amount of shatter.

### *Lithic Scatters*

Twenty-five lithic scatters were recorded in addition to those associated with the two quarries, the rock shelters, and the “Running Man.” Altogether they include tens of thousands of flakes and other debitage dispersed over the pavement-covered ridge tops. Site records for the larger, denser sites include only minimal estimates of the numbers of pieces

of lithic material. Several sites include one or more distinct concentrations within the scatter, but most do not include other artifact classes. Eight contain cairns, and five contain fire-affected rock. The fact that fire-affected rock features tend to be amorphous, without a clearly defined circular hearth arrangement, suggests that some may be rocks that were removed from a roasting pit. One site, CA-SBR-1041, does contain a defined hearth feature and is also associated with a trail that may be aboriginal. Another site, CA-SBR-10837, includes a circular arrangement of rocks of undetermined function. Relatively few shaped tools were present on the site surfaces, which consist mainly of debitage. Eight stone tools were collected; these are described later.

### ***Classification of Lithic Scatters***

These sites, including the scatters associated with the rock shelters and the “Running Man,” were classified into three categories based on the type of worked lithic material: rhyolite, chert, or both rhyolite and chert. Some sites that contain chert also include a few artifacts of other cryptocrystallines and basalt, but chert is predominant. All these materials occur as cobbles in the desert pavement.

As shown in Figure 4, the six sites with only rhyolite artifacts are located in the northern part of the survey area, which is closest to Searles Lake, at elevations ranging from 695 to 786 m. Sites where both types of material were used occur throughout the survey area except in the extreme south. Their elevations range from 719 to 823 m. With one exception, the sites with only chert artifacts occur in the southern half of the survey area at elevations of 774 to 829 m. The exception is CA-SBR-10058, located at an elevation of 732 m in the discontinuous part of the survey area to the west. The sites with rhyolite artifacts tend to be located overlooking the ancient shoreline, while the sites with chert are located up the drainages away from the lakeshore.

A more detailed investigation of the Christmas Canyon lithic scatters might identify some of these sites as prospects, as defined by Wilke and Schroth (1989), and now widely recognized throughout the Mojave Desert. This site type is associated with surface-exposed toolstone, or “float,” and is usually found on desert pavements. It is characterized by the presence of both whole and broken cobbles or pebbles of toolstone, a predominance of core reduction debitage, and a lack of tool production debris or finished tools. While these lithic sources may be used repeatedly, they differ from quarries in that they are not exploited intensively. In the Christmas Canyon survey area, materials from both desert pavements and outcrops were used for toolmaking. Some chert debitage present in the Christmas Canyon lithic scatters is visually identical to those at the two quarry sites.

### **Flaked Stone Tools**

#### ***Large Percussion-Flaked Tools***

Of the eight stone tools that were collected during the survey, six are large percussion-flaked artifacts that share some morphological characteristics. Four of these are of rhyolite, one is of pink chert with inclusions, and the sixth is of coarse-grained gray chert. One of the six is a core that has been modified for use as a tool, while the other five are bifaces. All are heavy and thick with weights ranging from 124.68 g to 152.66 g. The bifaces share a plano-convex profile with minimal working on the flat ventral surface and a slight to distinct dome on the dorsal face. All are ovate in outline. Four are widest near the high point of the dome, while the fifth tapers from a wide convex base to a narrow tip. Three of them exhibit beaks. These six tools are described below, and four of them are illustrated.

