The Journal

Houston Archeological Society

Number 143 2021

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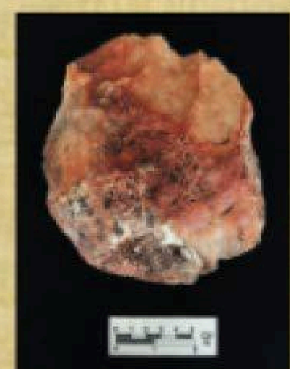

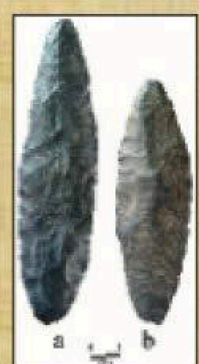

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Cover photos:
Top left: Anthropomorphic figure with sheep, Lower Centennial Canyon, Inyo County, California.
Top center: Teels Marsh, Nevada.
Top right: Atlatl petroglyphs, Lower Centennial Canyon, Inyo County, California.
Center left: Rhyolitic Tuff Biface, Swansea Paleoindian Site, Inyo County, California.
Center center: Hershey's Chocolate tin, Big Bend National Park, Texas.
Center right: Large chopper, Manix Lake site, San Bernardino County, California.
Bottom: Hasket points, Rock House Spring, Teels Marsh, Nevada.

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Wilson W. Crook, III, Editor

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Foreword

The ***Journal of the Houston Archeological Society*** is a publication of the Society. Our Mission is to foster enthusiastic interest and active participation in the discovery, documentation, and preservation of cultural resources (prehistoric and historic properties) of the city of Houston, the Houston metropolitan area, and the Upper Texas Gulf Coast Region.

The Houston Archeological Society holds monthly membership meetings with invited lecturers who speak on various topics of archeology and history. All meetings are free and open to the public.

Membership is easy! As a nonprofit organization, membership in the Houston Archeological Society is open to all persons who are interested in the diverse cultural history of Houston and surrounding areas, as well as the unique cultural heritage of the Upper Texas Gulf Coast Region. To become a member, you must agree with the mission and ethics set forth by the Society, pay annual dues and sign a Code of Ethics agreement and Release and Waiver of Liability Form.

The Membership Form and the Code of Ethics agreement and Release and Waiver of Liability Form are available from the HAS website: http://www.txhas.org/membership.html

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Editor's Message

I am pleased to present Issue #143 of *The Journal*, an issue dedicated exclusively to archeology in the Western United States. This issue of *The Journal* highlights the widespread interests of members of the Houston Archeological Society which cover not just the Gulf Coast and Texas, but many areas outside the state including the Western U.S. A total of eleven papers are included in this issue covering sites and archeological materials in West Texas, New Mexico, Colorado, Nevada, and California. These papers include research on material that ranges from potentially before Clovis, to the Paleoindian, Archaic, Late Prehistoric, and Historic periods.

The impetus for this issue stems from a number of years that your editor was functionally "marooned" in western Nevada and southeastern California doing mineral exploration for Mobil Oil. I say marooned because the projects were both long term in nature and required extensive field work collecting samples and surveying vast areas under lease. As any good avocational archeologist will do, every waking minute that I was not doing geochemical and mineralogical work, I spent learning Great Basin archeology and searching for new sites while visiting famous known locations. Most of my papers included in this issue stem from those explorations.

The first paper covers the enigmatic Manix Lake Industry which potentially could be as old as 18,000-20,000 years or more. All the scientific issues related to this "culture" are included. This is followed by several papers dealing with the Paleoindian period which includes two small Western Stemmed Tradition (WST) sites in California, a WST and Early Archaic site near Teels Marsh, Nevada, and some hitherto never reported finds from the famous Dent, Colorado Clovis site.

These papers are followed by two papers describing classic Great Basin Archaic sites in the Centennial Canyon area of Inyo County, California. Two Late Prehistoric arrow point and ceramic sites are described next including the discovery of a fairly complete Owens Valley Brown Ware pottery vessel.

These papers are followed by two historic period articles, one on a series of 19th and early 20th century sites in the Big Bend area of West Texas near the old mercury mining town of Terlingua and a second one by Alan Skinner on a unique sluice gate structure from Eddy County, New Mexico. The first paper is by HAS' own Louis Aulbach and Linda Gorski who make an annual trek to survey and record artifacts from these sites.

As always, we are very open to receiving any new submission that deals with an archeological subject. Do not worry that your paper may not be "perfect"; your editor is more than willing to work with you to create a publishable result. *The Journal* is the ideal vehicle for young and older authors alike to either begin or expand your published resume. Please send all submissions and inquiries to Dub Crook at the following email address:

dubcrook@kingwoodcable.com

Or call me with questions at 281-360-6451 (home) or 281-900-8831 (cell).

Contents

THE ENIGMATIC ARTIFACTS OF THE MANIX LAKE LITHIC INDUSTRY, SAN BERNARDINO COUNTY, CALIFORNIA

Wilson W. Crook, III

Introduction

During most of 1982-83 and the first half of 1984, the author was assigned to conduct detailed geological, geophysical, mineralogical, and geochemical tests in western Nevada (Teels Marsh) and the eastern part of southern California near the Nevada border. This was part of an extensive mineral exploration program conducted by the Mobil Oil Corporation (now ExxonMobil) in search of commercial quantities of uranium, lithium brines, and gold. On those weekends when I was not working, I used my free time to explore the region, including Death Valley, the Calico Mountains, and Pleistocene Lake Manix in the Mojave Desert. In particular, I became interested in the enigmatic artifacts associated with Lake Manix, known today as the "Manix Lake Lithic Industry" (Moratto 1984; Warren 1996). These artifacts can be found above the 1780 foot level of the Pleistocene lake bed, typically in isolated clusters which have been interpreted as camp sites (Simpson 1958, 1960, 1964). In order to study the artifacts in an unbiased manner, I selected a single, isolated cluster which appeared to represent an independent site. No other groups of artifacts were within several hundred meters and there were no source material stones in the immediate area. As such, the site could not be reasonably interpreted as a quarry location. I collected all the artifacts (n=71) present on the surface of this "site" and studied them both for morphology, method of construction, and use-wear analysis. In addition, I dug a number of test pits within the boundary of the artifact accumulation to test if there was any depth component to the site. This paper summarizes what is known about the Manix Lake Lithic Industry, its controversial proposed age, and my own analysis of the artifacts and observations from exploring the region in and around the Pleistocene shoreline.

Pleistocene Lake Manix

The current arid region that forms western Nevada and the Mojave Desert of southern California was not always dry. During the Pleistocene epoch (ca. 2.58-0.012 Mya), ice melt and rainfall created many large lakes in the Intermountain region of the Great Basin. All of the modern lakes in the region, such as Great Salt Lake, Carson Lake, Lake Tahoe, etc., are the shrunken remnants of the archaic Pleistocene bodies of water (Jefferson 1985). Thus during the Pleistocene, there were large sources of fresh water in the region which supported an expansive variety of wildlife.

At the end of the Pleistocene, deglaciation accompanied by climate change and regional warming led to increased evaporation, which in turn, caused the gradual desiccation of the large western lakes.

Figure 1. Thick bottom sediments of Pleistocene Lake Manix, San Bernardino County, California.

Figure 2. Afton Canyon, the former northern wing of Pleistocene Lake Manix.

Water levels dropped and many of the lakes broke apart into smaller, separate bodies of water. Starting after the last glacial maximum (ca. 18,000 B.P.), many of the region's lakes dried up completely while others shrunk to their current size by about 8000 B.P. (Jefferson 1985) (Figures 1-2). The ancient shorelines can be seen within present dry basins that were once filled with water (Figure 3).

The dry lake bed of Lake Manix is situated in the center of the Mojave Desert, approximately halfway between Barstow and Baker, California. The Mojave River flows intermittently through the area from the San Bernardino Mountains in the west to the eastern part of the desert. Interstate 15 runs roughly through the middle of the paleo lake bed. The lake formed approximately 400-500 Kya and filled an area of roughly 236 square kilometers (91 square miles) (Jefferson 1985). The Pleistocene lake was T-shaped, with one arm on the northwest (Coyote Arm), one arm on the southeast (Troy Arm), and the main body with a northeastern orientation. A large alluvial fan complex of rocks and sediments on the southwestern side of the lake acted as a natural dam which helped to trap rain and melt water and form the lake (Shlemon and Budinger 1990; Baty and Seff 1994) (Figure 4). The alluvial fan at the southwestern end of Lake Manix is composed of sediments laid down over as many as a dozen major depositional events (Baty and Seff (1994). Sometime during the late Pleistocene, the fan was cut off from its

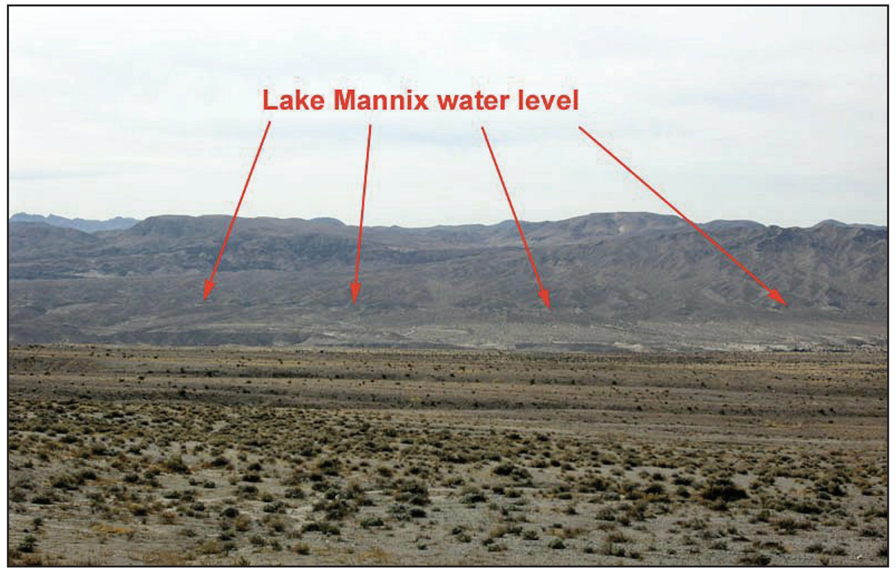

Figure 3. The 1780' Shoreline of Pleistocene Lake Manix.

Figure 4. Alluvial Fan at the southwest end of Lake Manix. Raw lithic material can be seen in the foreground.

source and began to erode. As Lake Manix dried up, the fan complex gave rise to a number of smaller alluvial fans which jut out from its perimeter. This alluvial fan complex, especially adjacent to the Coyote arm of the lake, has provided the lithic material (chert, chalcedony, fine-grained volcanics) that was utilized by the aboriginal inhabitants of the area (Shlemon and Budinger 1990). The lake bed is surrounded by mountains, most of which are of volcanic origin (Buwalda 1914; Reheis et al. 2004). These mountains contributed to the sediments found in the current lake bed. Lake sediments consist primarily of light gray-green colored arenaceous clays and fine argillaceous sands with quartz, feldspar and mica the principal constituents. The paleo lake beds are notable for their evenness and parallelism of individual strata (see Figures 1 and 2. Thickness of the lake sediments is about 23 meters (75 feet) but the beds gradually thin out toward the west (Buwald 1914). After the desiccation of the lake toward the end of the Pleistocene, the lack of rainfall in the area has served to preserve many archeological sites in a

Figure 5. Desert pediment surface above the paleo shoreline of Pleistocene Lake Manix. The large amount of lithic scatter can be seen in the foreground.

desert pediment surface at and above the 1,780 foot level (Figure 5). Fossils of Pleistocene animals such as mammoth, horse, bear, saber-tooth cat, coyote, and birds spanning the period of 350-20 Kya have been found around the edges of the paleo lake (Jefferson 1985; Meek 1990).

The Manix Lake Lithic Industry

The Manix Lake Lithic Industry was first recognized by noted California archeologist Dee Simpson in 1942. Based on the presence of large numbers of relatively crude artifacts above the paleo-shoreline of the lake, she postulated a very early age for the industry of at least 18,000-20,000 B.P. (Simpson 1958, 1960, 1964). Other noted North American archeologists including Krieger (1962, 1964) and Meighan (1965) agreed that the industry was a real contender for an older-than-Clovis occupation of the Americas. Simpson's argument for the early age of the Manix Lake artifacts was based on three points: (1) the artifacts occurred on or above the highest beach lines of Lake Manix whereas later "playa" industries were found on lower beach lines; ergo, the highest level must represent the oldest occupation of the area; (2) the complete absence of projectile points in the Manix Lake Industry and the similarity of the tools to the Paleolithic of the Old World; and (3) radiocarbon dates from the Bishop tuff in the highest beach line of Lake Manix yielded dates of 19,500 ± 500 B.P. (Hubbs et al. 1962) and 19,300 ± 400 B.P. (Ferguson and Libby 1962).

The Manix Lake Lithic Industry consists of large, hard percussion flaked bifaces, choppers, flake cores, scrapers, gravers, anvils, hammerstones, and worked and waste flakes. No projectile points of any kind, no bone or wood tools, and no pottery has ever been found associated with any of the Manix Lake Industry artifacts (Moratto 1984. Unlike the lithics found at nearby Calico (Leakey et al. 1968; Leakey et al. 1972; Simpson 1999) or Texas Street near San Diego (Carter 1957), the Manix Lake artifacts are unquestionably man-made artifacts and not naturally-occurring geofacts (Bamforth and Dorn 1988; Warren 1996). Furthermore, their association with the highest shorelines of Pleistocene Lake Manix suggests the artifacts were associated with the maximum fill of Pleistocene Lake and date to ca. 20,000 or more years ago (Warren 1996).

In order to disprove the proposed Pleistocene age of the Manix Lake Industry, it is necessary to show that the assemblage is either not man-made artifacts or demonstrate that the sites are not contemporary with Lake Manix and thus are not as old as ca. 20,000 B.P. Since the artifacts in the assemblages are unquestionably man-made (Simpson 1960, 1964; Warren 1996; Bamforth and Dorn 1998), the question of their age lies in the relatively crude nature of the artifacts and their association with the highest shoreline of Pleistocene Lake Manix. Nakamura (1991) explored the Lake Manix area in the early 1960s and concluded that the relatively unfinished nature of the tools (large bifaces and lack of projectile points) cannot be automatically associated with great age. Instead, he stated that while the tools could indeed be of Pleistocene age, their crudeness does not assure a temporal meaning as more recent (Archaic) quarry blanks can look very similar (Nakamura 1991). Glennan (1976) went further stating that all of the Manix Lake Lithic Industry tools were quarry blanks and were of Holocene, not Pleistocene age. He further stated that the large bifaces found in the Manix Lake Lithic Industry indicated a capability of producing projectile points despite the fact that none were found. He offered little direct evidence to support his conclusions other than his strongly-held belief that the artifacts were associated with a high desert pediment surface and their location above the ancient shoreline of Lake Manix was purely coincidental (Glennan 1976). Quarry workshop artifacts in the area do indeed produce a number of artifacts which look similar morphologically to those of the Manix Lake Lithic Industry (Bamforth and Dorn 1988; Bamforth 1990; Warren 1996). However, that does explain why many of the sites analyzed by Simpson (1960) and the one which is the subject of this study are located far from the location of known lithic quarries in the area. Moreover, if the desert pediment surfaces formed on the high ancient shoreline of Lake Manix, as they have at nearby Lake Mojave, then they are as old as Lake Manix and its beaches (Warren 1996). Lastly, if projectile points were a component of the Manix Lake assemblage, at least some broken or unfinished specimens would have been found as they have at other well-establish prehistoric quarry workshop in the Intermountain West such as the basalt quarries in eastern Oregon (Bryan and Tuohy 1960). To date, not a single projectile point, broken, finished, or unfinished preform, has ever been found associated with any of the Manix Lake Lithic Industry sites.

Many of the artifacts found in the Manix Lake Lithic Industry have what is known as "rock varnish", an accretion on rock surfaces that is composed of oxides of manganese, iron, and titanium, clay minerals, and minor trace elements including organic carbon (Dorn and Oberlander 1982). This varnish occurs in desert pediment surfaces because of the lack of rain to wash it off. In the 1980s, an attempt was made to develop a technique to date the age of desert rock varnish. Over time, even the minor moisture that is present in the desert has the ability to

replace more mobile cations, such as potassium and calcium, with more stable cations such as iron, manganese and titanium (Bamforth and Dorn 1988). By measuring the cation ratio (such as K+Ca/Ti), an approximate age date of the desert varnish can be obtained. Known as "Cation-Ratio" dating, the technique was applied to a number of rocks in both the Mojave Desert and the Lake Manix area in order to produce a cation leaching calibration curve for the region (Dorn et al. 1986; Dorn et al. 1987). A total of 21 artifacts from the Manix Lake Lithic Industry were then tested with the analytical results compared to the derived cation leaching curve. The dates from these 21 artifacts ranged from less than 400 B.P. to 32,000 B.P. with 12 artifacts producing dates within the last 10,000 years and the other 9 producing older, Pleistocene dates (Dorn et al. 1986; Dorn et al. 1987; Bamforth and Dorn 1988). The conclusions drawn from these tests suggest that either the Manix Lake Lithic Industry type artifacts persisted for a great deal of time or that Cation-Ratio dating is not a very effective age dating technique. Most scientists working in the Intermountain West see Cation-Ratio dating as an experimental methodology that needs considerably more work and for now, is not a valid dating system (Warren 1996).

Artifact Assemblage

A total of 71 artifacts were collected from an isolated site along the western margin of the Coyote arm of Pleistocene Lake Manix (Table 1). All of the artifacts recovered from the area were found on the surface. Despite conducting a number of test pits in the vicinity of the site, no artifacts were found at any significant depth below the surface (several artifacts were embedded in the desert pediment and thus their lower portions were actually "below the surface"). As stated above, the site where these tools were collected was specifically selected for study because of its isolated nature (no other similar sites in the immediate area) and its distance from raw material outcrops, thus assuring that all the lithics present were transported to the area rather than the site being an *in situ* quarry workshop.

Chalcedony is by far the most common lithic material at the site, comprising 76 percent (n=54) of the total artifact assemblage. Chalcedony occurs in large quantities in the fan material at the southern end of Lake Manix and thus the toolstone was likely procured locally. Color of the chalcedony varies greatly ranging from light gray (N7/0) to medium gray (N5/0), to light brown (5YR5/6), to grayish-orange (10YR7/4), to moderate orangish-pink (5YR6/4), to moderate reddish-brown (10YR4/6), to pale yellowish-orange (10YR8/6), to very pale orange (10YR8/2) (Geological Society of America 1995). Many of the pieces of chalcedony have small cavities which are lined with micro-crystals of quartz. Cortex is present on most of the artifacts however, with prolonged exposure to the sun and elements, it is often difficult to distinguish between cortex and desert varnish.

Another 21 percent (n=15) of the artifacts are made from various types of chert. Color varies from shades of gray (light gray (N7/0) to medium gray (N5/0), to dark yellowish-orange (10YR5/4), to moderate yellowish-brown (10YR5/4), to pale brown (5YR5/2), to light brown (5YR5/6) to black (N1/0) (Geological Society of America 1995). While jasper is noted as a common toolstone in Lake Manix Lithic sites (Warren 1996; Bamforth and Dorn 1998), none was found in the site selected for this study. Like chalcedony, chert is relatively common in the southern end of Lake Manix and thus were also procured locally. The remaining two artifacts (3 percent) were spherical to ovoid granitic rocks which based on the amount of battering on one or both ends, had been brought in and used as hammerstones.

The single most common artifact present in the test site used in this study are large bifaces (Figure 6). For the purposes of this study, "large" has been defined by a maximum length in excess of 100 mm with those artifacts smaller than 100 mm being categorized as "small" bifaces. A total of 27 specimens were recovered which represents 40 percent of the total artifact assemblage. Examination of the large bifaces shows a distinct commonality in their construction. Regardless of size or weight (many exceeded 500 grams), the ratio of length to width was similar with about 50 percent of the bifaces having a ratio in the range of 1.25-1.40. The similarity in construction can be clearly seen graphically using a coordinate plot of the ratios of Length/Length + Width + Thickness versus Width/Length + Width + Thickness versus Thickness/Length + Width + Thickness (Figure 7). The resulting convergence is not by coincidence and must reflect a general, conscious design characteristic. Moreover, all but two of the large bifaces from the site have one lateral edge which appears to have been preferentially made for use versus the opposite edge. However, despite this design characteristic, no edge use-wear was observed on any of the artifacts.

A total of 16 small (<100 mm in length) bifaces were recovered from the site. Three of these were broken during manufacture and appear to have been discarded. It is unknown if these smaller bifaces are in their original shape or are the products of further reduction of a larger biface. However, based on the similar number of flake scars and the lack of edge retouch, it is likely they are of similar design as the

Table 1. Measurements of Lake Manix Lithic Industry Artifacts.