Specimen CA-SBR-10840-1 is a bidirectional core of coarse-grained gray chert that was collected from CA-SBR-10840. This site is a lithic scatter situated on

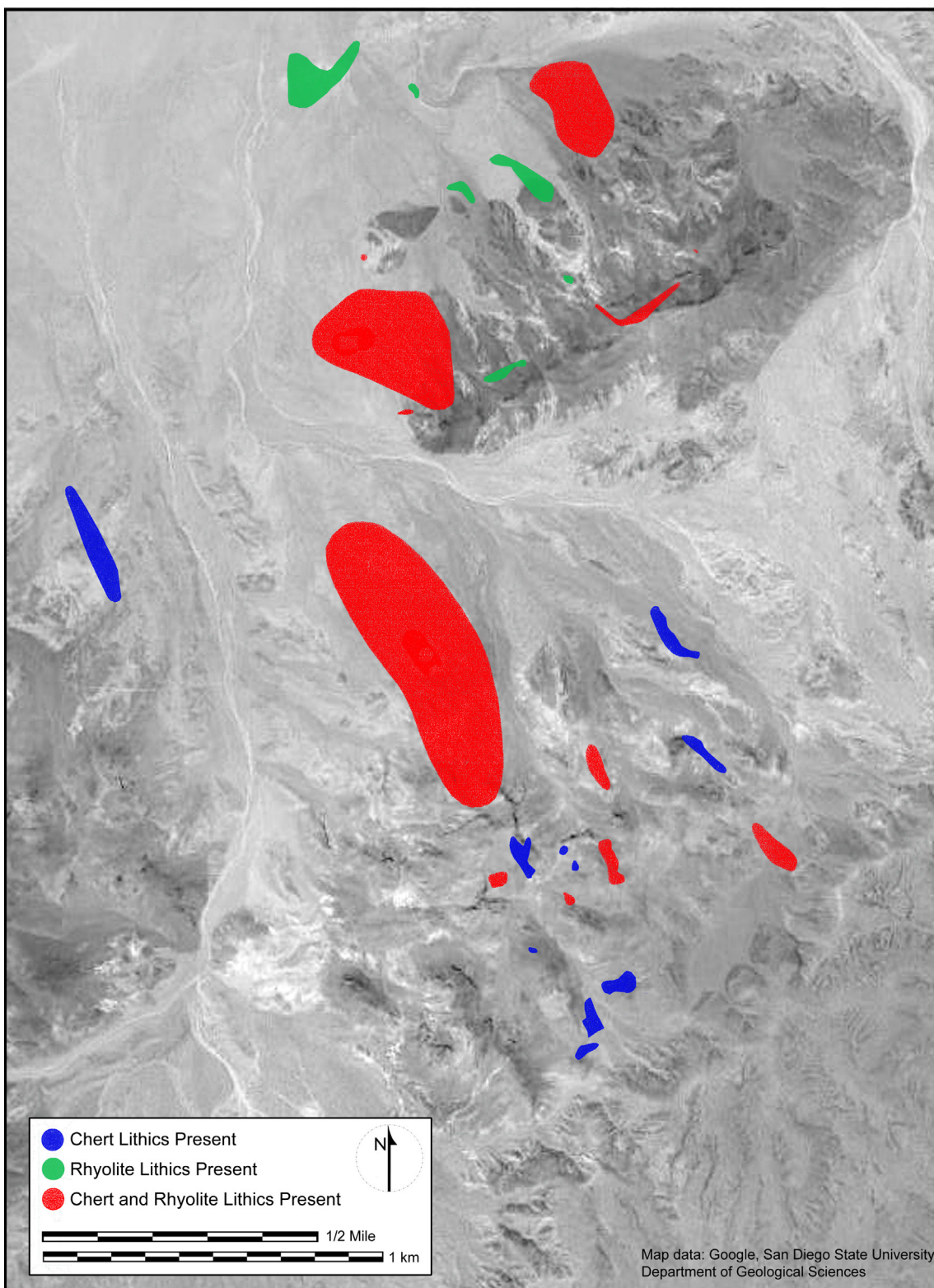


Figure 4. Surveyed area with sites differentiated by artifact material.



desert pavement on a ridge extending from an alluvial fan at an elevation of 786 m. Artifacts observed on the site consist of more than 300 interior and cortical chert flakes and other core reduction debitage. Most of the chert pieces range in size between 5 and 10 cm in length, and the color varies from white to yellowish-brown. The collected specimen measures 9.5 cm in length, 5.4 cm in width, and 4.3 cm in thickness and weighs 194.14 g. There is possible unifacial use wear on one end, which has a sawlike edge.