Tool Type	Lithic Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)	General Observations
Large Biface 1	Chalcedony	148.6	94.3	54.5	>600	One cutting edge
Large Biface 2	Chert	124.2	94.3	49.5	>600	One cutting edge
Large Biface 3	Chalcedony	124.3	92.5	53.1	524.2	One cutting edge
Large Biface 4	Chalcedony	125	92.5	48	579.3	One cutting edge
Large Biface 5	Chalcedony	109	80.5	40	386.7	One cutting edge
Large Biface 6	Chert	111.5	75.8	35	239.8	One cutting edge
Large Biface 7	Chalcedony	120.2	62.5	27	194.9	One cutting edge
Large Biface 8	Chalcedony	112.7	66	48	272.8	One cutting edge
Large Biface 9	Chalcedony	100.9	75.2	51	262	One cutting edge
Large Biface 10	Chalcedony	129.5	92.3	49.9	>600	One cutting edge
Large Biface 11	Chert	109.2	81.7	45	341.1	One cutting edge
Large Biface 12	Chert	108.4	85	35.5	299.2	One cutting edge
Large Biface 13	Chalcedony	109.2	68.4	34	206	One cutting edge
Large Biface 14	Chalcedony	116.9	68.4	28.9	197.2	One cutting edge
Large Biface 15	Chert	140.5	90	55.5	>600	Two cutting edges
Large Biface 16	Chalcedony	137.4	109.4	40.9	>600	One cutting edge
Large Biface 17	Chert	134.5	83.5	39	446.3	One cutting edge
Large Biface 18	Chalcedony	144.5	74	53.8	453.4	One cutting edge
Large Biface 19	Chalcedony	113.1	89.2	45.5	534.3	One cutting edge
Large Biface 20	Chalcedony	115.3	92.5	45	407.9	One cutting edge
Large Biface 21	Chalcedony	117.9	83	35	302.5	One cutting edge
Large Biface 22	Chalcedony	118.5	74.1	40	281.9	One cutting edge
Large Biface 23	Chert	113.8	70.2	29.8	223.4	Two cutting edges
Large Biface 24	Chalcedony	111.4	66.4	37.2	228.1	One cutting edge
Large Biface 25	Chalcedony	132.2	100.5	42.4	561.7	One cutting edge
Large Biface 26	Chalcedony	125.2	80	41.5	331.8	One cutting edge
Large Biface 27	Chalcedony	109	84.8	54	425.5	One cutting edge
Average		*120.8*	*82.5*	*43*	*n.d.*	

Table 1. Measurements of Lake Manix Lithic Industry Artifacts. (Continued)

Tool Type	Lithic Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)	General Observations
Small Biface 1	Chalcedony	92	59.9	37.7	163.1	One cutting edge
Small Biface 2	Chalcedony	59.1	79.8	23.5	123.7	Broken during manufacture
Small Biface 3	Chert	88	66	27.5	128.4	
Small Biface 4	Chalcedony	77.9	51.3	30	81.9	
Small Biface 5	Chert	74.6	59.1	23	94.7	Broken during manufacture
Small Biface 6	Chalcedony	97.3	70.8	45	242.6	
Small Biface 7	Chert	98.6	61.5	32	179.4	
Small Biface 8	Chert	98	58	35	177.5	Minor retouch on one edge
Small Biface 9	Chert	82	68	43.2	309.4	
Small Biface 10	Chalcedony	99.1	68	33.5	205.4	One cutting edge
Small Biface 11	Chalcedony	88.4	50	26.5	100.8	One cutting edge
Small Biface 12	Chalcedony	48.5	94.9	31.5		Broken during manufacture
Average		*91.3*	*61.4*	*34.5*	*129.3*	
Discoid 1	Chalcedony	110	104.5	52.5	551.1	Flake core; 360° flake scars
Discoid 2	Chert	100.5	81.5	40	290.5	Flake core; 360° flake scars
Discoid 3	Chalcedony	102	74.3	40.9	282.7	Flake core; 360° flake scars
Discoid 4	Chalcedony	190	130	73.8	>600	Flake core; 360° flake scars
Average		*125.6*	*91.5*	*51.8*	*n.d.*	
Flake Core 1	Chert	99	64.8	34	283.1	Flake core
Flake Core 2	Chalcedony	80.5	80	33	231	Flake core
Flake Core 3	Chalcedony	91	81.9	27	186.5	Flake core
Flake Core 4	Chalcedony	96.5	78	35	207.9	Flake core
Flake Core 5	Chalcedony	93.1	76	34.1	236.5	Flake core
Flake Core 6	Chalcedony	107.2	86.1	36	281.6	Flake core
Flake Core 7	Chalcedony	101	76.2	30.7	217.3	Flake core; barely utilized
Flake Core 8	Chert	131.4	104	44.1	>600	Flake core
Average		*99.9*	*80.9*	*34.2*	*n.d.*	
Large Flake 1	Chalcedony	111.5	78	28	192.3	No retouch or use wear
Small Flake 1	Chalcedony	55.5	60.8	11.2	35.3	No retouch or use wear

Table 1. Measurements of Lake Manix Lithic Industry Artifacts. (Continued)

Tools with Use-Wear	Lithic Material	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)	General Observations
Hammerstone 1	Granitic	67.7	61.1	55.5	255.4	Battering on one end
Hammerstone 2	Granitic	70.3	58.5	51	239	Battering on two ends
Chopper 1	Chalcedony	185.2	101	54.5	>600	Use-wear on cutting edge
Chopper 2	Chalcedony	155.2	140	60.8	>600	Use-wear on cutting edge
Chopper 3	Chalcedony	134.8	116.4	44.8	>600	Retouch on one lateral edge
Chopper 4	Chalcedony	134.5	95.7	42.2	525.7	Edge crushing on distal end
Ovoid Biface 1	Chalcedony	81.5	67	36.5	175.1	Retouch on both lateral edges
Ovoid Biface 2	Chalcedony	91.7	60.5	27.9	141	Retouch on one lateral edge
Ovoid Biface 3	Chalcedony	108.3	60.8	27.5	195.1	Retouch on one lateral edge
Ovoid Biface 4	Chalcedony	104.4	69.2	36.9	210.7	Retouch on one lateral edge
Ovoid Biface 5	Chalcedony	101.5	78.3	25.9	198.2	Retouch/use-wear on one edge
Ovoid Biface 6	Chalcedony	98.5	97.2	48.7	441.8	Retouch on both lateral edges
Small Handaxe 1	Chalcedony	105.2	68.7	28.5	175.9	Made on flake; lateral retouch
Small Handaxe 2	Chalcedony	114	65	28	190.2	Made on flake; minor retouch
Small Handaxe 3	Chalcedony	125.5	90.1	50.8	400.9	Made from cobble; minor retouch
Notch	Chalcedony	96.4	57.5	25	118.1	Notch has extensive use wear
Worked Flake 1	Chalcedony	58.4	41.9	11.1	28.4	Retouch on one lateral edge
Worked Flake 2	Chalcedony	71.8	45.9	7.8	24.7	Retouch on one lateral edge

Figure 6. Examples of large bifaces from Pleistocene Lake Manix. Note the work on the left lateral edge of the first biface as opposed to the right edge.

Figure 8. Two ovoid-shaped bifaces that have extensive retouch on their lateral edges. Note the fine retouch on the left lateral edge of both bifaces. Both show wear along that edge.

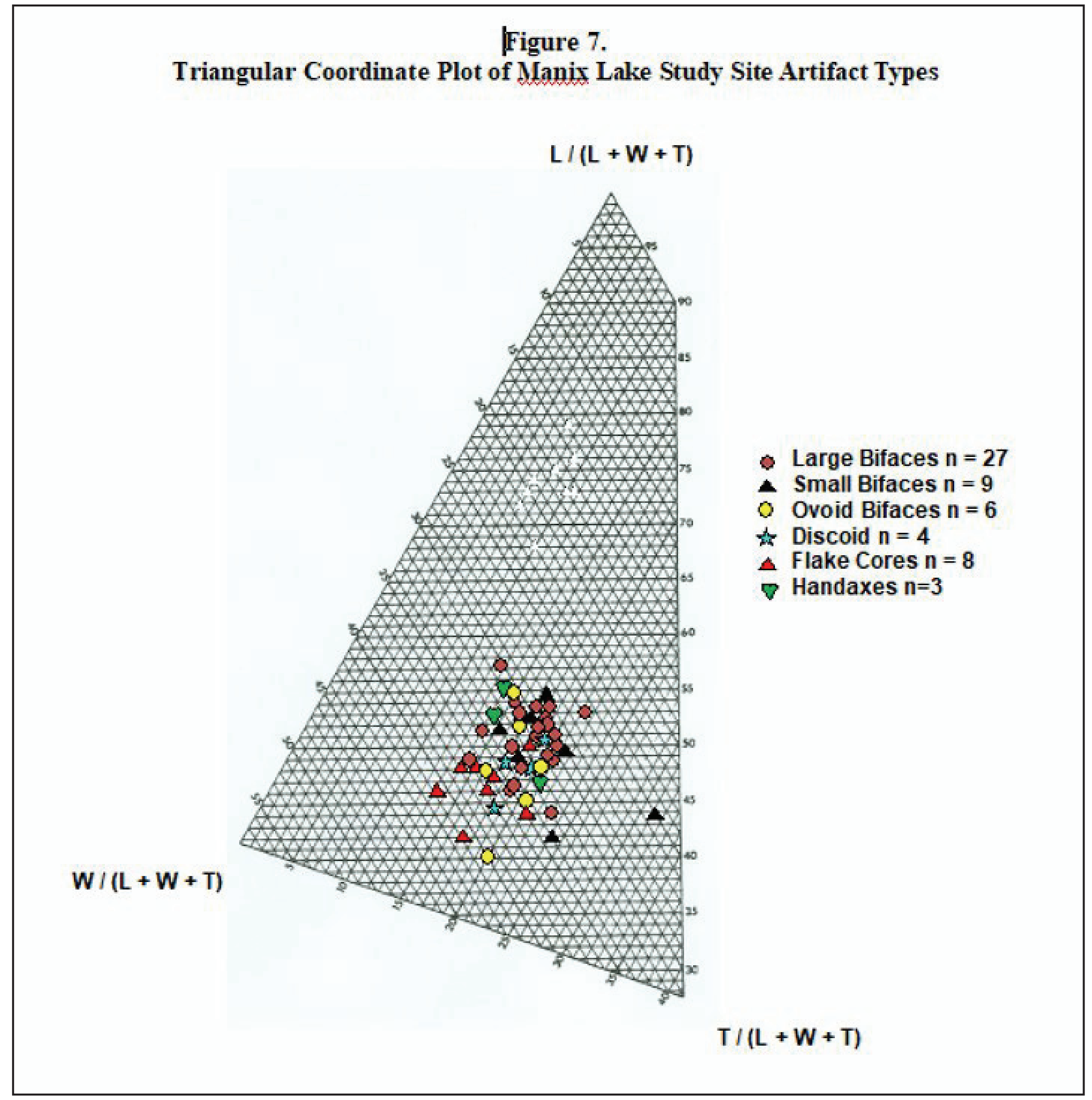

Figure 7. Triangular graphic plot of various types of Lake Manix Lithic Industry artifacts from the study site.

larger bifaces just having been made from smaller cobbles. This observation is further supported by the fact that with the exception of two outliers, the small bifaces plot almost on top of the large bifaces on the triangular coordinate diagram seen in Figure 7.

Six of the smaller bifaces exhibit extensive retouch on one or both lateral edges (Figures 8-10). They are also more ovoid in shape than the other small bifaces as a result of the retouch. As can be seen in Figure 7, they plot in the general range of the other bifaces from the site but two are considerably thinner and thus plot well below the range of the unfinished bifaces. Examination of the lateral edges of both bifaces at 60-80x using a Dino-Lite AM4111-T digital microscope shows extensive polish from cutting and/or scraping. No distinct striations were observed so the absolute use could not be determined.

A total of 12 flake cores were recovered. Eight of these were relatively flat and plot well below the rest of the bifaces from the site (see the red triangles on Figure 7). A large number of medium-sized flakes had been removed from each to the point that these cores were probably discarded. Four of the cores were more conically-shaped in much the same manner as an Acheulean discoid (Figure 11). I am in no way suggesting that these are discoids produced by Acheulean technology, merely that they have a similar overall shape. Interestingly, only one large flake was recovered from the site and it showed no signs of any reworking of edge wear. Three smaller flakes (<60 mm) of chalcedony were recovered from the site. All are thin (7.8-11.2 mm) and represent biface

Figure 9. Two ovoid-shaped bifaces that have extensive retouch on their lateral edges.

thinning flakes. Two of these flakes show very fine retouch on one lateral edge (Figure 12). The lack of extensive debitage recovered from the site reinforces the observation that the location appears to have been a living area and not a quarry workshop.

Two large flakes were reshaped into ovoid hand axes (Figure 13). Both were made using no more than 10-15 flakes per side and then retouched on their lateral edges. One of the bifaces showed minor use-wear on one lateral edge. A third handaxe was made from a cobble (Figure 14). One lateral edge showed both fine retouch as well as polish from use-wear.

One small biface had a large, purposefully made notch on one lateral edge (Figure 15). Exami-

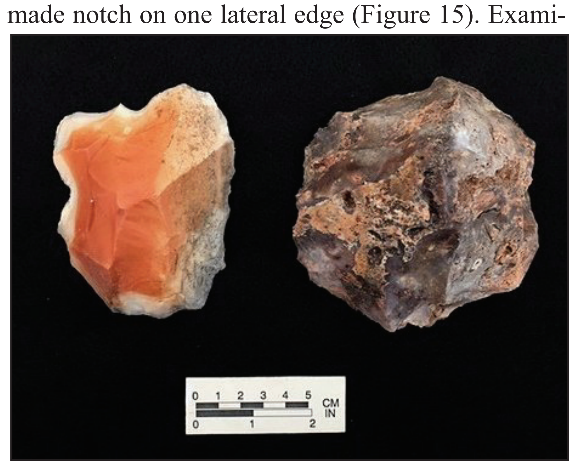

Figure 11. Examples of discoid flake cores from Pleistocene Lake Manix. The discoid on the left is made from chert and the one on the right from chalcedony.

Figure 10. Ovoid-shaped biface that has retouch and extensive use-wear polish on the left lateral edge.

nation of the artifact under high power (60-80x) showed extensive polish and edge crushing with small step fractures within the notch and no use-wear on any other part of the tool. Edge crushing and step fractures have been shown experimentally by Keeley (1980) to be produced when used on a hard sub-

Figure 12. Two biface thinning flakes made from chalcedonythat have fine retouch on the right lateral edge.

Figure 13. Two pear-shaped handaxes from Pleistocene Lake Manix. Both are constructed from flakes of chalcedony.

stance such as bone or wood. A large, semi-circular notch such as the one collected in this study could have been used to shape wood for use as a spear, digging stick, throwing stick, or other tool.

Other tools recovered from the site include four very large choppers (>600 grams) and two hammerstones. The choppers are similar to the large bifaces described above but have only one bifacially-flaked

Figure 15. A biface which contains a purposefully-made notch. The interior of the notch shows extensive use-wear and polish.

Figure 14. Handaxe made from a chalcedony cobble from Pleistocene Lake Manix.

lateral edge with the other part of the tool being largely unworked cortex. One chopper has a lateral working edge while the other tool's distal edge has been bifacially worked (Figure 16). Extensive use from battering was observed on the cutting edge of both tools. The distance end of chopper 4 (see Table 1) had such severe edge crushing from battering use that the chalcedony was smooth to the touch. This use-wear is very different from the polish observed on the ovoid bifaces or on the handaxes and is similar to what would be expected from work on wood or bone (ie. edge crushing and step fractures) (Keeley 1980). The two hammerstones are the only tools from the site not made from chalcedony or chert; instead, they are made from a granitic rock. Both are ovoid in shape and show extensive battering on one or both ends confirming their use as hammerstones.

Microscopic examination of this edge shows extensive edge crushing and step fractures from use.

Cultural Affiliation

The Manix Lake Lithic Industry received serious attention and study during the late 1950s and 1960s (Simpson 1958, 1960, 1964). Unlike other older-

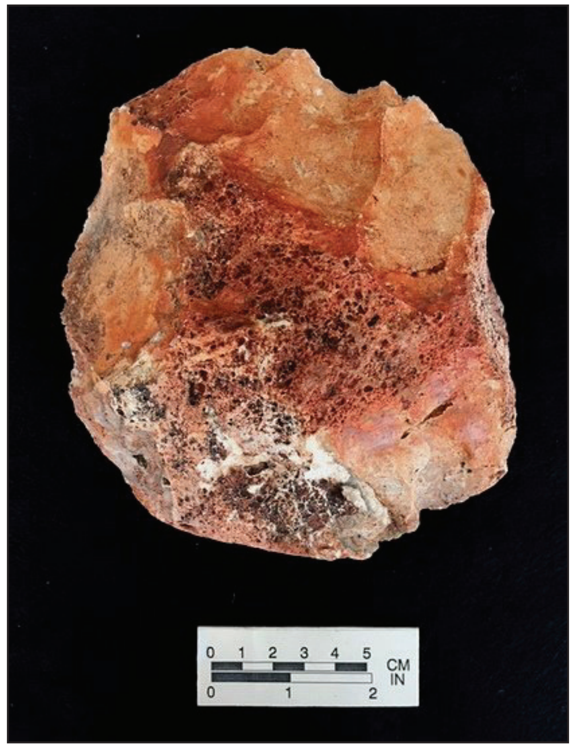

Figure 16. Large chopper made from chalcedony. The distal end at the top of the photograph has been bifacially flaked to produce a cutting/chopping edge.

than-Clovis claims elsewhere in North America, the Manix Lake Lithic Industry was seen as a strong candidate for an early occupation of the western U.S. In 1965, Meighan summed up the state of knowledge on the Manix Lake Lithic Industry stating "The Manix Lake Lithic Industry is the best contender for a tradition of great age that is not a projectile point tradition; the assemblages merit the most careful study and description" (Meighan 1965).

So why has the Manix Lake Lithic Industry not been more carefully studied and its potential Pleistocene age more generally accepted by archeologists? I believe the main reason for its lack of acceptance is its proximity to the nearby Calico site which has served to detract from serious study of the Manix Lake artifact assemblages. In the 1960s at the invitation of Dee Simpson, Louis Leakey was asked to come to California to view primitive lithic artifacts found in the Calico Hills (also known as the Yermo Hills) which had the appearance of ancient flaked tools found in Africa. After working at Calico for several years, Leakey pronounced the site to be of 100,000 years or more in age and perhaps as old as 250,000 years B.P. based on the crude nature of the "artifacts" (Leakey et al. 1968; Leakey et al. 1972). Additional support for an early date for *Homo sapiens* in North America came from Jeffrey Bada who developed an experimental age dating technique on bone in the early 1970s known as Amino Acid Racemization. Bada dated a number of human skeletons from southern California to greater than 40,000 years B.P. (Bada and Helfman 1975). However, later work by Taylor et al. (1985) using advanced accelerator mass spectrometry carbon 14 dating showed the same skeletons to be no older than 11,000 years B.P.

During the 1970s and 1980s, a number of researchers severely criticized the work of Leakey and his colleagues at Calico citing that the "artifacts" were solely the product of natural forces present in the large alluvial fan located at the end of Lake Manix and thus were "geofacts" not man-made artifacts (Haynes 1973; Meighan 1983). Payen (1982) applied the Barnes Test (Barnes 1939) to a large number of the Calico artifacts and showed that the angle of their fractures more closely corresponded to those seen in nature rather than those produced by man. The Barnes Test was set up in 1939 by Englishman Alfred Barnes as a quantitative technique to discern man-made artifacts from natural geofacts. Barnes' experiments showed that the higher the angle between fractured surfaces, the more probable that the fracture is due to natural rather than man-made causes. Thus geofacts have angles of fractures close to 90° whereas true artifacts typically have fracture angles of less than 80° and often considerably less than that. Meighan (1983) used the Barnes test to "prove" that all of the so-called artifacts at the Calico site were in fact naturally-produced geofacts. With the collapse of Amino Acid Racemization dating and general condemnation of Calico's "artifacts", serious interest the nearby Manix Lake Lithic Industry died by association. More recently, Patterson et al. (1987), Simpson (1999), Budinger (2000), and Hardaker (2009) among others have tried to demonstrate that not all of the Calico artifacts are "geofacts" and indeed many bear the same physical characteristics as man-produced artifacts. The problem at Calico is that are indeed later Archaic occupations in the area and in many areas, true artifacts and geofacts have become mixed. Thus, acceptance of Calico and its lithic assemblages remains problematical for now.

So what of the Manix Lake Lithic Industry? Simpson (1960, 1964, 1999) has repeatedly asserted that the best evidence for the Pleistocene age of the Lake Manix lithic artifacts is their occurrence as "isolates" (small living areas) which are not in direct association with later, known Archaic quarry workshops. Bamforth and Dorn (1988) tested this hypothesis and determined that due to weathering and redepositional processes present in the area, not all the "isolates" can be declared the production of human activity as some may be the result of later

natural forces (Carson and Kirkby 1972). This is exactly the argument that I attempted to eliminate in my exploration of the western arm of Lake Manix. As noted above, I observed both obvious prehistoric lithic quarry workshops as well as source areas for raw, unworked lithics. The former were obvious by the large amounts of both unfinished bifacial artifacts and the tens of dozens of flaked stone debitage. I therefore intentionally set out to find a remote isolate of Manix Lake Lithic artifacts to test the hypothesis of the site being the result of a living area versus that of a quarry workshop. The site I collected from had all the following attributes:

- The artifacts were in an oval-shaped isolate covering an area of approximately 100 square meters and were not in direct association with a quarry workshop (almost complete lack of flaked stone debitage).
- No other similar accumulations of artifacts were found within at least 150 meters of the site. Desert varnish was present on the majority of the artifacts indicating that they had been exposed on the surface for a prolonged period of time.
- The artifacts were present either on top of or embedded in a desert pediment surface. Secondly, the artifacts were scattered over a 10 x 10 meter area. They were not deposited as the result of hillslope formation or any other natural geological process.
- The location of the site was immediately above the 1780' level of Pleistocene Lake Manix indicating that it would have been on or near the shoreline of the lake at its peak over 20,000 years B.P.
- All the lithics present in the site with the exception of three small bifacial thinning flakes had been previously flaked into bifaces somewhere other than at the site. No extensive debitage was present.
- At least 18 artifacts exhibited some degree of retouch and end-use wear resulting in either edge damage or polish. This is not what would be expected from unfinished material in a quarry workshop.
- Only large bifacial artifacts were present. No projectile points of any kind, nor bone, stone, or ceramic implements were present.

All of the above would indicate that the site represents a single, probably short-term campsite (not a quarry workshop) that was located on the highest shoreline of Pleistocene Lake Manix. This shoreline is consistent with an age of 18,000 20,000+ B.P., but could also be older. Thus the artifact isolate I studied would appear to be consistent with a non-lithic projectile point culture (I cannot rule out weapons made from bone or wood which may have deteriorated with age and exposure) that is of Late Pleistocene age and potentially older than Clovis.

A major problem with the above conclusion is the site which is the subject of this study, and by inference the entire Manix Lake Lithic Industry, appears to represent a non-lithic projectile point culture. Until recently, our concept of what an older-than-Clovis lithic assemblage would look like has been very limited. However, recent discoveries of cultural materials firmly dated between 14,000 and 20,000+ years B.P. have now been found at Meadowcroft Rockshelter in Pennsylvania (Adovasio et al. 1998), Cactus Hill in Virginia (McAvoy and McAvoy 1997), the Delmarva Peninsula around Chesapeake Bay (Stanford and Bradley 2012), and at the Debra Friedkin and Gault sites in central Texas (Waters et al. 2018; Williams et al. 2018) among others. While the cultural and temporal setting is different at each of these sites, they all represent well-dated older-than-Clovis occupations with distinct lithic projectile points as a major constituent of the artifact assemblage. With the exception of the recent and highly controversial Cerutti Mastodon site near San Diego (Holen et al. 2017, 2018), the only other accepted early non-lithic projectile site is the Manis Mastodon site in Washington (Waters et al. 2011). Even there, a bone projectile point was found imbedded in one of the mastodon's vertebrae. Thus without the discovery of a bone or wooden projectile, the Manix Lake Lithic Industry remains unique in representing a non-projectile point culture.