Three complete bifaces of rhyolite were collected from CA-SBR-10841. The site, which is a lithic scatter with a cairn, is situated on well-developed desert pavement on a knoll and ridge at an elevation of 803 to 808 m. The scatter includes more than 250 flakes and other core reduction debitage of both chert and rhyolite. The chert is red to yellowish-brown, and the rhyolite is light brown, gray, and white.

Specimen CA-SBR-10841-1 is gray rhyolite with patina on the dorsal surface (Figure 5). The dorsal face has a more convex, almost domed, shape in contrast to the flatter ventral face. Bifacial use-wear is apparent on one end, which has been thinned to produce a dull point next to a shallow indentation. Davis referred to

this type of attribute as a beak (see Davis 1980b:245, Figure IX:80). The artifact measures 9.7 cm in length, 5.6 cm in width, and 3.1 cm in thickness and weighs 146.56 g.

The second artifact (Specimen CA-SBR-10841-2), also of gray rhyolite, has a plano-convex shape (Figure 6). The flat ventral face has been minimally worked. This artifact tapers in width from near the base, which has been thinned, to the tip, which appears battered from use. It measures 10.2 cm x 5.9 cm x 1.9 cm and weighs 124.68 g.

The third biface (Specimen CA-SBR-10841-3) is also of gray rhyolite with some cortex remaining on the dorsal surface and patina on the ventral surface. Plano-convex in shape, this artifact exhibits more bifacial symmetry than the other two, but the center of the dorsal side is distinctly domed. The artifact is ovate and is widest opposite the high point of the dome. From there it tapers in both width and thickness to the tip. A possible beak can be discerned on one lateral edge (see Davis 1980b:209, Figure IX:46). Bifacial use-wear is evident along the opposite edge. This artifact measures 10.0 cm x 5.1 cm x 3.1 cm and weighs 130.17 g.

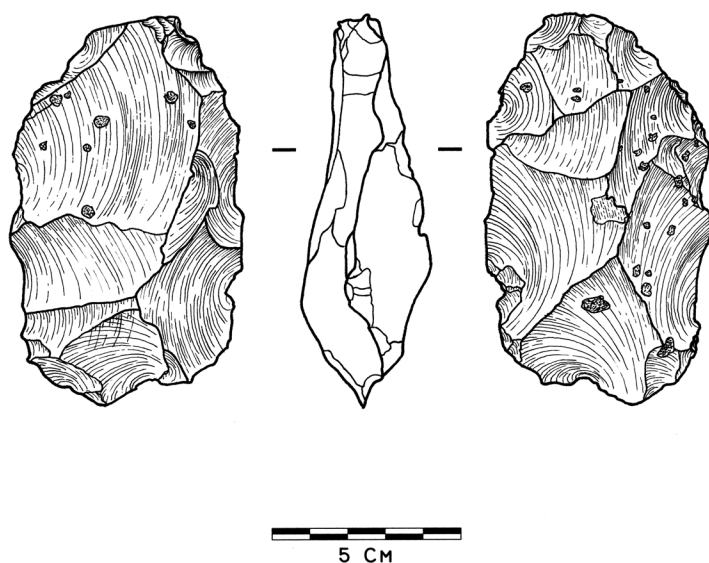


Figure 5. Biface, Specimen CA-SBR-10841-1.

One complete biface of rhyolite was collected from CA-SBR-10843, a lithic scatter approximately 260 m x 80 m in size that is situated on desert pavement on a low north-south trending ridge at an elevation of 796 m. The scatter consists of more than 2,000 pieces of chert and rhyolite and includes flakes and other core reduction debitage. The chert varies in color from red to tan, brown, and gray. The rhyolite is predominantly yellow with a high quantity of inclusions.