After studying these enigmatic artifacts and the area they come from, I remain of the belief that they do indeed represent an early, older-than-Clovis Pleistocene human occupation in southern California. However, much more research and work on other isolates and their artifact assemblages needs to be done before the Manix Lake Lithic Industry can be accepted as a valid member of the Pleistocene occupation of the Americas.

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PREVIOUSLY UNREPORTED ARTIFACTS FROM THE DENT CLOVIS SITE (5WL269), WELD COUNTY, COLORADO

Wilson W. Crook, III

Introduction

In the early 1980s, my father attended an archeological conference on Paleoindian research in Denver, Colorado where I was living at the time. One of the activities at the conference was a field trip to the famous Dent Clovis site (5WL269) located about 40 miles north of Denver in southern Weld County, Colorado. I could not attend the conference due to work commitments with my employer, Mobil Oil Corporation. However, the following Saturday, my father and I drove to the Dent site where he showed me the general site area and the small draw where the partially butchered remains of a number of mammoths (*Mammuthus columbi*) and three Clovis points had been found in 1932-33 (Figure 1). The landowner graciously gave us permission to explore the entire site for most of the day.

My father, being a geoarcheologist and a specialist in river terrace formation, showed me the exposures of the Kersey Terrace where both the mammoths and the Clovis points had been found. As we explored the area, I noted a number of small fragments of clearly large-celled bone which were probably mammoth. In the area where the mammoths had been excavated, we found a small thumbnail end-scraper made of gray chert and a baseball-sized ovoid stone which had distinctive battering marks of a hammerstone on two ends. Further exploration of the area over the next several hours revealed a second thumbnail end-scraper at the end of the draw near the Union Pacific railroad tracks which border the eastern side of the site.

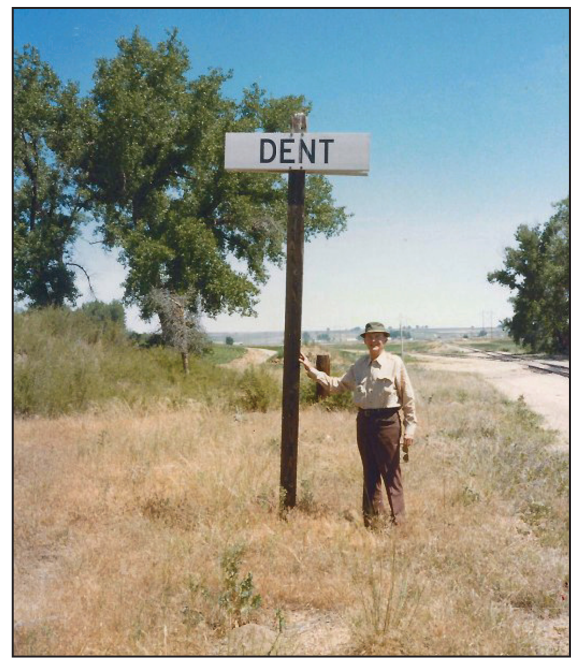

Figure 1. My father, the late Wilson "Bill" Crook, at the Dent railway stop adjacent to the Dent Clovis site.

The next week, I took the three artifacts to the Denver Museum of Natural History (now the Denver Museum of Nature and Science) where much of the original Dent site material is curated. None of the people at the museum were interested in retaining the artifacts as they had been found out of context on the surface. Despite my assertions that no other prehistoric material had been found in the same area and thus the three artifacts were very likely part of the Dent site, there was no interest in taking them. Therefore, rather than let the artifacts be potentially lost or worse discarded, I took them home, carefully cleaned and measured them, and placed them in storage where they have resided for the past 30+ years. With the publication of this issue of *The Journal* dedicated to Western U.S. Archeology, I decided that a short paper describing the three artifacts should be included. It is my sincere hope that someday the artifacts described herein may be included with the rest of the Dent site material so that the complete site suite can be studied.

The Dent Clovis Site

The Dent site is located on the western edge of the South Platte River in southern Weld County immediately east of the foothills of the Front Range. The site itself is located within a small drainage that cuts through a small bluff of the Cretaceous Foxhills Formation. The materials of the Dent site are superimposed on top of an eroded surface of the a Pleistocene river terrace known as the Kersey Terrace

(Haynes et al 998). The current South Platte River lies approximately 2 kilometers east of the site but was very close to the site during the late Pleistocene.

In April, 1932, Union Pacific railroad foreman Frank Garner noticed several large animal bones were eroding out of a small gulley draining out of a low sandstone bluff immediately to the west of the Dent railroad depot (Figure 2). The son of the Dent depot manager was a student at Regis College in Denver and he informed his geology professor (and priest) Father Conrad Bilgery of the discovery. In the fall of 1932, Father Bilgery and his students excavated some of the bones in the gulley and identified them as mammoth (*Mammuthus columbi*). A single Clovis point was also recovered in November of 1932 (Wormington 1957; Brunswig 2007). At this point, Father Bilgery informed the Denver Museum of Natural History of the discovery, and the following summer, museum paleontology curator Jesse Figgins and his assistant, Frederick Howarter, uncovered the remains of fourteen mammoths – five adult females and nine juveniles (Brunswig 2007). Embedded with the mammoths was another Clovis projectile point, the first found in the United States in unquestioned association with Pleistocene mammals (Brunswig 2007). The distal end of a third Clovis point that had been broken and repurposed into a knife was found by the site's discoverer, Frank Garner, who kept the artifact until the 1950s when it was given to the Denver Museum (Wormington 1957). In addition to the three Clovis points, Figgins also uncovered a number of large rocks in association with the mammoth bones which he believed has been used by the Clovis hunters in helping to disable or dispatch some of the smaller mammoths (Figgins 1933). The large boulders (exceeding 50 cm in circumference or about 15 cm in diameter) do occur naturally in some places within the South Platte terrace system and were likely found locally. Whether they were used to aid in the kill is unknown, however, analysis of the bones suggests that that rocks were likely used as hammers during the processing of the mammoths (Saunders 1999, 2007).

No further work was conducted at the Dent site until 1973 when a joint University of Colorado-University of Arizona team excavated a trench through the area of the original bone bed. The project was halted after several days when it was discovered that additional bones extended underneath the Union Pacific railroad tracks. The trench which was adjacent to the western side of the railroad line showed that mammoth bones had likely washed down from the draw after their kill and dismemberment (Brunswig and Fisher 1993; Brunswig 2007).

More recent research between 1987-1994 has focused on a detailed examination of the mammoth bones, season of death, and precise age dating. Dent bone studies have found cut, chop, and gouge marks consistent with the mammoth having been butchered when the animals were freshly killed (Saunders 1999, 2007). Season of death studies have shown that the animals were killed in the late fall or early winter when cold weather would have preserved the meat for days or even weeks allowing for a more complete processing of the kill (Fisher and Fox 2007). Geological studies of both the western railroad trench cut in 1973 and nearby terrace formations supports the observation that a narrow draw had been cut through a sandstone bluff providing the mammoths with access to a shallow crossing of the South Platte River. The narrow defile could have provided hunters with an excellent site to ambush and kill the mammoths (Haynes et al. 1998; Brunswig 2007). Lastly, more than a dozen radiocarbon dates have been obtained from the mammoth remains. Three high precision AMS dates were obtained in 2006 with an average calendar year date of 12,850 B.P. (Brunswig 2007).

Comparative studies of African elephants suggest the Dent mammoths probably represented a typical matriarchal family herd with young bulls separating from the group upon reaching maturity. The large female identified in the remains was most likely the matriarch of the herd with the other animals in the group being directly related (Douglas-Hamilton and Douglas-Hamilton 1975; Laws et al. 1975). Upon being attacked, matriarchal-led elephant herds will often stand their ground with the lead female either charging the danger or offering a number of bluff charges. The remainder of the herd will "bunch", typically forming a protective ring around the younger members. I have personally witnessed such matriarchal-led herds including bluff charges in Tanzania, Zambia, Zimbabwe, and South Africa and there is no reason to believe that mammoths would not have behaved similarly. Remaining bunched within the small ravine at the Dent site would have allowed the hunters the opportunity to kill multiple animals at a single encounter.

Recent examination of the mammoth bones has suggested that there may have actually be more than one closely spaced kill event at Dent (Saunders 2007). Elephants are extremely habitual creatures and will repeat the same migrational patterns over and over (Moss 1988). As such, their behavior can sometimes be predicted, especially around water. Assuming mammoths behaved in a similar manner, it is very possible that the same ambush site could have been used more than once, possibly even on the same herd.

Figure 2. Aerial view of the Dent Site showing the drainage fan to the right of the railroad tracks where the mammoth discovery was first made. (Photo from Brunswig 2007)

New Artifacts from the Dent Site

A total of 3 artifacts were collected from the Dent site by the author and his father (Table 1). Two of these were found within the draw where the kill had been made. These artifacts consist of a thumbnail end-scraper (Thumbnail End-Scraper 1 in Table 1) and a probable hammerstone. The second thumbnail end-scraper (Thumbnail End-Scraper 2 in Table 1) was found immediate west of the railroad tracks in the general area of the University of Colorado-University of Arizona trench dug in 1973.

Thumbnail end-scraper 1 is made from a medium light gray-colored chert (N 6/0) with thin bands of grayish-red purple (5RP 4/2), dark yellowish-orange (10YR 6/6), and dark brownish-gray (5YR 6/1) (Geological Society of America 1995). The scraper is quite small with a length of 22.9 mm and a maximum width of 21.5 mm. Maximum thickness is 5.0 mm. The scraper is unifacial and made from a thin flake of chert. Only the bit edge is significantly worked with steep angled flakes characteristic of these small tools. The tool has been used to the point of exhaustion as the bit edge is only 20 mm from the flake's bulb of percussion. A remnant "spur" is present on the left lateral side near the bit edge (Figure 3).

The second thumbnail scraper is slightly larger with a length of 32.0 mm and a maximum width of 24.2 mm. Thickness is 6.2 mm. The tool is unifacially flaked and there is a prominent thinning flake scar that runs the length of the dorsal surface (see Figure 3). The flake has a significant degree of curvature.

Table 1. New Dent Clovis Site Artifacts – Physical Measurement and Lithic Composition

Tool Type	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)	Lithic Material
Thumbnail End-Scraper 1	22.9	21.5	5	2.9	Chert[1] Medium Light Gray N 6/0 with bands of Grayish Red-Purple 5RP 4/2, Dark Yellowish-Orange 10YR 6/6, and Light Brownish-Gray 5YR6/1
Thumbnail End-Scraper 2	32	24.2	6.2	5.1	Chert[1] Very Light Gray N 8/0 to Pinkish-Gray 5YR 8/1 to White N 9/0
Hammerstone	69	61	43.4	239.1	Granite

[1] *The chert is consistent with Flattop Butte chert from Logan County, Colorado.*

Color varies from very light gray (N 8/0) to pinkish-gray (5YR 8/1) to white N 9/0). There are tiny specs of pale red-purple (5RP 6/2) within the chert (Geological Society of America 1995). Like end-scraper 1, the bit edge is marked by very steep angled flaking. However, unlike the first end-scraper, there is also fine retouch present on both lateral edges.

The lithic material used in both end-scrapers is very similar to and appears to correspond to Flattop Butte chert which crops out northwest of Sterling in Logan County, Colorado. This is roughly 135 kilometers northwest of Dent. The cherts from this area are well-known to have been extensively quarried in prehistoric times (Greiser 1983). Moreover, the chert is known to have been used as source material for Paleoindian artifacts across the Great Plains and one of the Clovis points recovered from the Dent site (Hoard et al. 1993; Brunswig 2007).

The other artifact recovered from the site is a ovoid-shaped cobble which is composed of a weathered biotite-bearing granitic rock. Similar cobbles can be found in the gravels of the South Platte River located just to the east of the site. Dimensions of the baseball-sized cobble are 69.0 mm x 61.0 mm x 43.4 mm. Weight is 239.1 grams. The cobble shows a large amount of battering on both ends indicative of its use as a hammerstone, either on lithic or bone material (Figure 4). No other cobbles of similar size were found anywhere within the draw.

Figure 3. Thumbnail end-scrapers recovered from the Dent Clovis site. End-scraper 1 is on the left and end-scraper 2 on the right. Both appear to be made from Flattop chert.

Conclusion and Discussion

While found on the surface and clearly out of context, the three artifacts described herein are consistent with both Clovis age tools and with the processing of large game which took place at the Dent Clovis site. In particular, spurred end-scrapers such as those described in this paper have been found in a number of Clovis contexts such as Gault (Collins and Hemmings 2005), Brushy Creek (Crook and Hughston 2008; Crook et al. 2009), Timber Fawn (Crook et al. 2016), Wood Springs (Crook 2017), and many more sites (Bradley et al. 2010). Some of these tools were clearly constructed from flakes. However, others, especially those with prominent "spurs", may be the worn remnant of end-scrapers made on blades (Collins and Hemmings 2005). Thumbnail End Scraper #2 with its degree of curvature was likely made on a Clovis blade. The hammerstone is consistent with its use as an expedient tool either for resharpening or repairing worn tools or for use in processing mammoth bone material.

It should be noted that while none of the three artifacts described here can be unambiguously associated with the Clovis hunting activity at the Dent site, no other archeological activity has been reported in the immediate area of the site. Coupled with similar tools being found as common components of Clovis sites and their construction from chert known to have been used at the site, their association with the original discovery is not only reasonable but likely. Their location, near the original excavation area of Bilgery, Figgins, and Howarter, and adjacent to the area excavated in 1973, further suggests that they were somehow missed during these two previous excavations of the site. It is hoped that these artifacts would someday be curated with the remainder of the collection so that they may be studied in greater detail by researchers in the future.

Figure 4. Granite hammerstone recovered from the upper draw at the Dent Clovis site.

Acknowledgements

The writer would like to thank my late father, Wilson W. "Bill" Crook, Jr., Past President and Fellow of the Texas Archeological Society, for taking me to the Dent site and aiding me in understanding its geology and the archeological find. While I have learned much geology and archeology in my global explorations in the 30 plus years since I first visited the Dent site, the foundational understanding I gained in both fields is largely attributable to having my father as my early mentor.

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ROCK HOUSE SPRING: A COMPOSITE WESTERN STEMMED TRADITION PALEOINDIAN AND PINTO BASIN TYPE ARCHAIC SITE NEAR TEELS MARSH, NEVADA

Wilson W. Crook, III

Introduction

The Rock House Spring site is located above a fresh water spring of the same name, five kilometers south of Teels Marsh in Mineral County, Nevada (T.3N R.32E). The nearest sizable population center and limited facilities is located in Mina, 37 kilometers northeast of Teels Marsh. The spring gets its name from the construction of a small (10 x 15') single room house made from local boulders which was constructed in the late 1800s above the spring.

Mobil Oil Corporation (now Exxon Mobil Corporation) became interested in the mineral potential of Teels Marsh in the early 1980s and purchased all the surface and subsurface mineral rights under a long-term lease. In the summer of 1982, the author was placed in charge of an extensive mineral exploration program within the Teels Marsh area. In addition to a comprehensive geophysical and drilling program, also included was a detailed water geochemical sampling of all the springs surrounding the marsh. During the course of water sampling, flaked stone artifacts were observed in the area around Rock House Spring. Subsequent exploration revealed the presence of a campsite which contained both Paleoindian and Early Archaic components. Several test pits were dug, each showing no cultural material below a soil hardpan exposed on or near the surface. A surface collection of the site was made during July and August, 1982 with a total recovery of 183 artifacts. The Paleoindian artifact assemblage is similar to the Western Stemmed Tradition as defined by Bryan (1980) and Beck and Jones (1977, 1993, 2009, 2010, 2012a), while the Archaic component at Rock House Spring is identical to material described by Campbell and Campbell (1935), Harrington (1957), and Madsen (2007) to define the Early Archaic, non-ceramic Pinto Basin culture.

Geology

The Rock House Spring site lies five kilometers south of Teels Marsh, an internally drained basin along the western margin of the Basin and Range Province (Figures 1-4). Immediately west and north of the basin are the northwest-to-southeast trending Excelsior Mountains. The Excelsior Range is composed of a varied mixture of Mesozoic rocks ranging from mafic volcanics (hornblende gabbro) to granodiorite to quartz monzonite (Stewart 1984).

The Tertiary section exposed at Teels Marsh consists of a series of extrusive volcanic rocks ranging in composition from felsic (rhyolites) to basic (flow basalts). Felsic volcanic units are exposed south of the marsh in the immediate area of the Rock House Spring Site. These units consist of small outcrops of fluvio-lacustrine tuffs which have been ascribed to the Mio-Pliocene Esmeralda Formation.

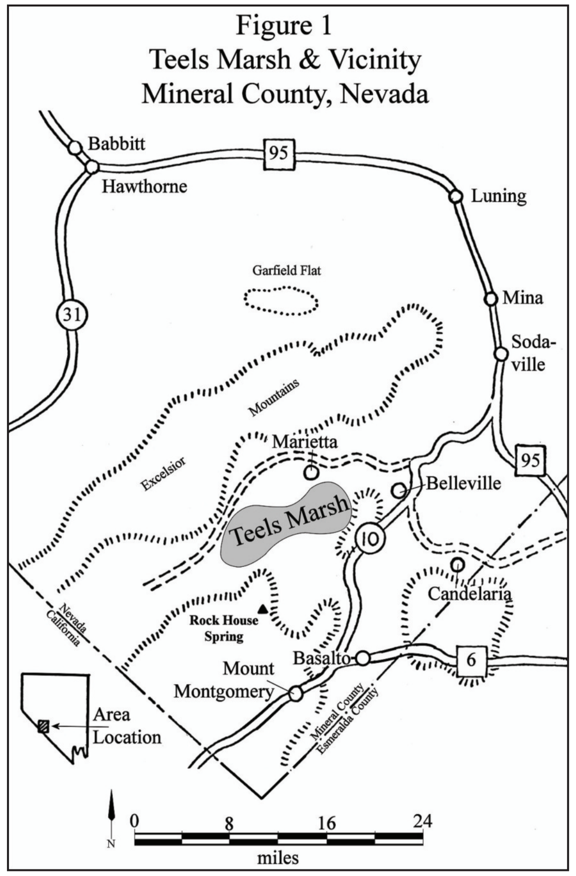


Figure 1. Map showing the location of Teels Marsh within Mineral County, Nevada. (Illustration by Lance K. Trask)

Figure 2. Photograph looking west across Teels Marsh toward the Excelsior Mountains. Note the basaltic rocks in the foreground and the white boron-rich evaporates which cover the surface of the marsh.

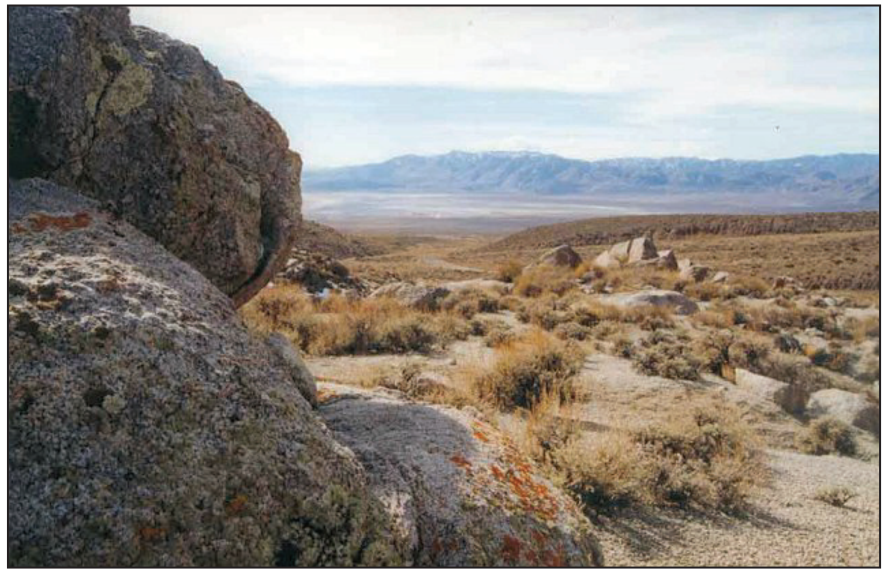
Overlying and unconformable with the Esmeralda Formation is a sequence of brown-gray-red crystal tuffs and light gray rhyolite flows. Rock House Spring is located on the faulted boundary between the crystal tuffs and recent Quaternary alluvium (Stewart 1984) (see Figure 1).

A series of intermediate to basic intrusive rocks unconformably overlie the Esmeralda felsic volcanics. These rocks vary in composition from andesite to basaltic andesite. The best exposures are located on the southern edge of the basin. Flood basalts represent the last phase of volcanism in the region. Individual flow units range from 10-100 feet in thickness. These flood basalts crop out throughout the basin but are best exposed on the eastern margin of Teels Marsh (see Figure 2). Formation of the flood basalts may have extended from the Pliocene into the early Quaternary (Stewart 1984).

The Teels Marsh basin has been filled by a variety of recent sediments, ranging from alluvial to lacustrine. Total thickness of basin fill is variable, being as thin as 20 feet on the margins of the marsh to greater than 3,000 feet at the basin depocenter. The present evaporative concentrated, alkaline brines which are present in the upper part of the marsh are thought to be a relatively recent geologic condition

Figure 3. Photograph looking north across Teels Marsh.

Figure 4. Photograph looking southwest across Teels Marsh and the Excelsior Mountains.



(Taylor, 1979; Taylor and Surdam, 1981). Boron and sodium-rich evaporite crusts are observed to be seasonal in formation today and would have been absent altogether during regional pluvial conditions observed within the archeological record of the Great Basin. However, during the late 1800s, Teels Marsh was actively mined for borax (boron) and in fact, was one of the first major borax production centers in the western U.S. (Hildebrand 1982) (Figure 5). To this day, wild donkeys, descendants of the original twenty mule team animals that helped transport borax to market, can be seen in small herds around the edges of the marsh (Figure 6). They are completely wild and generally very skittish around any human contact.

Structural Analysis of Teels Marsh

As part of Mobil's exploration program, the entire area covering Teels Marsh basin was flown to collect gravity and magnetic data. This data was then used to help position the subsequent exploration drilling program which was conducted during July and August of 1982 with the objective of finding either uranium-rich deposits within the marsh sediments and/or lithium-rich brines. A detailed structural analysis following the results of the drill program determined that Teels Marsh is bounded by a series of northwest and southwest trending faults which are currently tectonically active. The faults are typical Basin-and-Range graben faults with the downthrown portion forming the depocenter of the basin (Figure 7). The structural low created by these two graben

Figure 5. Remains of some of the early borax mine works at Teels Marsh.

Figure 6. Wild burro on the edge of Teels Marsh. This is as close as the author ever got to one of these normally very skittish animals.

fault systems has thus controlled the deposition in the basin. A second fault runs through the center of the basin and is downthrown to the southeast. A smaller series of faults are present on the southern end of the basin.

A number of volcanic ash producing centers, in particular the Long Valley Caldera (Bishop Tuff), occur near the Teels Marsh valley. As the marsh occupies a closed basin system, thick volcanic ash accumulations occur within the basin depocenter. These ash layers have been shown elsewhere in Nevada (Clayton Valley) to be very productive sources of lithium and are currently being mined for this element.

The fault systems which control the structure of the marsh also control its groundwaters. As can be seen in Figure 7, all of the 16 known springs which crop out within or along the edges of the marsh and are controlled by faults.

Spring Geochemistry

Teels Marsh is a typical closed-basin, shallow water discharge system. Surface run-off and groundwater from the interior of the basin are the primary sources of water. Average rain fall is only 5.5 inches

Figure 7.
Geology of Teels Marsh, Nevada
Location of Major Fault Systems and Spring Locations

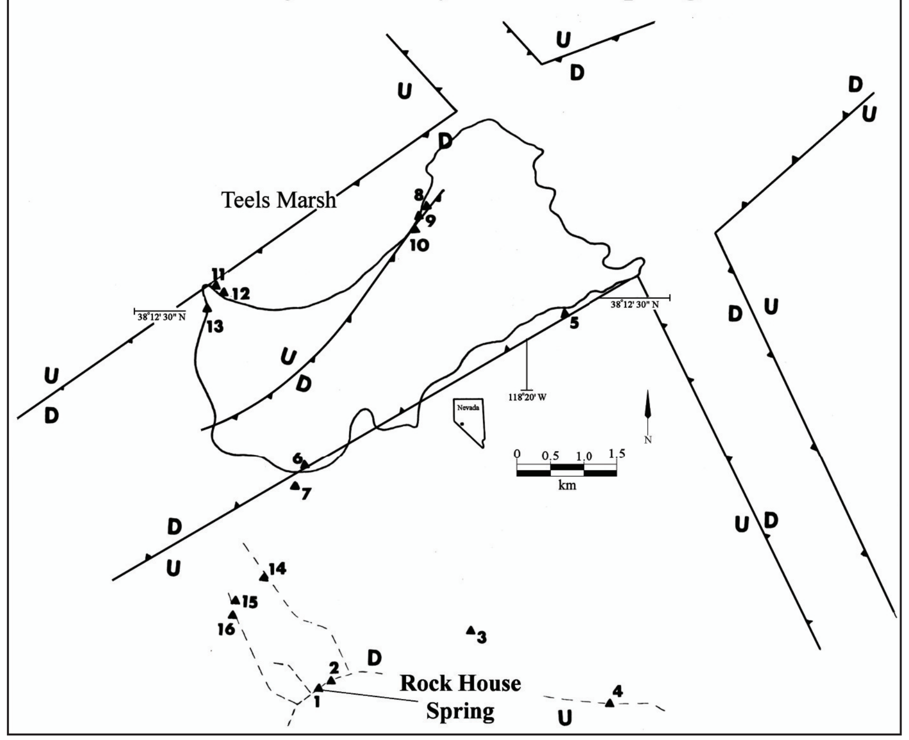


Figure 7. Map showing the location of the major fault systems which control deposition within Teels Marsh. Note that all 16 springs (numbered triangles) are located along one of these major fault systems. Rock House Spring is location 1 at the southern end of the basin. (Illustration by Lance K. Trask)

per year (Everts, 1969). The high rate of evaporative concentration is the dominant controlling factor in the geochemistry of the basin waters.

Two generic types of groundwater exist within the Teels Marsh basin: (1) saline alkaline brines associated with the playa lake sediments, and (2) fresh water springs. Airborne magnetic geophysical surveys conducted by the writer show that Teels Marsh is structurally controlled by two major intersecting graben systems. Of the two, the dominant feature is a northeast-southwest trending block which controls the lateral extent of the playa lake bed (see Figure 7). Intersecting this system is a smaller northwest-southeast trending graben block. The juncture between the two fault systems is the focus of a major structural distortion which has resulted in a dislocation and down dropping of a large central block, which forms the depocenter of the basin.

Located three miles south of the playa and conjugate to the smaller graben system is an east-west linear fault. Four springs (see Figure 7 – Springs 1-4), including Rock House Spring, are localized over this structure. Even though all 16 springs present in the basin may have been generated by the same regional structural mechanism, the individual water chemistries between the springs are vastly different. Evaporative concentration and precipitation of authigenic saline minerals is the controlling factor in spring water geochemistry at Teels Marsh (Smith, 1974).

Table 1 lists the geochemical analyses of the 16 known springs within the Teels Marsh basin. The springs are divided into four subgroups: (1) 4 springs south of the marsh (including Rock House Spring) (Springs 1-4), (2) 3 springs on the southeastern edge of the playa lake bed (Springs 5-7), (3) 6 springs on the northwestern edge of the playa (Springs 8-13), and (4) 3 springs located southwest of the marsh in Jack's Spring Canyon (Springs 14-16). Analysis of the spring waters from around the basin indicate that with long periods of evaporative concentration, calcium, magnesium, silica, carbonate, and sulfate are removed from solution above the water table (Smith and Drever, 1976). These elements are precipitated around the springs in the form of the minerals thermonatrite ($Na_2CO_3 \cdot H_2O$), natron ($NaHCO_3$), mirabilite (Glauber's salt) ($Na_2SO_4 \cdot 10H_2O$), gypsum ($CaSO_4 \cdot 2H_2O$), dolomite ($(Ca,Mg)(CO_3)_2$), calcite ($CaCO_3$) and burkeite ($Na_6CO_3(SO_4)_2$). The spring waters are further affected by seasonal "wet" periods

Table 1. Spring Water Geochemistry - Teels Marsh, Mineral County, Nevada

Spring	pH	SO_4 (ppm)	HCO_3 (ppm)	CO_3 (ppm)	SO_4%	As (ppb)	Se (ppb)	U (ppb)	Li (ppb)	B (ppb)	F (ppb)	Cl (ppb)
1	**6.9**	**196**	**1660**	**-----**	**13**	**<20**	**<20**	**0.05**	**2440**	**760**	**5400**	**297**
2	7.7	188	1810	-----	11.7	<20	<20	0.05	2390	2300	6050	342
3	7.5	100	755	-----	14.4	<20	<20	6.8	680	880	1360	145
4	7.3	140	980	-----	15.4	<20	<20	0.05	920	290	3058	216
5	9.1	300	1010	239	20.3	40	<20	1.1	1360	5500	6000	985
6	7.8	116	665	-----	18.1	25	<20	4.8	380	4450	1375	221
7	9.4	1480	2810	1120	27	1180	<20	5.6	1330	5700	6600	1480
8	8.2	122	54	-----	74.2	<20	<5	10	225	3100	6200	202
9	8.3	143	162	29	60	<20	7	8.1	345	5400	8600	201
10	9.7	215	2810	1120	45.1	1180	<20	3	600	4000	>10000	1455
11	7.5	215	182	-----	79.1	20	<20	3.6	600	4000	>10000	374
12	7.9	220	345	-----	44.8	35	10	3	1050	3350	>10000	367
13	8.4	164	61	-----	77.8	<20	7	6.2	164	3000	9200	278
14	8.3	335	955	-----	30.8	<20	7	2.5	1840	12500	7100	505
15	7.7	183	785	-----	19.8	<20	7	8.6	1250	7750	6200	329
16	9.2	350	1445	302	17.8	820	<20	6.2	6000	4800	24500	306

Spring Key: **1 - Rock House Springs**, 2 - Upper Rock House Springs, 3 - Company Spring, 4 - German Spring, 5 - CS Spring, 6 - Cased Hole, 7 Arsenic Spring, 8 - TTS1, 9 - TTS1A, 10 - TTS2, 11 - TTS3, 12 - TTS4, 13 - TTS5, 14 - TMW-7, 15 - TMW-8, 16 - TMW-12.

which result in a re-solution of some of the salts. The result is, depending on the amount of fresh water influx, an alkaline water system, rich in bicarbonate, variable in sulfate, carbonate and chlorine, and typically low in metals.

Analysis of the four groups of springs (Table 1) shows that each group except the one immediately south of the marsh contains at least one spring which is extremely high in arsenic content (>100 ppb). Amounts in excess of 300 ppb arsenic are considered poisonous to humans. In general, the springs located immediately adjacent the marsh also contain higher boron, fluorine, and chlorine, have a higher pH, and a higher relative sulfate percent ratio (as defined by total sulfate/bicarbonate + carbonate + sulfate). These elements combine to produce a water which is less tolerable by the human system.

By contrast, the four springs located south of the marsh have a near neutral pH, very low relative sulfate ratios, and low arsenic, selenium, and boron concentrations. These waters are by far the freshest and most potable in the entire basin. And, of the four southern springs, Rock House Spring is the only one near a topographic high providing both visibility of the entire basin (700' above the playa lake bed) and shelter. It is therefore only logical that the major archeological campsite for the area would be located near this spring.

Table 2. Rock House Spring Lithic Artifacts by Composition and Tool Type

Tool Type	Obsidian	Basalt	Chert	Quartzite / Chalcedony	Total
Dart Points - Paleoindian					14
Haskett	6	2	–	–	8
Silver Lake	2	–	–	–	2
Parman	1	1	–	–	2
Manix Lake	2	–	–	–	2
Crescent	2	–	5	2	9
Dart Points - Archaic					58
Humboldt	24	–	2	–	26
Pinto	14	–	1	–	15
Cascade	4	2	5	1	12
Stanislaw	2	–	–	–	2
Elko	1	–	–	–	1
Mantis	–	–	1	–	1
Point Sal	–	1	–	–	1
Unidentified Points	30	2	7	–	39
Biface / Knife	16	7	2	1	26
Scrapers (all types)	16	5	5	1	27
Drill / Perforator	3	2	–	–	5
Graver	1	–	–	–	1
Core	1	–	–	–	1
Grinding Stone	–	3	–	–	3
TOTAL	125 (68%)	25 (14%)	28 (15%)	5 (3%)	183

Artifact Assemblage

A total of 183 artifacts were collected from the Rock House Spring site (Table 2). As stated above, all of the artifacts recovered from the area in and around Rock House Spring were either exposed on the surface or within a few centimeters of the surface. Extensive test pits in the area showed that the surface consisted of a fine-grained, loose sand underlain by a hard, alkaline whitish-colored clay. All the artifacts occurred either slightly above or resting on the clay layer. This is typical of a desert pediment type surface where wind periodically deflates loose surface sand and the heavier stone artifacts settle. Over time, the area loses its stratigraphic integrity and artifacts from vastly different time periods can be found adjacent to one another. This is exactly the case at Rock House Spring.

Obsidian is by far the most common lithic material at the site, comprising 68 percent (n=125) of the total artifact assemblage. Another 14 percent (n=25) are made from basalt. Both of these lithic materials can be found in and around Teels Marsh and thus were likely procured locally. There is a clear distinction between artifacts made from obsidian that are Paleoindian (Western Stemmed Tradition) in age and those from the later Archaic period. The older obsidian material tends to have a dull, opaque luster probably the result of devitrification of the glass after years of being exposed to sunlight and heat. Conversely, many of the younger obsidian artifacts retain their original glassy luster or are just beginning to devitrify. While this distinction does not hold for every artifact, it is a general useful tool in determining the age of some of the non-projectile point artifacts at the site.

A total of 15 percent (n=28) of the artifacts are made from chert. Exploration of the entire Teels Marsh Basin showed that this material does not occur naturally in the area and thus was transported into the area. Most of the chert is a light gray color but one piece of bright red chert (see Figure 12b) and one of light yellow-brown (see Figure 12d) was also recovered. Lastly, 3 percent (n=5) of the artifacts were made of either quartzite and/or a white chalcedony. The latter was used exclusively in the construction of two crescent-shaped scrapers (see Figure 12a, c). Both of these materials do not occur within the Teels Marsh Basin and like the chert, were brought into the site from elsewhere in the region.

Within the recovered artifact assemblage, projectile points are by far the dominant tool type representing some 60 percent (n=111) of the total artifacts from the site. Of these, 14 projectile points can be assigned to types associated with the general Western Stemmed Tradition including Haskett (n=8), Silver Lake (n=2), and Parman (n=2) (Figures 8-10). In addition, two very crude pentagonal-shaped points were recovered which fit the general description of Manix points (Figure 11). The Manix point has been defined by Van Buren (1974) as an early crudely-fluted point found near Pleistocene Lake Manix in San Bernardino County, California. The point is characterized by a concave base, thick cross-section, general oval to pentagonal shape, and a crude flute or basal thinning flake, usually only along one face. Both points from the Rock House Spring Site fit all the descriptive criteria, with length-to-width ratio, weight, and flute characteristics being almost identical to those described by Van Buren (1974).

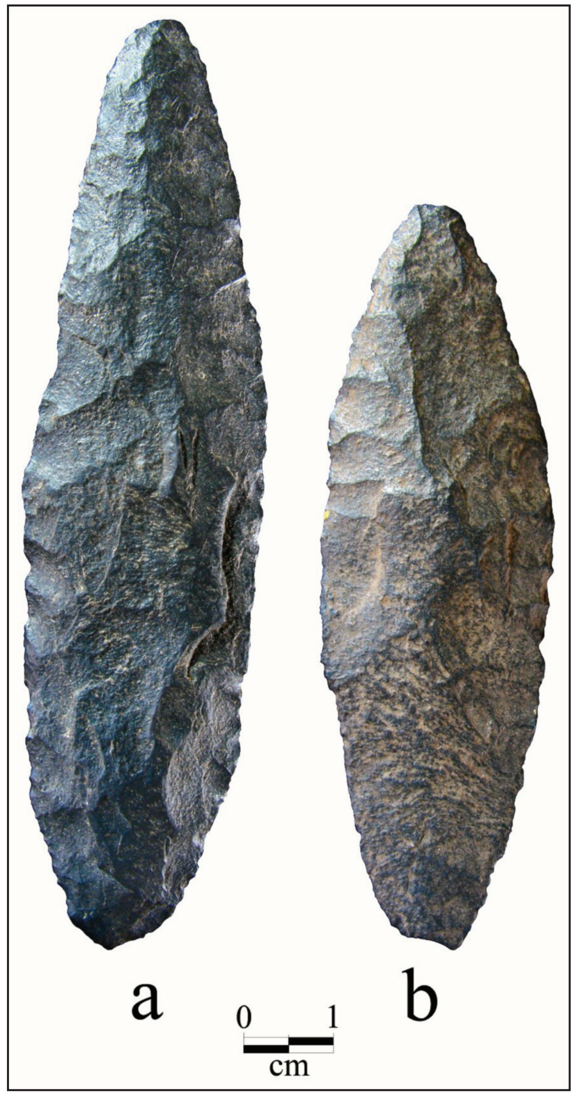


Figure 8. Two Haskett points from the Rock House Spring site near Teels Marsh, Nevada. Point a (left) is made from obsidian and point b (right) is made from a fine-grained flood basalt. Note how devitrification of the obsidian makes the two materials look similar. (Photograph by Lance K. Trask)

Figure 9. Silver Lake point made from obsidian from the Rock House Spring site. (Photograph by Lance K. Trask)

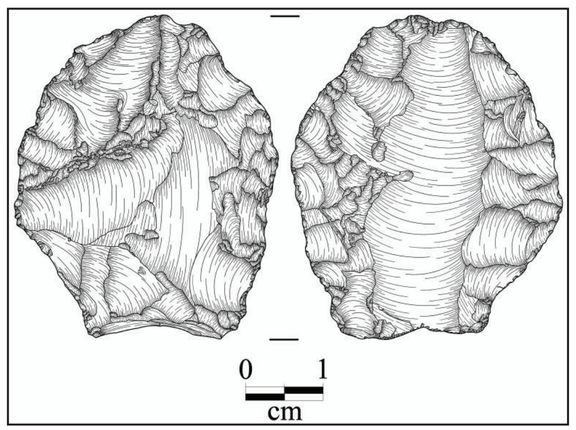


Figure 11. Illustration of the obverse face (left) and reverse face (right) of one of the Manix points recovered from the Rock House Spring site. Note the large impact fracture on the reverse face. (Illustration by Lance K. Trask)

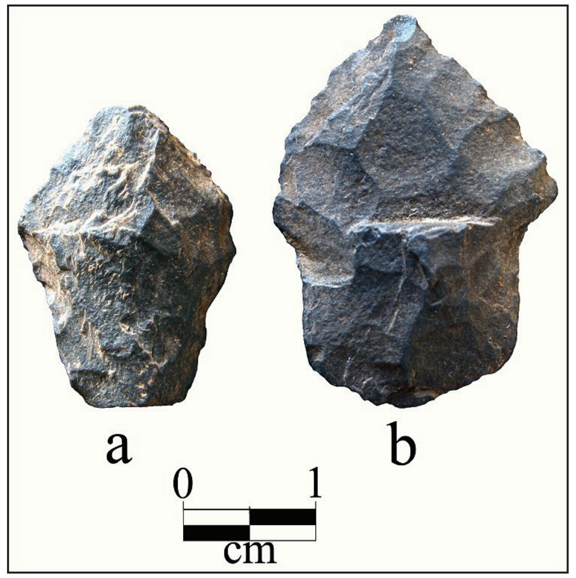


Figure 10. Parman points from the Rock House Spring site. Point a (left) is made from devitrified obsidian and point 2 (right) is made from fine grained basalt. (Photograph by Lance K. Trask)

The above projectile points and their associated assemblages belong to what has been referred to as the "Western Stemmed Tradition" (Bryan 1980; Willig and Aikens 1988; Beck and Jones 2010). A number of point types from the Intermountain West have now been assigned to this tradition, including Cougar Mountain (Layton 1970), Silver Lake and Lake Mohave (Amsden 1937), Parman (Layton 1970), Lind Coulee (Daugherty 1956), and Haskett (Butler 1965; Sargeant 1973). All of these types generally have long, contracting stems, however, the length of the stems can vary with both lithic material and use.

Western Stemmed Tradition points differ from Clovis and other early Paleoindian points in a number of ways. In particular, side-struck instead of end-struck flake blanks were the preferred method of initial tool construction (Pendleton 1979). Flake blanks were also reduced to a very considerable degree at the lithic source and then carried to occupation sites (Beck et al. 2002). This appears to be the case at rock House Spring as there is an almost complete lack of flake debitage at the site. However, small piles of flakes can be found elsewhere in the Teels Marsh Basin where both fine-grain basalt and obsidian can be found. Unlike Clovis and other early Paleoindian point types, Western Stemmed Tradition points are almost exclusively made from either obsidian or other fine-grain volcanics (basalt, dacite, andesite) as opposed to chert (Fagan 1974; Amick 1995; Willig and Aikens 1988; Beck and Jones 2010; Jones et al. 2003). As described above, the Manix point is both poorly described and even poorer dated.

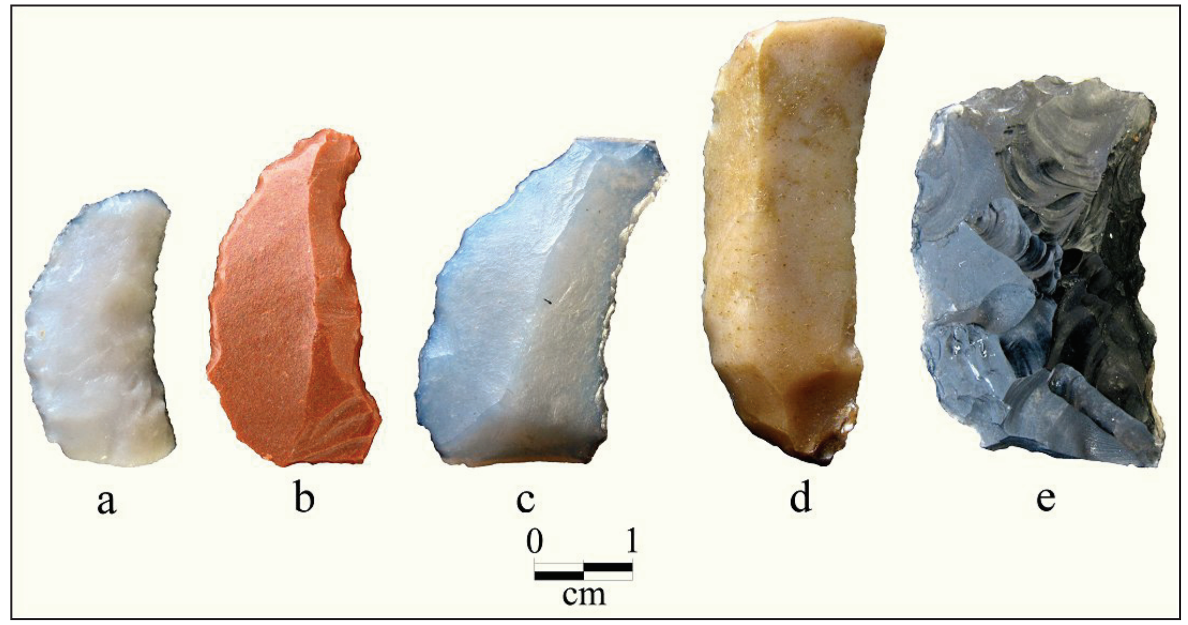


Figure 12. Crescent tools recovered from the Rock House Spring site. Crescent a and c are made from chalcedony, b and d from chert, and e from obsidian. (Photograph by Lance K. Trask)

It is included here with the Western Stemmed Tradition points based on its estimated age (>11,000 B.P.) at Pleistocene Lake Manix and Lake Mohave (Van Buren 1974).