The material of the collected specimen (Figure 7) is variable in color but is predominantly tan with large and numerous inclusions. It is plano-convex in shape and, like the bifaces from SBR-10841, is flat and only minimally worked on the ventral surface, but it has a high convex profile on its dorsal side. It is ovate in outline with the widest point opposite the highest part of the convex side. From there it tapers in width and thickness to both base and tip. Near the tip it measures only 1.0 cm in width. Overall, however, this artifact

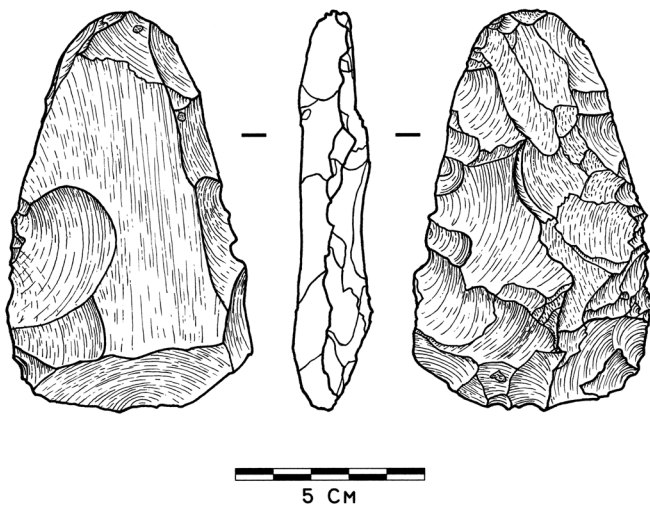


Figure 6. Biface, Specimen CA-SBR-10841-2.

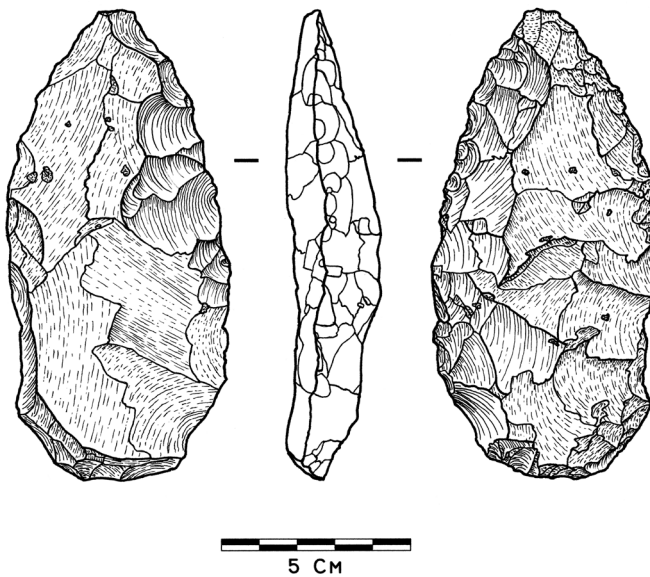


Figure 7. Biface, Specimen CA-SBR-10843-1.

(CA-SBR-10843-1) measures 11.7 cm in length, 5.6 cm in width, and 1.9 cm in thickness. It weighs 136.8 g. It appears to have use-wear on one lateral edge near the tip, but the coarse grain of the material makes this difficult to ascertain.

One biface (Specimen CA-SBR-10857-2) was collected from CA-SBR-10857/H), which is located at an elevation of 719 to 732 m. It is made of pinkish-white chert with black inclusions. No other tools of this material were observed during the survey. As shown in Figure 8, it is ovate with a domed profile on the dorsal surface and an almost flat ventral surface. Small flakes have been removed from both ends to produce the working edges. It has a distinct beak at one end, similar to Specimen CA-SBR-10841-1, described above (see Davis 1980b:245, Figure IX:80). This artifact measures 9.6 cm in length, 5.3 cm in width, and 3.6 cm in thickness and weighs 152.66 g.