The lack of stratigraphic context at the site makes it difficult to assign a Paleoindian period to any of the non-projectile point artifacts except the crescents. A total of nine crescents were recovered from the site (Figure 12). As can be seen in Table 2, crescents are made from a wide range of materials including obsidian (n=2), chert (n=5), and chalcedony (n=2). The crescents are generally bifacially flaked but they also occur as unifacially retouched flakes (see Figure 12b, c, and d). They range from 30-50 mm in length and are often ground along the medial segment of the outward lateral edge. There is wide speculation concerning the function of these tools, with suggestions ranging from surgical instruments (Amsden 1937), to cutting implements (Daugherty 1956), to hafted weapons for waterside hunting of large birds (Tadlock, 1966; Clewlow 1968). Although their function remains uncertain, crescents are found most commonly in the Intermountain West at sites which are adjacent to marsh or riverine environments during the terminal Pleistocene (Amick 1998; Smith 2008; Beck and Jones 2010).

The majority of the dart points recovered from Rock House Spring belong to the Early Archaic period and include Humboldt (n=26), Pinto (n=15), and Cascade (n=12) projectile point types. Humboldt points are lanceolate in shape and have a relatively shallow concave base (Figure 13). No lateral edge grinding is typically present. The points may or may not have an exaggerated serration to the lateral edges of the blade (see Figure 13b). Humboldt points have been dated to ca. 7500-6000 B.P. in the eastern Great Basin (Holmer 1986) and to 6700 to as late as 1200 B.P. in the western part of the Great Basin (Thomas 1981, 1983). At Rock House Spring, Humboldt points are preferentially made from obsidian (see Table 2).

The other predominant Early Archaic dart point type present at the site is the general category of Pinto points. Pinto points are large (typically >50 mm) shouldered triangular blades with straight to expanding stems and concave bases (Figure 14). Holmer (1986) refers to these points as "large bifurcate-stemmed points" and notes that various names have been assigned to the variants of the point form. Because of the wide variation in overall form, this has led to what Warren (1980) calls the "Pinto Problem". Thomas (1981) divided the points into two series: an earlier point type as found in the type sites of the Pinto Basin in California (Amsden 1935; Campbell and Campbell 1935; Harrington 1957) and morphologically similar but later points which he called "Gatecliff". Gatecliff points generally have deeper and wider concave bases, relatively straight stems, and often pointed ears (Thomas 1983). Pinto points and their variants have been dated between 8000 and 2000 B.P. but the true earlier forms appear to date largely between 8000-6000 B.P. (Jennings 1986; Beck and Jones 2012b).

Other dart points found include willow leaf shaped points identical to those described from the Stahl Site (Harrington 1957). These are now referred

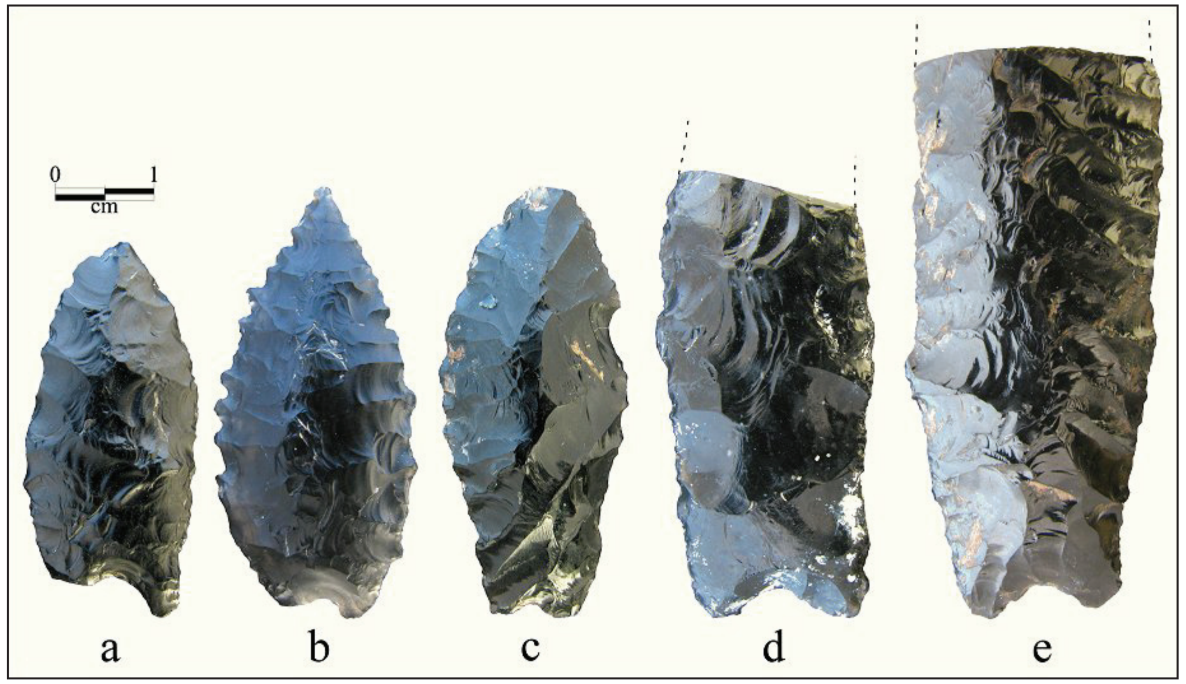


Figure 13. Humboldt points from the Rock House Spring site. All are made from obsidian; point b has exaggerated serrated lateral edges. (Photograph by Lance K. Trask)

to as Cascade points (Butler 1965; Jennings 1986). Cascade points are ovoid in shape with rounded, contracting stems. Extreme serration on the lateral edges is common. Where dated, they fall within the general Early Archaic range of both Humboldt and Pinto points (ca. 8000-4000 B.P.) (Jennings 1986).

A few later Archaic points including Stanslaw (n=2), Elko (Elko Corner Notch or Elko Barbed) (n=1), Mantis (n=1), and Point Sal (n=1) are present at the site. All of these later Archaic point types date to ca. 4000-1500 B.P. (Holmer 1986; Jennings 1986). In addition, a total of 39 points could not be typed as they were mainly tip or mid-sections and lacked any definite form. However, based on their lithic material and style of flaking, most probably stem from the Early Archaic (Humboldt-Pinto-Cascade) occupation at the site.

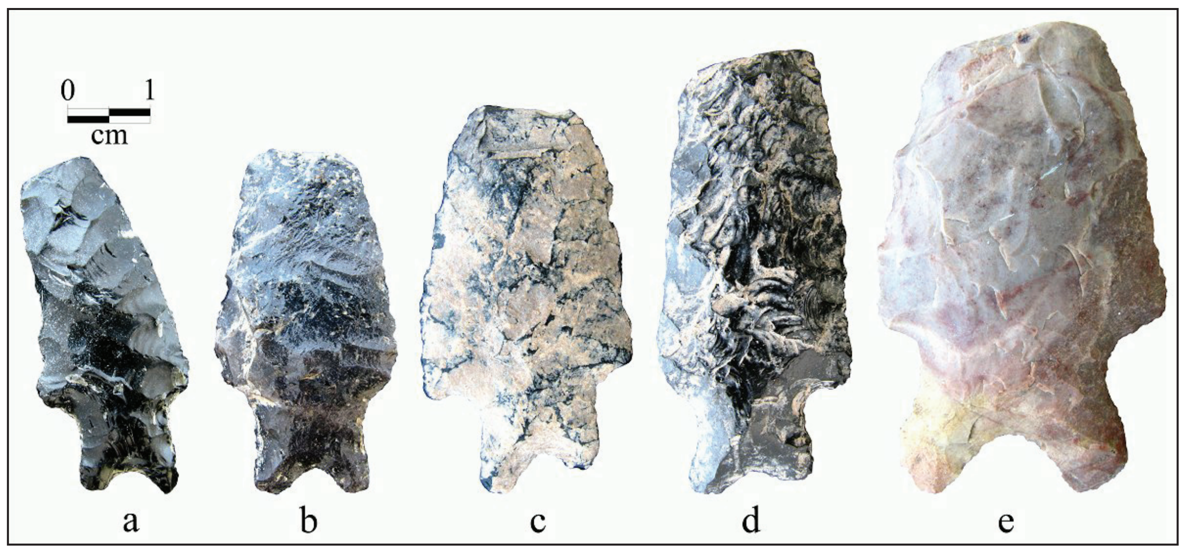


Figure 14. Pinto points from the Rock House Spring site showing some of the variant forms under the general point category. Points a-d are made from obsidian; point e is constructed from gray chert. (Photograph by Lance K. Trask)

Figure 15. Large bifaces made from obsidian from the Rock House Spring site. Note the degree of dehydration in the far right biface as compared to the other two. No use-wear could be seen on the first two artifacts and they may have been large blanks. The right hand biface showed edge wear along the left lateral side and was probably used as a knife.

Other artifacts recovered from the Rock Springs site include 26 bifaces, 27 scrapers (mostly concavo-convex side scrapers, thumbnail end scrapers, or flake side scrapers), 5 perforators, 1 graver, 1 obsidian core, and 3 rough basalt metates (Figures 15-20). All artifact types present are identical to those reported from both Western Stemmed Tradition and Pinto Basin type sites (Beck and Jones 2010; Campbell and Campbell 1935; Harrington 1957). Beck and Jones (2009, 2012) note that in many sites in the Intermountain West, fine-grained volcanics (obsidian, andesite, dacite, basalt, etc.) are used in the construction of projectile points whereas chert is the preferred lithic material for other tools. At Rock House Spring, obsidian remains the predominant toolstone for all tools, however the percentage of use of basalt, chert, and quartzite does increase for the non-projectile point assemblage (see Table 2). No hammerstones, manos or bone implements were found. It is also significant to note that while a few arrow points were found elsewhere in the area (notably on the north side of the marsh), no arrow points or pottery was present at Rock House Spring.

Figure 16. Smaller bifaces which appear to have been used as cutting tools. All are made from obsidian except for the second from the left which is constructed from a fine-grain basalt.

Figure 17. Large concavo-convex side scrapers made from obsidian. All show extensive use-wear.

The single oddest observation about the artifacts assemblage from Rock House Spring is the notable paucity of lithic debitage. All the material from the test pits was screened using ¼ inch mesh and the material carefully gone through by hand. Less than 20 flakes, again mostly obsidian with a few of fine-grained basalt, were recovered. This further underscores the observation of lithic debitage piles around the edges of the marsh where much of the toolstone is exposed as being the areas where lithic reduction was carried out as opposed to the area in and around Rock House Spring itself.

Cultural Affiliation

The artifact assemblage collected at Rock House Spring indicates a long period occupation, ranging from the Paleoindian Western Stemmed Tradition through the Early Archaic, with a very minor later Archaic component. Exploration around the remainder of the Teels Marsh Basin revealed several minor sites adjacent to the eastern and northern edges of the playa lake bed as well as evidence of a small occupation in Jack's Spring Canyon to the southwest. All appear to be small campsites with late Basketmaker

Figure 18. Small thumbnail end-scrapers. The far left and the two right hand artifacts are made from obsidian; the second from the left is made from chalcedony and the middle scraper is made from gray chert.

Figure 19. Perforators from the Rock House Spring site. The first three are made from obsidian whereas the right hand two perforators are constructed from basalt.

cultural material (arrow points but no ceramics). No Western Stemmed Tradition or Pinto Basin type artifacts were found outside of the immediate area around Rock House Spring.

Traditionally, the Western Stemmed Tradition is thought to be derived from a fluted point industry in the Intermountain West (Willig and Aikens 1988; Beck and Jones 2012). However, more recently, sites have been found that show Western Stemmed Tradition points are coeval in age or even older than Clovis (Jenkins 2007; Beck and Jones 2012). Due to the lack of stratigraphic context at many Great Basin sites (as is the case at Rock House Spring), age dates for many of the Western Stemmed Tradition points are relatively scarce. Galm and Gough (2007) dated Haskett points from Sentinel Gap, Washington between 10,010 ± 60 to 10,680 ± 190 B.P. Bedwell (1973) dated Haskett points from Connley Cave, Oregon at 11,200 ± 200 B.P. Parman points have been dated at Wildcat Canyon, Oregon at 10,600 ± 200 B.P. (Dumond and Minor 1983). Similarly, crescents have been dated by Beck and Jones (2009; 2012) from the Sunshine Locality, Nevada at 10,320 ± 50 B.P. Crescents have been further dated between 9810 ± 40 to 10,250 ± 40 B.P. at Lind Coulee, Washington (Craven 2004) to as young as 8490 ± 400 to 9030 ± 350 B.P. at the C. W. Harris site in California (Warren 1967). All of these artifacts have been found at Rock House Spring suggesting the initial occupation of the site was at least as early as 10,000-11,000 B.P. A terminal Pleistocene date for the first occupation of the site is further supported by the extreme obsidian dehydration seen on nearly all of the Western Stemmed Tradition artifacts. The large bifaces (Figure 15) and the thumbnail end scrapers (Figure 18) may also belong to this period.

The two Manix points are more problematical in their age. Van Buren (1974) hypothesized a Pre-Clovis age of approximately 30,000 years for Manix Points from California based on the assumption of a 50,000 years old date for the Calico site (Leakey et al. 1972) which is stratigraphically below Manix material. However, much of the supposed Calico material has now been shown to be geofacts and not true artifacts (Payen 1983), so the Manix points may well fit into the general Western Stemmed Tradition timeframe or perhaps even younger into the Early Archaic. Harrington (1957) found a consistent low percentage of Lake Mohave and Silver Lake points (13 percent) in the lower part of his large Pinto Basin campsite at Little Lake, California.

The majority of the artifacts present at the Rock House Spring site belong to the Early Archaic period of the Intermountain West as characterized by Humboldt, Pinto, and Cascade projectile points associated with bifacial cutting tools, scrapers, perforators and

Figure 20. Obsidian core from the Rock House Spring site. The core was apparently utilized to make expedient flakes as opposed to blades.

gravers. In the Intermountain West, these points have generally been dated in the range of 8000-6000 B.P. (Thomas 1981; Holmer 1986; Jennings 1986). The majority of the other tools such as the bifaces in Figure 16, the circular scrapers (Figure 18), the perforators (Figure 19) and the small obsidian core (Figure 20) also probably belong to the Early Archaic Humboldt-Pinto period of occupation.

As noted above, five projectile points were recovered which can be typed to a later, post-4000 B.P. Archaic period. These represent less than 3 percent of the occupational material and most likely represent only a small, seasonal occupation at the spring.

Elston (1982) attempted to map the density of Early Archaic (Pinto) sites across the western Great Basin. His research showed a relative high density of sites in northwestern Nevada as well as in south-central California. Reported occupations between the two concentrations do exist but are not abundant. Rock House Spring is located approximately halfway between the two site concentrations and may have represented a seasonal migrational stopping place, providing both good clean water, abundant high quality toolstone (obsidian and fine-grain basalt), and the likelihood of game either near Teels Marsh or the spring itself. While not abundant, the author saw Desert Bighorn Sheep on more than one occasion both near the marsh as well as above Rock House Spring in the mountains surrounding the marsh. The artifact assemblage recovered from the area around the spring (n=183) is relatively small given that they represent at least 4000-5000 years of seasonal occupation. This small assemblage further suggests that Rock House Spring was a seasonal campsite used by people moving north and south between northern Nevada and southern California and does not represent a permanent campsite at any one point in time.

Acknowledgements

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A LAKE MOHAVE COMPLEX PALEOINDIAN SITE NEAR SWANSEA, OWENS VALLEY, CALIFORNIA

Wilson W. Crook, III

Introduction

In January 1984, while stationed doing geochemical surveys in Inyo County, California, I visited the Swansea petroglyph site (CA-INY-272) on the northeast side of Owens Dry Lake (to accommodate the addition of Alaska and Hawaii, California archeologists have dropped the state numeric from their trinomial system and simply use the California state abbreviation; they also place dashes between the state, county and site number). One of principal tasks during this period was to explore and sample all the areas within the Owens Valley that Mobil Oil had leased for mineral exploration. Above the former lead-silver mining town of Swansea, the foothills of the White-Inyo Range are composed of marble. The aboriginal inhabitants of Owens Valley found that these marbles make an excellent "canvas" to carve petroglyphs (Figure 1). These rocks contain superb representations of desert bighorn as well as anthropomorphic figures (Figure 2). There are also several well-made depictions of the sun, both as a series of spirals and with radiating rays (Figure 3). One unique petroglyph depicts a series of north-south trending circles which are connected by a series of short lines (Figures 4a and 4b). Based on ethnographic studies conducted in the late 1800s and early 1900s of the Paiute Indians living in Owens Valley, these circles are believed to represent the series of pluvial lakes connected by the Owens River which existed during prehistoric times (Giambastiani and Basgall 2014).

Figure 1. Marble outcrop above Swansea, California that contains numerous rock petroglyphs (CA-INY-272). Owens Dry Lake can be seen in the distance beyond the rock outcrop.

Figure 2. Depictions of desert bighorn sheep at site CA-INY-272.

After observing the petroglyphs at site CA-INY-272, I explored the region behind the site along the foothills of the White-Inyo Range. The foothills are composed of a series of small benches which represent the former high beach line of Owens Lake during the late Pleistocene and early Holocene. A few hundred meters to the west toward the small mining community of Dolomite, I discovered several large artifacts on the surface. The site was very small, covering no more than about 10 x 10 meters. A total of 14 artifacts were recovered from the surface including two Lake Mohave and one Silver Lake type dart points. Other artifacts included a crescent biface, several large bifaces, scrapers, and one graver.

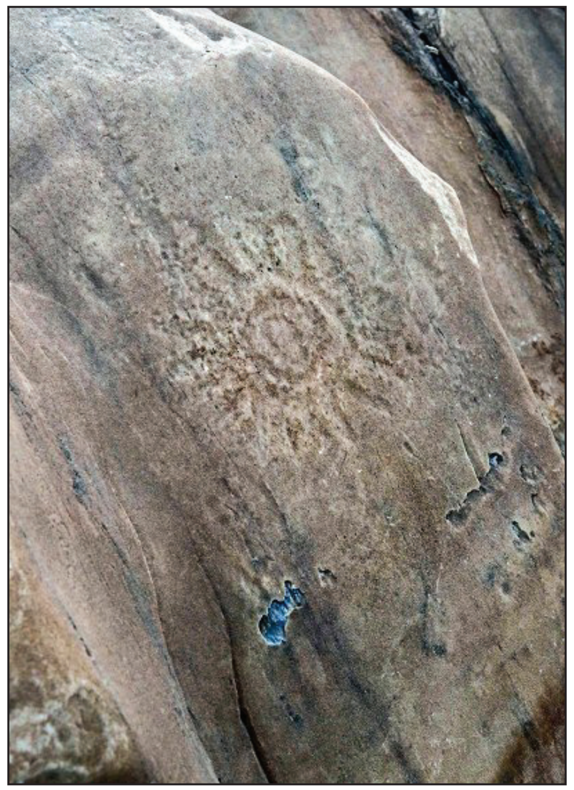

Figure 3. Depiction of sun with rays at site CA-INY-272.

After my discovery of the site in January, 1984, I revisited the area a number of times. I dug twelve test pits across the area where the artifacts had been present on the surface. Each shovel scoop was carefully screened. No additional artifacts or debitage were found in any of the test pits and an extensive surface survey of the immediate area failed to produce any additional artifacts. The recovered assemblage is consistent with a Late Paleoindian campsite of the Lake Mohave-Silver Lake type which are known throughout Owens Valley (Amsden 1937; Bettinger and Taylor 1974; Koerper et al. 1983; Koerper et al. 1994; Koerper et al. 1996). As the site had not been recorded before in the literature, this paper serves to record its occurrence and lithic assemblage.

Geology

The site lies above the northeastern shore of Owens Dry Lake in southwestern Inyo County, California. Owens Valley lies at the intersection of two large and traditionally recognized Western cultures – California to the west and the Great Basin to the east (Eerkens et al. 2008). The valley is the location of a number of important archeological and ethnological studies starting in the 1930s and especially over the past 30-40 years (Bagsdall and McGuire 1988; Bettinger 1989; Delacorte 1999; Eerkens et al. 2008).

Figure 4a. Depiction of a series of circles connected by lines which is believed to represent the pluvial lake system in Owens Valley during prehistoric times (site CA-INY-272).

Owens Valley is a long (160 km), narrow (8-24 km) northwest-to-southeast trending lowland plain that is flanked by the Sierra Nevada Mountains on the west and the White-Inyo Mountain Range on the east. The valley has formed as a result of Basin and Range extension faulting and contains two asymmetrical grabens whose boundary faults parallel the two flanking mountain ranges (Glazner et al. 2002). Since the Pleistocene, drainage from the surrounding highlands has deposited significant amounts of water and sediments in Owens Valley. Both grabens have filled with sediments from fluvial, alluvial fan, and lacustrine deposits up to three kilometers in thickness (Hollett et al. 1991; Varnell-Lusk 2006). Basement rocks beneath the sediment-fill are Cretaceous age granodiorites and quartz monzonites. Even with this thick basal sediment fill, Owens Valley is the deepest valley in the United States with an almost 10,800 foot difference between Mount Whitney (14,494') and Lone Pine (3,700') (Varnell-Lusk 2006).

During the Pleistocene, the Owens River and Owens Lake were part of a larger pluvial system that formed in response to a fluctuating environment of glacial and interglacial cycles (Hollett et al. 1991). At that time, the Owens Lake system of lakes extended from Big Pine to the Coso Range and intermittently overflowed to join a larger chain of pluvial lakes in Southern California (Morris and Webb 1990; Harden 1998). Nearly 3,000 meters of sediment has accumulated underneath the Owens Lake system since the Pleistocene (Hollett et al. 1991). The Owens Valley has also been the site of extensive Quaternary volcanism including the olivine basalt flows of the Big Pine Volcanic Field, the welded rhyolitic Bishop Tuff from the Long Valley Caldera, and the flood basalt and rhyolite flows from the Coso Range (Duffield and Bacon 1981).

The site lies in the foothills of the White Mountain-Inyo Range which are part of the Basin and Range Province (Hollett et al. 1991). The Basin and Range is a large region of extension and associated

Figure 4b. Close-up of the petroglyph seen in Figure 4a.

volcanism that stretches from eastern California to northwestern New Mexico in the south, and from southern Oregon and Idaho to eastern Utah in the north (Glasner et al. 2002). The province is characterized by numerous north-south trending ranges and valleys. Each range is roughly 120-240 kilometers long separated by valleys 30-50 kilometers wide (Harden 1998). The Basin and Range topography is the result of extensional faulting and crustal thinning over the region (Glasner et al. 2002). Older basement rocks and granitic intrusions are typically exposed in the highlands while the valleys are filled with Pleistocene fluvio-lacustrine and alluvial sediments as well as Tertiary basaltic and rhyolitic volcanic flows (Harden 1994). Both the White-Inyo Mountains, the Sierra Nevada Mountains, and Owens Valley are classic components of this Basin and Range phenomenon (Norris and Webb 1990; Harden 1998; Varnell-0Lusk 2006).