### *Small Chert Tools*

Small chert tools, one each from CA-SBR-3116 and CA-SBR-10858, were collected. These are distinctly different in material, size, shape, and method of

manufacture from the artifacts that are described above. Both are made from fine-grained dark red chert and are small and thin with symmetrical profiles. Although neither is diagnostic, they are similar to tools commonly found at Middle to Late Holocene sites in the Mojave Desert and other areas of California. Specimen CA-SBR-3116-1 is a biface made of dark red chert with black striations; a very small amount of cortex remains on one surface. This is a finished tool that exhibits bifacial use-wear. It has been broken on one edge. It measures 4.6 cm in length, 2.6 cm in width, and 1.3 cm in thickness, and it weighs 14.56 g. Although it is not diagnostic, its small size, the type of material, and the use of pressure flaking distinguish it from other bifaces that were collected and have been described. This specimen was collected from one of two artifact concentrations on the site. It was associated with a concentration of six chert flakes, while the other concentration consisted of white rhyolite debitage.

CA-SBR-10858-1 is a broken leaf-shaped projectile point of red chert with gray mottling. This artifact measures 3.7 cm long, 2.2 cm wide, and .6 cm thick. It weighs 4.31 g. It has a convex base and a missing tip and appears to be unfinished. It is not diagnostic,

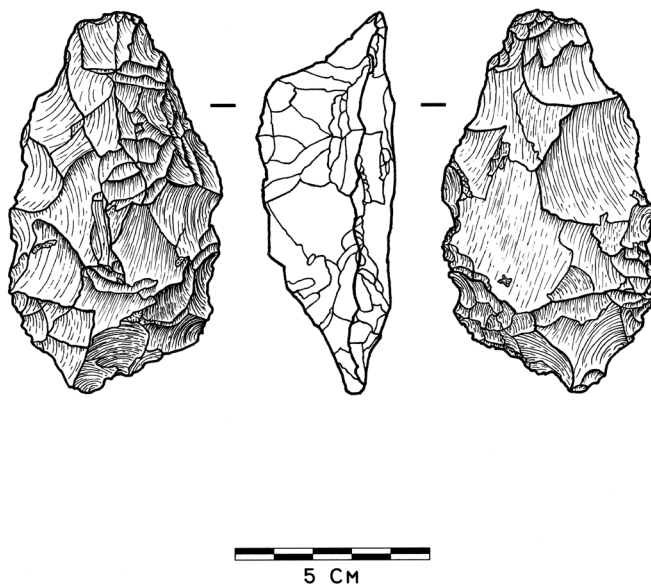


Figure 8. Biface, Specimen CA-SBR-10857-2.

but like the biface from SBR-3116, its small size, its material, and its pressure flaking distinguish it from most of the other tools that were collected during the survey.

### ***Tool Categories and Materials***

Our small and admittedly biased sample suggests a correlation of large percussion-flaked tools with rhyolite and other coarse-grained materials. The two small pressure-flaked tools, in contrast, are of fine-grained chert. This may reflect the suitability of certain materials, particularly rhyolite, for the production of large tools and/or the suitability of this type of material for tools used for certain tasks, such as plant collection and processing. The use of fine-grained chert for the two small artifacts most likely reflects its suitability for the production of small, pressure-flaked tools used for hunting, cutting, and butchering. Although the material recovered from the subsurface investigation of SBR-10836 does not include any shaped tools, core and flake size suggest that the materials, which consist of fine-grained chert, chalcedony and obsidian, may be related to the production of small, pressure-flaked artifacts similar to the two that were collected from SBR-10858 and SBR-3116.

### ***Temporal Considerations***

Although none of the artifacts described above were dated, the two categories of tools may reflect temporal as well as functional differences. The few age determinations that are available from the 1,000-acre survey area are listed in Table 1. Only one of these is a radiocarbon date. It was obtained on pedogenic carbonate from a rock in the “Running Man” geoglyph (SBR-10839), which yielded an AMS date of 4110 +/- 40 years BP (Dorn and Cervený 2002).

Three obsidian hydration readings were obtained, but only two of these are on flakes that could be sourced. Both are from the West Sugarloaf subsource in the

Coso Volcanic Field (Hughes 2002). The third flake was too small for sourcing. The two flakes that were sourced are from the 0–10 cm level of the test unit. They yielded obsidian hydration measurements of 8.9  $\mu$  and 3.3  $\mu$  (Origer 2002). A formula for determining age from micron measurements on Coso obsidian was developed by Basgall (1990) and subsequently published by Gilreath and Hildebrandt (1997). The formula is  $\text{LOG } Y = (2.32 [\text{LOG } (X \times a)]) + 1.50$ , where  $X$  is the rim measurement,  $Y$  is the date in years before present, and  $a$  is the correction factor for effective hydration temperature (Gilreath and Hildebrandt 1997:16). Applying this formula, but without the correction factor, the age for Specimen CA-SBR-10836-1 is 3672 YBP, or 1670 BC, and the age for Specimen CA-SBR-10836-3 is 368 YBP (AD 1635). Both dates indicate a Late Holocene occupation of the rock shelter.

The BLM obtained several dates from Dorn and Cervený (2002) using the somewhat controversial cation ratio method, which is viewed by many archaeologists as needing refinement (see Harry 1995). These data, which have been previously published by Reed (2006), are presented here in the absence of an alternative method for dating stone artifacts directly. These dates range from Early to Late Holocene. Three of these, listed in the table below, are from the quarry site SBR-10835. A cobble from the “Running Man” site (SBR-10839) yielded a date of 900 +/- 350 years BP, and a large flake that was part of a cairn at CA-SBR-10834 yielded a date of 6600 +/- 1300 BP (Dorn and Cervený 2002). Additional dates obtained by the BLM on samples from other sites within the Christmas Canyon ACEC represent a similar range from Early to Late Holocene, with the majority falling within the Middle to Late Holocene (Reed 2006:166).

### **Discussion**

It might be questioned whether the small collection of artifacts described above should be considered

Table 1. Chronometric Dates from the Survey Area.

Site No. CA-SBR-	Sample Description	Age (BP)	Method
10834	Davey Flake	6600 +/- 1300	Cation Ratio
10835	Quarry Face 1	4,800 +/- 1500	Cation Ratio
10835	Quarry Face 2	8800 +/- 2000	Cation Ratio
10835	Quarry Face 3	800 +/- 200	Cation Ratio
10839	Beta 168080	4110 +/- -40	AMS
10836	6-1	3672	Obsidian Hydration
10836	6-3	368	Obsidian Hydration
10839	cobble	900 +/- -350	Cation Ratio

representative of the archaeological resources of the Christmas Canyon region. There were few tools present on the sites. Those that were collected are artifacts that would likely be in jeopardy from unauthorized collectors or vehicular traffic. The collected artifacts do, however, reflect the range of sizes, morphology, and materials observed by the field crew on the surface of sites throughout the survey area.

Another limitation of our data is the absence of subsurface data from the sites where the tools were collected. Ahlstrom and Roberts (2001) argued that ancient subsurface deposits could be present under desert pavement. Thus, areas where roasting pits are suspected might be tested in future investigations.

Despite the small size and biased nature of the assemblage, it is worthwhile to offer observations and tentative interpretations. The artifacts from sites in the surveyed area may represent two distinct traditions, which, based on comparisons with tools from other regions of the Mojave Desert, may represent different time periods. Although no patterning can be discerned in the locations where the two groups of tools were found, there is patterning in the distribution of worked lithic material. Sites containing only rhyolite debitage are located in the northern part of the survey area, closest to the main Searles Valley basin and at lower elevations, while sites with chert only or both

rhyolite and chert are found in other areas of the subbasin.