Owing to the high degree of Quaternary volcanism in the area, the region surrounding Owens Valley contains many sources of obsidian which were intensively used by the prehistoric inhabitants of the area. It is not unusual for obsidian to account for 90 percent or more of all the lithic material at a site (Eerkens et al. 2008).

The immediate area of the Swansea site is part of an alluvial fan system that forms the foothills of the White Mountain-Inyo Range. Fine to very coarse-grained alluvium is on the surface of the site with nearby dolomite forming the closest rock outcrop exposures. The alluvium is part of the fluvio-lacustrine sediments that once formed the highest beach level of Owens Lake. Test pits dug in the immediate vicinity of the site show that this alluvium is very unconsolidated for about 10-30 cm. The alluvium is then underlain by a hardpan of tan-colored clay which extends to an undetermined depth (>60 cm). No artifacts were found below the surface.

Weather patterns in Owens Valley vary seasonally and are highly affected by the two mountain ranges that flank the valley. The Sierra Nevada range to the east serves to block much of the moisture coming from the Pacific Coast while the White-Inyo Range deflects the moisture coming from the Gulf of Mexico or the Gulf of California. As a result, much of valley only receives about 15 cm of annual precipitation with 60 percent of this falling between December and February (Powell and Klieforth 1991; Western Regional Climate Center 1997). Precipitation increases between 3.8-6.6 cm for every 300 meter increase in elevation such that the tops of the White Mountain-Inyo Range are considerably greener than the Owens Valley floor. Temperatures range from a high of 112° F in the summer to a low of -7° in winter. Average temperatures are 76° in July and 37° in January (Western Regional Climate Center 1997). At least 174 seep springs occur throughout the valley creating small riparian enclaves where plant and animal life are more plentiful. Most of the springs are located either near the toes of alluvial fans or at the edges of volcanic flows (Powell and Klieforth 1991).

Artifact Assemblage

A total of 14 artifacts were collected from the Swansea site (Table 1). All of the artifacts recovered from the area were found on the surface. Despite conducting a number of test pits across the site, no artifacts were found at any depth.

Table 1. Swansea Paleoindian Site Artifacts by Composition and Tool Type.

Tool Type	Obsidian	Chert	Agate	Rhyolite	Total
Projectile Points					3
Lake Mohave	1	1	–	–	2
Silver Lake	1	–	–	–	1
Crescent	–	–	1	–	1
Large Biface	2	–	–	1	3
Small Biface	1	–	–	–	1
Scrapers (all types)	1	1	3	–	5
Graver	–	–	1	–	1
TOTAL	6 (43%)	2 (14%)	5 (36%)	1 (7%)	14

Obsidian is the most common lithic material at the site, comprising 43 percent (n=6) of the total artifact assemblage. Obsidian can be found in the vicinity of the Coso Range and in nearby Owens Valley and thus the toolstone was likely procured locally (Eerkens et al. 2008). In Owens Valley, at least four sources of obsidian have been utilized in prehistoric times (West Sugarloaf, Sugarloaf, Cactus Peak, and Joshua Ridge (Elston and Zeier 1984; Hughes 1988; Gilreath and Hillebrandt 1997; Erikson and Glascock 2004; Eerkens and Rosenthal 2004). Of these, the West Sugarloaf and Sugarloaf sources have been seen as the most heavily utilized (Eerkens et al. 2008). Another relatively close source to the site, Fish Springs, is present in Owens Valley and does not require climbing a mountain range to get to it. However, the obsidian at this locality has been shown to be full of impurities and is of markedly lower quality (Bettinger 1989; Eerkens et al. 2008).

Another 36 percent (n=5) are made from a pale yellow-orange colored agate (10YR 8/2 very pale orange to 10YR 7/4 grayish-orange to 10YR 8/6 pale yellowish-orange) (Geological Society of America 1995). Agates of various colors are found throughout the length of Owens Valley, especially in the northern part of the valley between Bishop and Lone Pine (Kittle 1996). Three of the artifacts made from agate at the Swansea site are all the same color and appear to have been collected from the same source. The fourth agate artifact is a crescent-shaped biface and is made from a clear to milky-white colored material.

Two artifacts, a well-made Lake Mohave point and a side scraper made on a small blade, are constructed from a pale yellow (2.5Y 8/2) to white-colored (2.5Y 8/1) chert. Like agate, chert can be found throughout Owens Valley, notably in the limestone and dolomites of the White-Inyo Range that forms the valley's eastern boundary and is directly above the Swansea site.

The last artifact is a large, thin biface made from a silica-rich volcanic rock, mostly likely either a rhyolite or dacite. The material is aphanitic with large phenocrysts of quartz as well as fragments of other rocks. This texture is characteristic of a welded tuff similar to the Bishop welded tuff found north of the site in the Long Valley Caldera. Color varies across the biface from reddish-brown (5YR 5/3) to light reddish-brown (5YR 6/3-6/4) to pink (5YR 7/3) (Geological Society of America 1995).

All the lithic materials represented at the Swansea site occur within Owens Valley between Owens Lake in the south and Mono Lake in the north and thus were likely procured by the inhabitants of the site during north-to-south migrations through the valley.

Within the artifact assemblage, three projectile points were recovered, two of the Lake Mohave type and a single Silver Lake type. The Lake Mohave type is a medium lanceolate point with a contracting stem. The cross-section is diamond to elliptical. Heavily re-sharpened examples may have a short stubby blade and a long stem. The shoulders are weak to absent and the stem is contracting. The stem is typically long being one third the length of the blade to longer than the blade depending on the degree of resharpening. The hafting region has heavy lateral edge grinding below the shoulders. Basal thinning is not present and the point has a random flaking pattern. Lake Mohave points range from 28-92 mm in length (average 35-50 mm) and 13-35 mm in width depending on the presence and/or absence of shoulders. Thickness ranges from 6-11 mm (Justice 2002). Lake Mohave points were originally described by Amsden (1937) from the type site near Pleistocene Lake Mohave. The point has been dated to the Late Paleoindian period with age dates in the 11,000-8,000 B.P. range (Hester 1973; Jennings 1986; Justice 2002).

The two points recovered from the Swansea site are 61.8 and 46.0 mm in length, respectively, with widths of 28.5 and 25.5 mm (Figure 5). Thickness is 7.0 mm in the longer point made from chert and 8.5 in the obsidian point. These measurements fit well within the known range of Lake Mohave points from Southern California (Justice 2002). The larger point has fairly prominent shoulders for the type and the stem represents 40 percent of the total length. The point is heavily ground on the lateral edges below the shoulders. The obsidian point appears to have been re-sharpened at least once and the lowermost point of the base has been broken. The lateral edges of the point have been ground below the shoulders which are weak as typical in many Lake Mohave points (see Figure 5).

The other projectile point recovered from the site is a Silver Lake point. Silver Lake points are small to medium lanceolate points with a contracting stem. The cross section is elliptical and the blade is commonly short and stubby. Like Lake Mohave points, the shoulders are weak to absent and at an upward slope. The stem is contracting and shorter than in Lake Mohave points and may have a more bulbous appearance. The hafting region has heavy lateral edge grinding. The point has a random flaking pattern. Silver Lake points range from 26-66 mm in length with a blade width of 21-37 mm. Thickness ranges from 6-11 mm (Justice 2002). Silver Lake points were described by Amsden (1937) and are typically found in direct association with Lake Mohave points. This they are believed to have the same temporal range of approximately 11,000-8,000 B.P.

Figure 5. Projectile points from the Swansea site. The two Lake Mohave points are on the left and the Silver Lake point is on the right.

(Koerper et al. 1983; Koerper et al. 1994; Jennings 1986; Justice 2002).

The Silver Lake point recovered from the surface at the Swansea site measures 41.0 mm x 26.2 mm x 7.1 mm and is constructed of obsidian (see Figure 5). The point appears to have been re-sharpened at least once. One prominent shoulder is present with other one being considerably weaker, possibly the result of re-sharpening. Both lateral edges of the stem are ground below the shoulder.

Other artifacts recovered from the Swansea site include a crescent-like biface, three large bifaces, one smaller biface, five flake side or end-scrapers, and one graver. The crescent biface recovered from the site is made of a clear to milk-white agate (Figure 6). Crescents are generally bifacially flaked like the one from the Swansea site but they can also occur as unifacially retouched flakes (Smith 2008). They range from 30-50 mm in length and are often ground along the medial segment of the outward lateral edge (Amick 1998; Smith 2008). There is wide speculation concerning the function of these tools, with suggestions ranging from surgical instruments (Amsden 1937), to cutting implements (Daugherty 1956), to hafted weapons for waterside hunting of large birds (Tadlock, 1966; Clewlow 1968). Although their function remains uncertain, crescents are found most commonly in the Intermountain West at sites which are adjacent to marsh or riverine environments during the terminal Pleistocene (Amick 1998; Smith 2008). The tool recovered from Swansea appears to have been partially repurposed into a knife and does not fully retain the classic crescent form.

Three large and one smaller biface were parts of the Swansea lithic assemblage. Three of the bifaces were made from obsidian (Figure 7). Of these, one had extremely worn and rounded edges and does not appear to have served as a cutting implement. It is well-established in the Owens Valley region that bifaces, notably of obsidian, also served as sources of flakes for additional knapping and specifically replacement of projectile points (Delacorte 1999;

Figure 6. Crescent style biface made from white agate from the Swansea site.

Elston and Zeier 1984). Obsidian cores are rarely found in sites in the region and thus large bifaces served as a source of flakes to replace projectile point lost or broken during hunting (Eerkens et al. 2008). The other large biface found at the site is made from a welded rhyolitic tuff, most likely the Bishop Tuff found north of the site toward the northern end of Owens Valley (Figure 8). Flaking is random but there are many large flakes that extend over the midline point of the biface. The artifacts is extremely large, measuring 155.0 mm in length by 82.5 mm in width and 15.0 mm in maximum thickness. With a width-to-thickness ratio of 5.5, the artifact almost qualifies as an ultra-thin biface but is considerably larger than most examples found in Western U.S. Paleoindian sites (Beck and Jones 2009, 2010). There are two other possible explanations for the artifact. One, like the obsidian bifaces, it could have served as an easily transportable source of flakable lithic material. It also could have had a more ceremonial purpose. The biface was found at the northern end of the site adjacent to the upper part of the bench terrace. As the Swansea site was likely a seasonal hunting camp, the biface could have been cached or future use or even left as an offering for success in hunting.

Figure 7. Obsidian bifaces from the Swansea site.

The large biface on the right has extremely worn, rounded edges and may have served as a flake core to replace lost or broken artifacts.

The other lithic artifacts present at the site include five flakes reworked into either side or end-scrapers. Three of the scrapers are made from a light yellow-orange colored agate and appear to come from the same source material (Figure 9). The fourth scraper is made from obsidian and the fifth one is from a small blade of chert. All five show fine lateral edge retouch. Examination under a high power microscope (60-80x) show extreme edge-wear consistent with use on animal hides (Keeley 1980). Another agate flake has been worked into a small graver tip at one end (Figure 10).

Cultural Affiliation

The artifact assemblage from the Swansea site indicates a small, seasonal campsite from the Late Pleistocene to Early Holocene period. In Owens Valley, this is known as the Lake Mojave Complex and is characterized by Lake Mohave and Silver Lake dart points, crescent-shaped tools, large bifaces, small unifacial and bifacial side and end-scrapers, and occasionally cobble-core tools and ground stone implements (Warren 1984; Sutton 1988, 1996). These sites tend to be surface deposits found around the ancient shorelines of Pleistocene lakes such as Owens Lake, China Lake, Lake Mojave, etc. in the southern part of Inyo County (Sutton 1988). The assemblages appear to represent temporary small camps typically associated with hunting mammals

Figure 8. Large biface made from a welded rhyolitic tuff. Note the large inclusions of other rock material which is typical of a welded tuff flow such as the Bishop Tuff.

Figure 9. Side and end-scrapers made on flakes of chert, obsidian, and agate from the Swansea site.

such as deer and desert bighorn sheep. Studies suggest human populations during the Lake Mohave Complex period were small, ranged over large territories, and exploited a diverse range of resources (Polson 2009). Diversity in the flaked stone assemblages, such as that seen at the Swansea site, supports a high mobility pattern throughout the length of Owens Valley (Polson 2009).

Lake Mohave and Silver Lake points, have been dated at the C. W. Harris site (CA-SDI-149) in San Diego County to 9100-8500 B.P. and at the Fort Rock site in Oregon to 11,250 B.P. (Hester 1973). This brackets the likely occupation of the Swansea site between 11,000-8,000 B.P. This period is consistent with other Lake Mohave Complex sites studied elsewhere within Owens Valley (Meighan 1965; Bettinger and Taylor 1974; Warren 1984; Sutton 1988, 1996; Justice 2002).

As noted above, no hammerstones, milling stones, or manos were found at the site. The small number of artifacts (n=14) further supports the conclusion that the site does not appear to represent a large or permanent occupation at any period during its use. Rather it appears to be a seasonal campsite which was focused on hunting (ambushing) desert bighorn sheep and other game along well-traveled trails coming in and out of the White-Inyo Range and at the edge of Owens Lake.

The Lake Mojave Complex is part of the Western Pluvial Lakes Tradition which stretches from Oregon in the north, southward along the California-Sierra uplift, and into the (now) arid lands of Southern California (Bedwell 1970; 1973). Because of numerous pluvial lakes, adaptations to lake, marsh and grassland environments were made throughout this region. The Western Lakes Pluvial Tradition flourished for several millennia after 11,000 B.P., then gradually disappeared early in the following Altithermal climatic period (Moratto et al. 1978). By 8000-7000 B.P., the Pluvial Lakes way of life was

Figure 10. Graver made on a small flake of pale yellow-brown agate.

replaced by traditions better adapted to more arid lands (Bedwell 1970).

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THE UPPER CENTENNIAL FLAT PALEOINDIAN SITE INYO COUNTY, CALIFORNIA

Wilson W. Crook, III

Introduction

From December, 1983 through January, 1984 the author was part of an intensive geochemical and mineralogical exploration program for Mobil Oil for commercial quantities of gold in the area of Centennial Canyon, Inyo County, California. As part of this exploration program, I sampled the sediments in the areas leased by Mobil Oil which included the entire length of Centennial Canyon and its upper parts, primarily Upper Centennial Flat. In the uppermost part of Centennial Canyon there is a major spring known locally as Upper Centennial spring (Figure 1). The spring flows year round and the water is potable. Animals, including desert bighorn sheep, deer, and wild mustangs were seen coming to the spring to drink.

Immediately beyond the spring, Centennial Canyon empties into a wide, open area known as Upper Centennial Flat (Figure 2). On the eastern side of the canyon is a small bench which affords an excellent view down into the canyon and especially of Upper Centennial Spring (Figure 3). In the immediate area of this bench are a large number of rock petroglyphs which depict desert bighorn sheep and atlatls (Figures 4-5). These figures are common throughout Owens Valley and especially in Centennial Canyon and elsewhere in the Coso Mountain Range (Giambastiani and Basgall 2014).

Exploration of the bench overlooking Upper Centennial Flat and Upper Centennial Spring revealed the presence of a small number of artifacts (n=12) including two Lake Mohave projectile points. Other artifacts recovered included three small obsidian bifaces, an obsidian blade with lateral edge re-

Figure 1. Upper Centennial Spring at the southern end of Centennial Canyon, Inyo County, California. The Paleoindian site described herein lies on a small ridge to the immediate left of the photo.

Figure 2. Upper Centennial Flat. The site lies on the leading edge of the small ridge in the center-right of the photo.

touch, an agate knife, a circular scraper, three worked flakes of obsidian, and a single worked flake of chert. The artifacts were present on the surface over an area of less than 10 x 10 meters. Several test pits in the area failed to produce any additional cultural materials at depth. Less than 20 meters from the location of the artifacts were several basalt boulders containing petroglyphs of atlatls and desert bighorn sheep (see Figures 4 and 5). Immediately to the right of one of these boulders, the distal end of a large bi-pointed biface made of fine-grained basalt was exposed on the surface. Excavation of the biface revealed three additional bifaces of similar size and construction, all lying parallel to one another within an area of 10 x 15 cm in what appears to have been a purposefully made cache. Three of the bifaces were made from the identical fine-grain basalt material while the fourth biface was constructed of obsidian. Excavation all around the area where the four bifaces were cached failed to produce any additional artifacts.

During the course of my work in the area, I revisited the area of the surface site and the cache area a number of times. No additional artifacts or debitage were found after the initial discovery of the

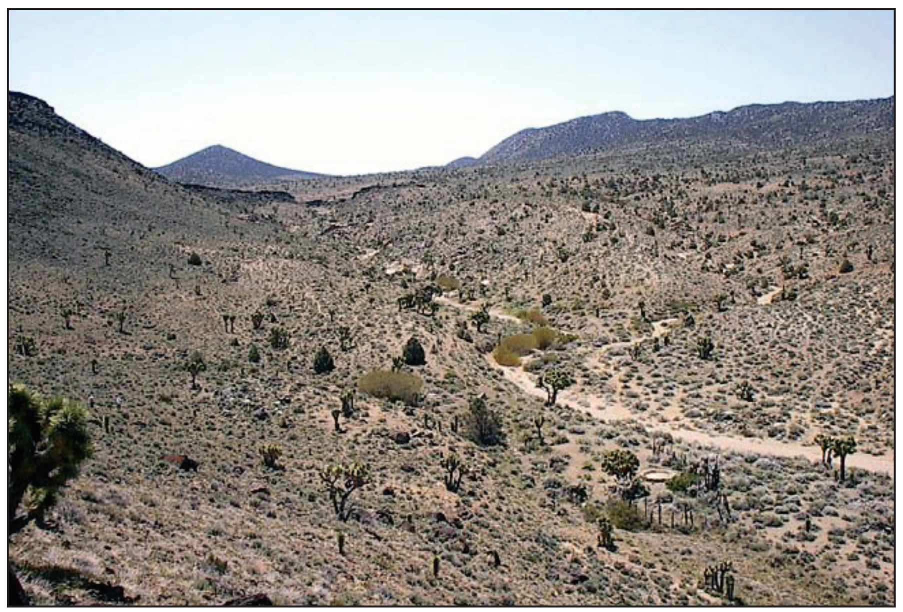

Figure 3. View from the Upper Centennial Flat site down Centennial Canyon. Upper Centennial Spring is in the center of the photo. This is the view of the spring that Paleoindian hunters would have had waiting in ambush for game animals.

Figure 4. Rock petroglyph of desert bighorn sheep in the area of Upper Centennial Flat overlooking Upper Centennial Spring.

site. The recovered assemblage is consistent with a Late Paleoindian campsite of the Lake Mohave-Silver Lake type which are known throughout Owens Valley and the Coso Range (Amsden 1937; Bettinger and Taylor 1974; Koerper et al. 1983; Koerper et al. 1994; Koerper et al. 1996). This paper serves to record the location and lithic assemblage of both the site and the biface cache.

Geology

The Upper Centennial Flat site lies at the southern end of the Owens Valley in southwestern Inyo County, California. Owens Valley lies at the intersection of two large and traditionally recognized Western cultures – California to the west and the Great Basin to the east (Eerkens et al. 2008). The valley was the location of a number of important archeological and ethnological studies starting in the 1930s and especially over the past 30-40 years (Bagsdall and McGuire 1988; Bettinger 1989; Delacorte 1999; Eerkens et al. 2008).

The site lies near the foothills of the Coso Range in the southwestern corner of Inyo County, California. The site is surrounded by the north-to-south trending Coso Mountains which are composed of a mixture of quartz monzonites, alkaline feldspar granites, and meta-volcanics of Jurassic age (Duffield and Bacon 1981; Whitmarsh 1997). Parts of the area are covered by Tertiary flood basalts. Centennial Canyon dissects the Coso Range and is filled by granitic alluvium interspersed with large boulders from the surrounding mountains.

Owing to the high degree of volcanism in the area, the region surrounding Owens Valley contains many sources of obsidian which was intensively used by the prehistoric inhabitants of the area. It is not unusual for obsidian to account for 90 percent or more of all the lithic material at a site (Eerkens et al. 2008). The exception to this are Paleoindian sites which typically contain a wide variety of lithic material, supporting the supposition that the people of the Late Pleistocene traveled large distances as a normal course of annual movement throughout Owens Val-

Figure 5. Close-up of a rock petroglyph in the area of the Upper Centennial Flat Paleoindian site. The cache of four ovoid blades was found in the loose dirt to the right of the petroglyphs.

ley searching for water, wild game, and other edible foods (Polson 2009).

The area of Upper Centennial Canyon where the Upper Centennial Flat site is located is covered in fine to very coarse-grained granitic Quaternary alluvium, most of which has altered to quartz sand and clay. Tests pits dug in the immediate vicinity of the site show that this alluvium is very unconsolidated for about 10-30 cm. The alluvium is then underlain by a hardpan of tan-colored clay which extends to an undetermined depth (>60 cm). No artifacts were found below the surface.

Artifact Assemblage

A total of 16 artifacts were collected from the Upper Centennial Flat site including twelve at the location of the surface site and an additional four bifaces from the cache located 20 meters away at the base of the foothills overlooking Upper Centennial Flat (Table 1). All of the artifacts recovered from the site were found on the surface. The four bifaces were within 2-3 cm of the surface with the distal end of one biface exposed at the surface. No artifacts were found at any significant depth.

Obsidian is the most common lithic material at the site, comprising 50 percent (n=8) of the total artifact assemblage. Obsidian can be found in the vicinity of the Coso Range and in nearby Owens Valley and thus the toolstone was likely procured locally (Eerkens et al. 2008). In Owens Valley, at least four sources of obsidian have been utilized in prehistoric times (West Sugarloaf, Sugarloaf, Cactus Peak, and Joshua Ridge) (Elston and Zeier 1984; Hughes 1988; Gilreath and Hillebrandt 1997; Erikson and Glascock 2004; Eerkens and Rosenthal 2004). Of these, the West Sugarloaf and Sugarloaf sources have been seen as the most heavily utilized (Eerkens et al. 2008). Another relatively close source to the site, Fish Springs, is present within Owens Valley and does not require climbing a mountain range to get to it. However, the obsidian at this locality has been shown to be full of impurities and is of markedly lower quality than that found in the Coso Range (Bettinger 1989; Eerkens et al. 2008).