While not diagnostic, the small, pressure-flaked tools of fine-grained material are similar to those found widely in California and are most likely from the Middle to Late Holocene time periods. The makers of the larger, percussion-flaked tools, however, selected rhyolite and coarse-grained cherts to produce tools that are morphologically similar to each other and to artifacts that have been found in association with Pleistocene shorelines to the north and west (see Davis et al. 1980). All the tools share some similarities to tools that have been found on the old shorelines of China Lake and assigned by Davis (1980b) to her Late Wisconsin Culture II for which she proposed an age of 20,000 to 15,000 BP. The large percussion-flaked tools from Christmas Canyon may be related to the use of marsh resources, most likely plants, associated with Searles Lake. If Ramirez de Bryson (2004) is correct, such lacustrine resources might have been available for a short time during the Middle Holocene as well as during the Late Pleistocene/Early Holocene.

Alternatively, these tools might have been used to collect or process other non-marsh plant resources that were available at lower elevations of the Mojave prior to the mid-Holocene shift in vegetation

communities. Clarus Backes (personal communication 2010) has suggested that the large percussion-flaked tools might have been used to collect and harvest *Yucca whipplei*. Although this plant is no longer present in the Christmas Canyon region, it may have grown there in the past. Backes cites Woodcock's (1986) data from Death Valley packrat middens. These provide a record of Late Pleistocene vegetation below about 775 m asl, directly below the elevation of the Late Pleistocene juniper woodland zone. The most abundant fossil contained in these middens is *Yucca whipplei*, which is now locally extinct in Death Valley and grows only in areas of greater precipitation and milder temperatures than occur today in Death Valley. Although packrat middens containing *Yucca whipplei* have not been recovered from the Searles Valley, recent studies place juniper as low as 670 m on the Searles Lake shoreline during the Late Pleistocene and indicate both more moisture and cooler temperatures at that time (Erwin and Schorn 2006).

The tools collected during the 2002 survey are not the first to be reported from the Christmas Canyon subbasin. Sylvia Winslow collected artifacts she called "hand axes" in the Searles Lake basin in the 1960s. According to unpublished documents cited by Reed (2006:161), Winslow most likely collected these tools from the Christmas Canyon region. The location of Winslow's collection is unknown, but she described them as "massive choppers, scrapers and other tools which are usually associated with hand axe sites in other countries" and believed them to be of great antiquity (see Reed 2006:161).

### Conclusions

Based on his own research, which included micro-mapping within the ACEC and a survey transect on the 690 m shoreline contour around the Christmas Canyon subbasin, Whitley characterized the ACEC as "an intact ancient landscape [containing] 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" (Whitley et al. 2006:209). Whitley and his colleagues relied primarily on the geomorphological context of sites, including their relationship to the Tioga highstand (post-16,500 BP), to date them (Whitley et al. 2006:216). As previously stated, all sites recorded during the Ancient Enterprises, Inc. survey within the ACEC are on old landforms above the highstand contour of 690 m. Of the artifacts that were collected, the pinkish-white biface from SBR-10857/H was found closest to the 690 m contour, near the north end of the subbasin at an elevation of approximately 720 m.

The striking quantity of debitage found on dozens of ridges attests to the importance of the Christmas Canyon pavements and outcrops as sources for lithic material. It is likely that they were exploited for thousands of years through wet and dry times. The handful of large percussion-flaked tools that have been described bear a striking resemblance to artifacts that have been classified as Late Pleistocene in other areas of the desert and that are associated with the shorelines of ancient lakes. In the Christmas Canyon survey area, the makers of these large bifaces favored certain lithic materials over others, possibly for functional reasons. If these tools are indeed Late Pleistocene or Early Holocene in age, they may have been used for collecting and processing resources that disappeared from the surrounding environment thousands of years ago.

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