Another 19 percent (n=3) are made from a light to dark gray-colored, fine-grain basalt (N5/0 medium gray to N4/0 medium dark gray to N3/0 dark gray) (Geological Society of America 1995) . Quaternary flood basalts of varying composition occur through Owens Valley and the three basalt bifaces from the cache are undoubtedly constructed from some of this material.

Three artifacts (19 percent), one of the Lake Mohave points, a circular scraper, and a worked flake with lateral edge retouch are made from chert, which can also be found in Owens Valley, especially in the White Mountain-Inyo Range located immediately east of Centennial Canyon. The chert used to make the projectile point is a light grayish-orange (10YR 7/4) to pale yellowish-brown (10YR6/2) color (Geological Society of America 1995). The chert used to make the circular scraper has a wider range of colors that vary from black to brown to red to the same pale yellow-brown seen in the Lake Mohave point. The worked flake was made from a dark gray chert nodule that retained its outer limestone cortex on one side.

Two artifacts (12 percent), a large Lake Mohave projectile point and a heavily used knife, were made from a grayish-pink (5R 8/2) to grayish orange-pink (10R 8/2) agate (Geological Society of America 1995). Agates of various colors occur throughout the length of Owens Valley, especially in the northern part of the valley between Bishop and Lone Pine (Kittle 1996).

Table 1. Upper Centennial Flat Paleoindian Site Artifacts by Composition and Tool Type.

Tool Type	Obsidian	Chert	Agate	Basalt	Total
Projectile Points					2
Lake Mohave	–	1	1	–	2
Large Biface[1]	1	–	–	3	4
Small Biface	3	–	–	–	3
Biface/Knife	–	–	1	–	1
Worked Blade	1	–	–	–	1
Scrapers (all types)	3	2	–	–	5
TOTAL	8 (50%)	3 (19%)	2 (12%)	3 (19%)	16

[1] The four large bifaces were found in a small cache 20 meters north of the rest of the occupational material.

All the lithic materials represented at the Upper Centennial Flat site occur within Owens Valley between Owens Lake and the Coso Range in the south and Mono Lake in the north and thus were likely procured by the inhabitants of the site during north-to-south migrations through the valley.

Within the artifact assemblage, two projectile points were recovered, both of the Lake Mohave type. The Lake Mohave type is a medium lanceolate point with a contracting stem. The cross-section is diamond to elliptical. Heavily re-sharpened examples may have a short stubby blade and a long stem. The shoulders are weak to absent and the stem is contracting. The stem is typically long being one third the length of the blade to longer than the blade depending on the degree of resharpening. The hafting region has heavy lateral edge grinding below the shoulders. Basal thinning is not present and the point has a random flaking pattern. Lake Mohave points range from 28-92 mm in length (average 35-50 mm) and 13-35 mm in width depending on the presence and/or absence of shoulders. Thickness ranges from 6-11 mm (Justice 2002). Lake Mohave points were originally described by Amsden (1937) from the type site near Pleistocene Lake Mohave. The point has been dated to the Late Paleoindian period with age dates in the 11,000-8,000 B.P. range (Hester 1973; Jennings 1986; Justice 2002).

The two points recovered from the Upper Centennial Flat site are 46.0 and 66.8 mm in length, respectively, with widths of 20.9 and 27.0 mm (Figure 6). Thickness is 6.4 mm in the shorter point made from chert and 9.7 mm in the agate point. These measurements fit well within the known range of Lake Mohave points from Southern California (Justice 2002). Both points have fairly prominent shoulders for the type and the stem represents 42-46 percent of the total length. Both are heavily ground on the lateral edges below the shoulders. The agate point appears to have been re-sharpened at least once and the stem has several notches which appear to be the result of breakage. The lateral edges of the point have been ground below the shoulders which are weak as typical in many Lake Mohave points (see Figure 6).

Two small and one broken biface are part of the Upper Centennial Flat site lithic assemblage. All three are made from obsidian (Figure 7). Of these, one has extremely worn and rounded edges and does not appear to have served as a cutting implement. It

Figure 6. Lake Mohave type projectile points from the Upper Centennial Flat site. The point on the left is made from chert whereas the point on the right is from a pinkish-gray colored agate. On both points, the lateral edges of the stem below the shoulder has been heavily ground.

is well-established in the Owens Valley region that bifaces, notably of obsidian, also served as sources of flakes for additional knapping and specifically replacement of projectile points (Delacorte 1999; Elston and Zeier 1984). Obsidian cores are rarely found in sites in the region and thus large bifaces served as a source of flakes to replace projectile point lost or broken during hunting (Eerkens et al. 2008).

The other lithic artifacts present at the site include a triangular-shaped blade with lateral edge retouch, three obsidian flakes reworked into either side or end-scrapers, a chert flake with lateral edge retouch, and a circular scraper made from a multi-colored piece of chert. The blade is narrow (18.5 mm) relative to its length (68.0 mm) with a triangular cross-section (Figure 8). There is a fairly high degree of curvature and has blade scars on both the left and right lateral surface (see Figure 8). The left lateral edge has fine retouch to produce a cutting edge. The worked flakes of obsidian all show fine lateral edge retouch and were probably used as side-scrapers. Examination under a high power microscope (60-80x) show edge-wear consistent with use on animal

Figure 7. Obsidian bifaces from the Upper Centennial Flat site. The biface on the right has extremely worn, rounded edges and may have served as a flake core to replace lost or broken artifacts.

hides (Keeley 1980). Examination of the circular scraper shows extreme edge polish also consistent with use on hides (Keeley 1980).

A well-used and heavily resharpened bifacial knife was found in association with the other artifacts on the surface site (Figure 9). The knife is made from the same grayish-pink to grayish-orange pink agate as the larger of the Lake Mohave points described above. Microscopic examination of the lateral edges shows that the artifacts has been resharpened a number of times which gives it its unusual asymmetric shape (see Figure 9). The left lateral edge as seen in Figure 9 shows considerable use-wear, principally of a bright shiny polish which is consistent with cutting of meat (Keeley 1980).

Four bi-pointed ovoid bifaces were found a few meters north of the site adjacent to a medium-sized boulder festooned with desert bighorn petroglyphs. Three of the bifaces are made from the same type of medium to dark gray-colored basalt while the fourth biface is made from obsidian. Physical measurements of the cache bifaces is shown in Table 2.

Flaking on the bifaces is random but there are many large flakes that extend over the midline or plunge into the center of the biface. This is especially true on the three made from fine-grain basalt. In general, the bifaces are large, measuring 101 to 113 mm in length by 26-38 mm in width and 7-13 mm in maximum thickness. Width-to-thickness ratios range from 2.9-3.8, which is much narrower than ultra-thin bifaces typically found in Western U.S. paleo sites (Beck and Jones 2009, 2010). As can be seen in Table 2, all four bifaces are within 6 percent of each other in terms of length and, with the exception of Biface #3 which is slightly narrower, are similarly close in terms of maximum width. So close are the three bifaces made from fine-grain basalt in terms of construction material and shape that they appear to have been made by the same individual (Figure 10).

Figure 8. Obsidian blade with left lateral edge retouch. Note the blade scars on both left and right lateral faces.

Figure 9. Agate bifacial knife from the Upper Centennial Flat site. The left lateral edge shows considerable use-wear in the form of a bright polish which is consistent with the tool having been used to cut meat.

Examination of the lateral edges of the three basalt bifaces shows no evidence of use. Only the biface made from obsidian appears to have been used as a knife and then resharpened which distorted its original ovoid shape (see Figure 10). It is unclear if the bifaces in this small cache are associated with the other cultural material described above but the flaking pattern, especially of the diving across-the-face flakes is indicative of Paleoindian knapping and thus there is a likelihood that the two artifact concentrations are connected (Beck and Jones 2009, 2010).

There are two other possible explanations for the biface cache. One, they could have served as an easily transportable source of flakable lithic material and were cached for possible future use. As mentioned above, microscopic examination of the lateral edges of the bifaces did not reveal any discernable use-wear. So it would appear that they could have been cached for future use either as knives or to produce replacement Lake Mohave type projectile points.

Alternatively, the bifaces could have been cached for a ceremonial purpose. The cache was found 20 meters north of the main site concentration and at the base of a large boulder which had abundant desert sheep petroglyphs (see Figure 5). If the petroglyphs were contemporary with the biface cache, they could have been an offering for success in a future hunt. The Upper Centennial Flat site overlooks Upper Centennial Spring (see Figure 3) and provides an excellent vantage point for observation and stalking of game animals coming into the spring to drink. The relatively small number of artifacts recovered from the site indicate that its use was likely as a seasonal hunting location which was probably revisited multiple times during annual migrations along the length of Owens Valley.

Table 2. Comparative measurements of the four bifaces found in the cache at the Upper Centennial Flat Paleoindian site.

Biface[1]	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)	Lithic Material
Biface 1	106	34.9	6.8	30.3	Basalt
Biface 2	105	37.1	11	32.1	Basalt
Biface 3	101.5	26.3	8	29	Basalt
Biface 4	112.8	38.4	12.8	52.6	Obsidian
Average	106.3	34.1	9.6	37.2	N/A

[1] The four large bifaces were found in a small cache 20 meters north of the rest of the occupational material.

Figure 10. Large bi-pointed bifaces from the small cache near the Upper Centennial Flat site.

Cultural Affiliation

The artifact assemblage from the Upper Centennial Flat site indicates a small, seasonal campsite from the Late Pleistocene to Early Holocene period. In Owens Valley, this is known as the Lake Mojave Complex and is characterized by Lake Mohave and Silver Lake dart points, crescent-shaped tools, large bifaces, small unifacial and bifacial side and end-scrapers, and occasionally cobble-core tools and ground stone implements (Warren 1984; Sutton 1988, 1996). These sites tend to be surface deposits found around the ancient shorelines of Pleistocene lakes such as Owens Lake, China Lake, Lake Mojave, etc. in the southern part of Inyo County (Sutton 1988). The assemblages appear to represent temporary small camps typically associated with hunting mammals such as deer and desert bighorn sheep. Studies suggest human populations during the Lake Mohave Complex period were small, ranged over large territories, and exploited a diverse range of resources (Polson 2009). Diversity in the flaked stone assemblages, such as that seen at the Upper Centennial Flat site, supports a high mobility pattern throughout the length of Owens Valley (Polson 2009).

Lake Mohave and Silver Lake points, have been dated at the C. W. Harris site (CA-SDI-149) in San Diego County to 9100-8500 B.P. and at the Fort Rock site in Oregon to 11,250 B.P. (Hester 1973). This brackets the likely occupation of the Upper Centennial Flat site between 11,000-8,000 B.P.. This period is consistent with other Lake Mohave Complex sites studied elsewhere within Owens Valley (Meighan 1965; Bettinger and Taylor 1974; Warren 1984; Sutton 1988, 1996; Justice 2002).

As noted above no hammerstones, milling stones or manos were found at the site. The small number of artifacts (n=15) further supports the conclusion that the site does not appear to represent a large or permanent occupation at any period during its use. Rather it appears to be a seasonal campsite which was focused on hunting (ambushing) desert bighorn sheep and other game along well-traveled trails coming in and out of the southern end of Centennial Canyon.

The Lake Mojave Complex is part of the Western Pluvial Lakes Tradition which stretches from Oregon in the north, southward along the California-Sierra uplift, and into the (now) arid lands of Southern California (Bedwell 1970; 1973). Because of numerous pluvial lakes, adaptations to lake, marsh and grassland environments were made throughout this region. The Western Lakes Pluvial Tradition flourished for several millennia after 11,000 B.P., then gradually disappeared early in the following Altithermal climatic period (Moratto et al. 1978). By 8000-7000 B.P., the Pluvial Lakes way of life was replaced by traditions better adapted to more arid lands (Bedwell 1970).

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LOWER CENTENNIAL CANYON: A PINTO BASIN TYPE ARCHAIC SITE IN INYO COUNTY, CALIFORNIA

Wilson W. Crook, III

Introduction

From December, 1983 through January, 1984 the author was part of an intensive exploration program for commercial quantities of gold in the area of Centennial Canyon, Inyo County, California. As part of this program, I sampled sediments across all of Mobil Oil's lease holdings including the length of Centennial Canyon as well as the area of Lower Centennial Flats which the canyon empties into (Figure 1). In the area of Lower Centennial spring, which is near the mouth of the canyon, there were numerous petroglyphs of desert bighorn sheep, atlatls, and anthropomorphic figures (Figures 2-6). In addition, several stone "ambush" structures were present constructed along sheep trails leading into and out of the spring. These structures consisted of piles of rocks about one meter in height placed against the rock wall of the canyon providing room for one or two hunters to conceal themselves (Figure 7).

While no campsite was located in the immediate area of Lower Centennial spring, a small accumulation of lithic artifacts was located immediately outside the canyon in the upper area of Lower Centennial Flats. The location of the site is 0.5 kilometers south of the spring and is situated where animal movement both in and out of Centennial Canyon as well as across Lower Centennial Flats could be easily observed. Elevation at the site is 5,560 feet above sea level. The site is located at the southern end of Owens Valley, south of California State Route 190 near the foothills of the Coso Range (Figures 8-9). The nearest sizable population center and limited facilities is located in Lone Pine, 45 kilometers northwest of Lower Centennial Flats. The site gets its name from the major spring located nearby within Centennial Canyon. During my time working in the area, I had the opportunity to meet a local avocational archeologist who knew of the site and referred to it as the "Lower Centennial Canyon" site. He informed me that this was the name the locals had called the site for years, so while the location is actually in Lower Centennial Flats, I have adopted the name traditionally assigned to the site.

After the site's discovery in December, 1983, I revisited the area a number of times. Artifacts were scattered across the surface in a relatively small 20 x 20 meter area. Several tests pits were dug, each showing no cultural material below a soil hardpan exposed between 10-20 cm below the surface. A surface collection of the site was made during the two months I was present in the area with a total

Figure 1. The mouth of Centennial Canyon. Lower Centennial Canyon is near the base of the mountain in the background.

Figure 2. Large boulder within Centennial Canyon depicting petroglyphs of desert bighorn sheep.

Figure 3. Close-up of a petroglyph of desert bighorn sheep.

Figure 4. Boulder within Centennial Canyon depicting an atlatl.

Figure 5. Another boulder within Centennial Canyon depicting numerous atlatls.

Figure 6. Boulder within Centennial Canyon depicting an anthropomorphic figure with desert bighorn sheep.

Figure 7. Sheep hunter ambush hide near Lower Centennial Spring.

Figure 8. General area of the Lower Centennial Canyon site, Inyo County, California. The entrance to Centennial Canyon is just to the right of the photo.

recovery of 43 artifacts. The artifact assemblage consisted primarily of lithic artifacts (93 percent) and three small shell beads. The assemblage consists primarily of Early Archaic dart point types with a minor Middle Archaic component. The Early Archaic artifacts are consistent with material described by Campbell and Campbell (1935), Amsden (1935), Harrington (1957), and Madsen (2007) to define the Early Archaic, non-ceramic Pinto Basin culture. Unlike sites in the upper part of Centennial Canyon and nearby Hunter Mountain, no arrow points or ceramics are present at the site.

Geology

The site lies at the southern end of the Owens Valley in southwestern Inyo County, California. Owens Valley lies at the intersection of two large and traditionally recognized Western cultures – California to the west and the Great Basin to the east (Eerkens et al. 2008). The valley is the location of a number of important archeological and ethnological studies starting in the 1930s and especially over the past 30-40 years (Bagsdall and McGuire 1988; Bettinger 1989; Delacorte 1999; Eerkens et al. 2008).

The Lower Centennial Canyon site lies near the foothills of the Coso Range near the mouth of Centennial Canyon in the southwestern corner of Inyo

Figure 9. Location of the Lower Centennial Canyon site. The majority of the artifacts were found near the center of the photo.

County, California. Immediately south and west of the site are the north-to-south trending Coso Mountains which are composed of a mixture of quartz monzonites, alkaline feldspar granites, and meta-volcanics of Jurassic age (Duffield and Bacon 1981; Whitmarsh 1997). Parts of the area are covered by Tertiary flood basalts. Centennial Canyon dissects the Coso Range and is filled by granitic alluvium interspersed with large boulders from the surrounding mountains.

The area of Lower Centennial Flats where the Lower Centennial Canyon site is located is covered in fine to very coarse-grained granitic Quaternary alluvium, most of which has altered to quartz sand and clay. Tests pits dug in the immediate vicinity of the site show that this alluvium is very unconsolidated for about 10-20 cm. The alluvium is then underlain by a hardpan of tan-colored clay which extends to an undetermined depth (>60 cm). No artifacts were found below the upper unconsolidated material.

Artifact Assemblage

A total of 43 artifacts were collected from the Lower Centennial Canyon site (Table 1). All of the artifacts recovered from the area were either on the surface or slightly above the underlying hardpan layer. This is typical of a desert pediment type surface where wind periodically deflates loose surface sand and the heavier stone artifacts settle. Over time, the area loses its stratigraphic integrity and artifacts from vastly different time periods can be found adjacent to one another.

Obsidian is by far the most common lithic material at the site, comprising 65 percent (n=28) of the total artifact assemblage. Another 14 percent (n=6) are made from either fine-grained basalt or dacite. All three of these lithic materials can be found in and around the Coso Range and thus were likely procured locally. Not only does obsidian occur within the Coso Range but there is also a prehistoric quarry at Fish Springs in nearby Owens Valley (Eerkens et al. 2008). However, detailed analysis of the source of obsidian used in prehistoric sites within the Owens Valley region shows a preferential non-use of Fish Springs obsidian due to impurities and its poor flaking characteristics (Eerkens et al. 2008). Another eight obsidian quarry sources are located within 100 kilometers of the site (Eerkens et al. 2008) (Figure 10). A total of 9 percent (n=4) of the artifacts are made from either a light brown or gray-colored chert. Exploration of the entire length of Centennial Canyon showed that this material does not occur naturally in the area and thus was transported into the site. Lastly, two artifacts (5 percent) were made from white bull quartz. Quartz veins occur throughout Centennial Canyon, several of which were found by the author to contain small stringers of native gold. The remaining 7 percent of the artifact assemblage was composed on non-lithic shell.

Within the recovered artifact assemblage, projectile points are by far the dominant tool type representing some 53 percent (n=23) of the total artifacts from the site. Of these, 15 projectile points were complete enough to be assigned to types associated with either the Early or Middle Archaic. The majority of the dart points recovered from Lower Centenni-

Table 1. Lower Centennial Canyon Site Artifacts by Composition and Tool Type.

Tool Type	Obsidian	Basalt / Dacite	Chert	Quartz	Shell	Total
Dart Points - Archaic						23
Humboldt	1	–	–	–	–	1
Pinto	7	2	–	1	–	10
Borax Lake	–	–	–	1	–	1
Elko	3	–	–	–	–	3
Unidentified Points	7	–	1	–	–	8
Biface / Knife	–	1	2	–	–	3
Scrapers (all types)	8	1	–	–	–	9
Drill / Perforator	2	2	1	–	–	5
Shell Beads	–	–	–	–	3	3
TOTAL	28 (65%)	6 (14%)	4 (9%)	2 (5%)	3 (7%)	43

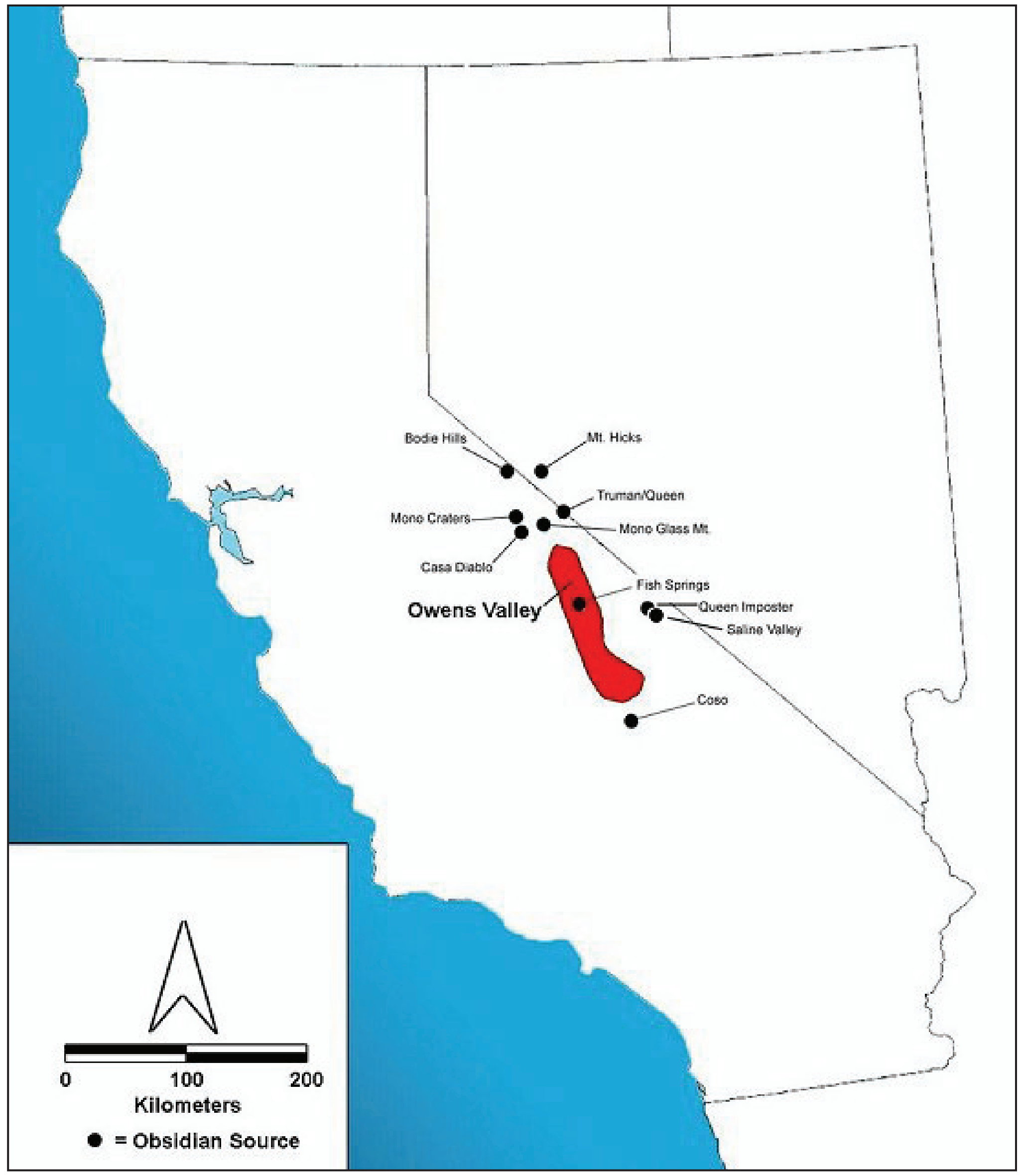

Figure 10. Map showing the location of major prehistoric obsidian sources in eastern California (after Eerkens et al. 2008). The Coso location is very near the Lower Centennial Canyon site.

al Canyon belong to the Early to Middle Archaic period and include Humboldt (n=1), Pinto (n=10), and Borax Lake (n=1) projectile point types. Humboldt points are lanceolate in shape and have a relatively shallow concave base (Figure 11). No lateral edge grinding is typically present. The points may or may not have an exaggerated serration to the lateral edges of the blade. Humboldt points have been dated to as early as ca. 7500-6000 B.P. in the eastern Great Basin (Holmer 1986) and from 6700 to as late as 1200 B.P. in the western part of the Great Basin (Thomas 1981, 1983; Justice 2002). In the Owens Valley region, Pinto and Humboldt points characterize the Pinto (Little Lake) period which extends from the end of the Early Archaic through the Middle Archaic (Bettinger and Taylor 1974; Delacorte 1990; Eerkens et al. 2008).

One example of a heavily re-worked Borax Lake point was recovered (see Figure 11). Borax Lake points are a medium triangular stemmed point with an elliptical cross-section. The blade may vary from straight to excurvate. Most examples have heavy re-sharpening which shortens the blade and forms a straighter edge. The shoulders may range from barbed to horizontal. Re-sharpened examples have reduced shoulders as is the case in the single example recovered from Lower Centennial Canyon (see Figure 11). The stem is straight with a straight base.

Figure 11. Humboldt (left) and Borax Lake points from the Lower Centennial Canyon site. The Humboldt point is made from obsidian while the Borax Lake point is made from quartz.

The point has a random flaking pattern. Borax Lake points have been dated from the Early Archaic to the beginning of the Middle Archaic (7600-5000 B.P.) (Harrington 1957; Jennings 1986; Justice 2002).

The most common dart point type present at the site is the general category of Pinto points (n=10). Pinto points are large (typically >50 mm) shouldered triangular blades with straight to expanding stems and concave bases (Figure 12). At Lower Centennial Canyon, the Pinto points range from 31-46 mm in length, 15-25 mm in width, and 4-9 mm in thickness, the latter governed by the type of lithic material used with obsidian points being the thinnest. Holmer (1986) refers to these points as "large bifurcate stemmed points" and notes that various names have been assigned to the variants of the point form. Because of the wide variation in overall form, this has led to what Warren (1980) calls the "Pinto Problem" (Vaughan and Warren 1987; Schroth 1994). Thomas (1981) divided the points into two series: an earlier point type as found in the type sites of the Pinto Basin in California (Amsden 1935; Campbell and Campbell 1935; Harrington 1957) and morphologically similar but later points which he called "Gatecliff". Gatecliff points generally have deeper and wider concave bases, relatively straight stems, and often pointed ears (Thomas 1983). Pinto points and their variants have been dated between 8000 and 2000 B.P. but the association with both Humboldt and Borax Lake points indicates a likely date between 7500-5000 B.P. (Jenkins and Warren 1984;

Figure 12. Pinto points from the Lower Centennial Canyon site showing some of the variant forms under the general point category. From left-to-right, the first six points are made from obsidian; the seventh point is constructed from dacite; and far right hand point is made from quartz.

Jennings 1984; Meighan 1989; Justice 2002; Beck and Jones 2012). They form a principal component of the Pinto (Little Lake) period in Owens Valley (Bettinger and Taylor 1974).

A few later Middle Archaic points of the general Elko type (Elko Corner Notch or Elko Barbed) (n=3) were present at the site (Figure 13). Elko points are a small to medium triangular corner notched point with a flattened to elliptical cross-section. The blade may range from slightly excurvate to straight. Blades are commonly finely serrated, especially when made from obsidian. The shoulders are barbed, with the barbs terminating at a sharp point. The tips of the barbs are wider than the basal ears. Diagonal notches enter the blade from the corner and are generally deep and narrow. The stem is expanding with a straight to slightly concave base. This point generally has a random flaking pattern, but may vary to a parallel oblique pattern. Elko points have been dated to ca. 4000-1500 B.P. (Holmer 1986; Jennings 1986; Justice 2002) and characterize the Newberry period in Owens Valley (Bettinger and Taylor 1974).

In addition, a total of 8 points could not be typed as they were mainly tip or mid-sections and lacked any definite form. However, based on their lithic material and style of flaking, they most probably stem from the Early Archaic Pinto period (Humboldt-Pinto) occupation at the site.

Other artifacts recovered from the Lower Centennial Canyon site include three bifaces, five concavo-convex side-scrapers, four flake side-scrapers, five perforators (Figure 14), and three shell beads. The latter are very small (7 mm x 6 mm), thin (1-2 mm), with a small central perforation (1-2 mm) (Figure 15). As there are no freshwater shells in the area, the beads must have come from a distant source of water such as Owens Lake (24 kilometers to the north) or even the Pacific Ocean (300 kilometers to the west). All lithic artifact types present are identical to those reported from Pinto Basin type sites (Beck and Jones 2010; Campbell and Campbell 1935; Harrington 1957). Beck and Jones (2009, 2012) note that in many sites in the Intermountain West, fine-grained volcanics (obsidian, andesite, dacite, basalt, etc.) are used in the construction of projectile points whereas chert is the preferred lithic material for other tools. At Lower Centennial Canyon, obsidian remains the predominant toolstone for all tools, however the percentage of use of basalt and chert does increase for the non-projectile point assemblage (see Table 1). No manos, metates, hammerstones, or bone implements were found. It is also significant to note that while arrow points are abundant elsewhere in Centennial Canyon, no arrow points or pottery was present at Lower Centennial Canyon. This is very typical for small seasonal Archaic period campsites in the Owens Valley region (Bettinger and Taylor 1974; Delacorte 1990).

Debitage is present at the site but is not abundant. The material found consists largely of biface thinning flakes made from obsidian. The lack of extensive debitage coupled with absence of hammerstones and grinding stones supports the conclusion that the site represents a seasonal campsite that was focused on hunting the large game animals (desert bighorn deer) present in Centennial Canyon and the Coso Range.

Figure 13. Elko type points from the Lower Centennial Canyon site showing some of the variant forms under the general point category. All the points are made from obsidian.

Figure 14. Perforators from the Lower Centennial Canyon site.

Cultural Affiliation

The artifact assemblage collected at Lower Centennial Canyon indicates a fairly long period of at least seasonal occupation, ranging from the Early Archaic through at least the beginning of the Middle Archaic. This phase is defined by the Pinto (Little Lake) period for Owens Valley (Bettinger and Taylor 1974). Exploration around the remainder of the Coso Range including Upper Centennial Canyon,

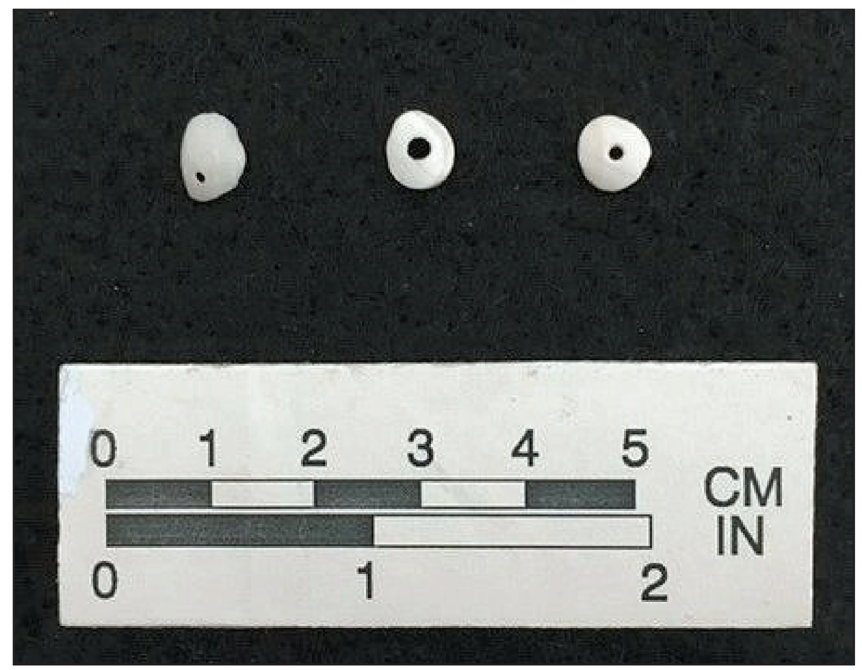

Figure 15. Small circular shell beads from the Lower Centennial Canyon site.

and nearby Hunter Mountain and Owens Lake, revealed a large number of other small sites. However, all of these other sites appear to be small campsites with either arrow points but no ceramics (Haiwee period) or Late Prehistoric cultural material (arrow points and ceramics) (Marana period) (Bettinger and Taylor 1974). No additional Pinto Basin type artifacts were found outside of the immediate area around Lower Centennial Canyon.

The majority of the artifacts present at the Lower Centennial Canyon site belong to the Early Archaic period of the Intermountain West as characterized by Humboldt, Pinto, and Borax Lake projectile points associated with bifacial cutting tools, scrapers, perforators and gravers. In the Intermountain West, these points have generally been dated in the range of 8000-5000 B.P. (Harrington 1957; Thomas 1981; Jenkins and Warren 1984; Holmer 1986; Jennings 1986; Meighan 1989). The majority of the other tools such as bifaces, scrapers, and perforators also probably belong to the Early Archaic period of occupation.

As noted above, three Elko type projectile points were recovered which can be typed to a later, post-4000 B.P. Archaic (Newberry) period. These represent less than ten percent of the occupational material and most likely represent only a small, seasonal occupation at the spring.

Elston (1982) attempted to map the density of Early Archaic (Pinto) sites across the western Great Basin. His research showed a relative high density of sites in northwestern Nevada and especially in south-central California centered in and around the type Pinto Basin and Little Lake (Stahl) sites. These sites are less than 60 kilometers from Lower Centennial spring and Centennial Canyon could easily have been within the seasonal migration range of the Pinto people. As noted above, the site does not appear to represent a permanent occupation. Rather it appears to be a seasonal campsite which was focused on hunting (ambushing) desert bighorn sheep and other game along well-traveled trails coming in and out of the canyon and up to and around Lower Centennial spring.

Acknowledgements

The writer would like to thank the late Dr. Richard R. Bower for his aid in showing me Centennial Canyon, its petroglyphs, and the surrounding environs. Dick Bower was my supervisor at Mobil Oil from the late 1970s through 1985 and had a great degree of experience not only in Great Basin geology and mineralogy but its archeology as well.

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CENTENNIAL CANYON CAVE: A UNIQUE DISCOVERY OF ATLATL DART FRAGMENTS AND LITHIC ARTIFACTS FROM INYO COUNTY, CALIFORNIA

Wilson W. Crook, III

Introduction

In early 2019 during the course of preparing this issue of *The Journal* dedicated to Western U.S. archeology, I was contacted by Mr. Mel Priddy of Richland Center, Wisconsin about a site that he had found a number of years ago in Centennial Canyon in Inyo County, California. As I had done extensive archeological and geologic exploration throughout Centennial Canyon in the past (see papers on the Upper Centennial Canyon, Upper Centennial Flat, and Lower Centennial Canyon sites in this issue), I was obviously very interested in Mr. Priddy's discovery. The site consisted of a small, dry cave which occurred directly above some prominent anthropomorphic petroglyphs. Inside the cave, a single dart point, a large basalt biface, two retouched obsidian blades, and six pieces of one or more atlatl darts were recovered. After an exchange of emails regarding the site, Mr. Priddy sent me what he had collected along with information on the location of the site and all the artifacts that he had found. This brief paper records the site and describes the artifacts recovered.

Site Location

Centennial Canyon is located in southwestern Inyo County, California, approximately 45 kilometers (28 miles) south of the town of Lone Pine. The canyon is roughly 2.4 kilometers in length and terminates in a large flat area known as Upper Centennial Flat. The canyon is surrounded by mountains of the Coso Range. The canyon is marked by a prominent perennial spring at its mouth (Lower Centennial Spring) and an even larger spring near its upper end (Upper Centennial Spring). A very rough jeep trail connects the two springs which can be traversed in dry weather in a high clearance four-wheel drive vehicle.

Just beyond Upper Centennial Spring, the eastern side of the canyon is marked by a steep face of rocks, many of which contain petroglyphs of desert bighorn sheep, rabbits, atlatls, anthropomorphic figures, and abstract designs (Grant et al. 1968). One such feature contains at least six petroglyphs of anthropomorphic figures above several depictions of sheep (Figure 1). The human figures have various headdresses, including horns which may depict hunting outfits. Several

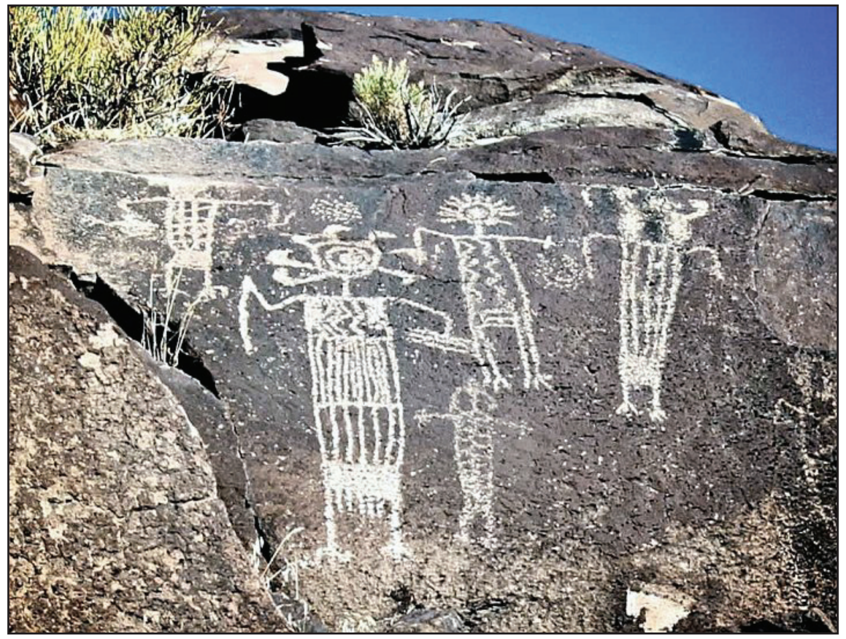

Figure 1. Small rock shelter above anthropomorphic petroglyphs in Centennial Canyon, Coso Range, Inyo County, California.

also have long sticks in the right hands which probably represent atlatls (Mel Priddy, personal communication, 2019) (see Figure 1). Above the petroglyphs is a small cave / rock shelter which measures about 1.5 meters in width and about one meter in height. According to Mr. Priddy, the cave goes back into the rocks for about one 1.5 meters. The cave floor has a thin covering of sand and rock fragments which reportedly is no thicker than 5 cm. Near the front of the cave was a large biface made from fine-grain basalt. At the back of the cave, a small dart point made from basalt was found on the surface. Nearby were two obsidian blades which had lateral edge retouch on both edges. Along the walls of the cave as well as toward the back, six pieces of cane and hardwood were found which appear to represent the broken pieces of one or more atlatl darts. Two of the pieces of cane retained some sinew lashing and a third piece had a purposefully-made notch on one end, as an apparent nock. Although diligently searched, no additional artifacts were found either inside the cave or in the immediate area outside among the rocks (Mel Priddy, personal communication, 2019). While it cannot be unambiguously ascertained that the eight artifacts are associated with one another, it appears to be a reasonable assumption given the small size of the cave and the fact that the artifacts recovered are consistent with each other from a chronological standpoint.

Geology

The site lies at the southern end of the Owens Valley in southwestern Inyo County, California. Owens Valley lies at the intersection of two large and traditionally recognized Western cultures – California to the west and the Great Basin to the east (Eerkens et al. 2008). The valley is the location of a number of important archeological and ethnological studies starting in the 1930s and especially over the past 30-40 years (Bagsdall and McGuire 1988; Bettinger 1989; Delacorte 1999; Eerkens et al. 2008).

The Centennial Canyon Cave site lies near the foothills of the Coso Range in the southwestern corner of Inyo County, California. The site is surrounded by the north-to-south trending Coso Mountains which are composed of a mixture of quartz monzonites, alkaline feldspar granites, and meta-volcanics of Jurassic age (Duffield and Bacon 1981; Whitmarsh 1997). Parts of the area are covered by Tertiary flood basalts including the area in and around the cave site. Centennial Canyon dissects the Coso Range and is filled by granitic alluvium interspersed with large boulders from the surrounding mountains.

Owing to the high degree of volcanism in the area, the region surrounding Owens Valley contains many sources of obsidian which was extensively used by the prehistoric inhabitants of the area. It is not unusual for obsidian to account for 90 percent or more of all the lithic material at a site (Eerkens et al. 2008).

Artifact Assemblage

A total of ten artifacts were collected from the Centennial Canyon Cave site (Table 1). All of the artifacts recovered from the cave were found on the surface. No additional artifacts were found within the cave or immediately outside the cave among the rocks.

A single dart point made from basalt was found at the back of the cave. The point has a triangular blade and a small contracting stem which appears to have been reworked several times (Figure 2). Total length of the point is 40.0 mm with a maximum width of the blade being 27.0 mm. Maximum thickness of the blade is 6.5 mm. Stem length is 8.0 mm. There is no grinding of the lateral edges of the blade or on the stem. Based on the shape and measurements, the projectile point was determined to be a Gypsum Cave type point.

Table 1. Centennial Canyon Cave Artifacts by Composition and Tool Type.

Tool Type	Obsidian	Basalt	Hard Wood	Cane	Total
Dart Points					
Gypsum Cave	–	1	–	–	1
Biface / Knife	–	1	–	–	1
Blade w/edge retouch	2	–	–	–	2
Atlatl Fragments	–	–	2	4	6
TOTAL	2 (20%)	2 (20%)	2 (20%)	4 (40%)	10

Figure 2. Gypsum Cave type dart point made from basalt, Centennial Canyon Cave, Inyo County, California.

Gypsum Cave points are a medium point with a flattened to elliptical cross-section. The blade ranges from straight to excurvate and can be serrated. The shoulders are most commonly at an upward angle, but may be horizontal to barbed. The most notable characteristic for this point is the contracting stem with the convex base. Basal grinding is generally absent and the point has a random flaking pattern. Length ranges from 34-59 mm, with an average of 42 mm. Maximum blade width is 19-24 mm, with an average of about 24 mm. Thickness ranges from 4-8 mm. Stem length ranges from 7-14 mm (Holmer 1986; Justice 2002). The Gypsum Cave point recovered from Centennial Canyon Cave fits well within these published parameters. As basalt crops out throughout the length of Centennial Canyon, the point was likely made from local material.

Gypsum Cave points were originally thought to be early Paleoindian in age due to a mistake in dating them concurrent with ground sloth coprolites at the type site in Nevada (Harrington 1933; Davis and Smith 1981; Moratto 1984). More recently, Gypsum Cave points have been definitively dated to the Middle to Late Archaic period (Holmer 1986; Jennings 1986; Justice 2002; Glowick and Rowland 2008). In the Owens Valley area, the basic cultural sequence has been well-established by Bettinger and Taylor (1974) and Bettinger (1989). Davis and Smith (1981) found Gypsum Cave points in association with Elko points at the Newberry site. The sequence was dated using both fragments of cane and willow wood to 4000-2800 B.P. This period is known as the Newberry in the Owens Valley region (Bettinger and Taylor 1974). The Newberry period is characterized by highly mobile populations which generally moved in a north-south annual pattern including the settlement of a large number of seasonal campsites, usually near a source of water (Delacorte 1999).

Near the front entrance of the cave was a large biface made from fine-grain basalt (Figure 3). The biface is 94.0 mm in length with a maximum width of 44.1 mm. Maximum thickness is 17.0 mm. The biface has a well-developed cutting edge on one lateral edge. Under a high power microscope, this edge showed bright polish from probable use as a knife.

The other lithic artifacts recovered from the Centennial Canyon Cave site included two elongate blades made from obsidian that had lateral edge retouch on both edges. The first blade measured 99.8 mm in length with a maximum width of 27.0 mm. Thickness varies from 8.2 mm over the bulb of

Figure 3. Basalt biface from Centennial Canyon Cave. The left lateral edge shows polish from use-wear.

percussion to 3.5-6.5 mm over the length of the blade (Figure 4). The second blade was 68.4 mm in length with a maximum width of 14.0 mm. Maximum thickness was 4.7 mm near the midpoint and thinning to 3.0-4.0 mm at both ends (Figure 5).

Obsidian can be found in the vicinity of the Coso Range and in nearby Owens Valley and thus the toolstone was likely procured locally (Eerkens et al. 2008). In the Coso Range, at least four sources of obsidian have been utilized in prehistoric times (West Sugarloaf, Sugarloaf, Cactus Peak, and Joshua Ridge (Elston and Zeier 1984; Hughes 1988; Gilreath and Hillebrandt 1997; Erikson and Glascock 2004; Eerkens and Rosenthal 2004). Of these, the West Sugarloaf and Sugarloaf sources have been seen as the most heavily utilized (Eerkens et al. 2008) and these are the two sources closest to the Centennial Canyon Cave site. Another relatively close source, Fish Springs, is present in Owens Valley and does not require climbing a mountain range to get to it. However, the obsidian at this locality has been shown to be full of impurities and is of markedly lower quality (Bettinger 1989; Eerkens et al. 2008).

A total of six pieces of wood material was found alongside the lithic artifacts in the cave; two were pieces of hardwood and four were fragments of river cane (Table 2). Four of the six artifacts showed some evidence of human modification and are presumed to be pieces of at least one and probably two or more atlatl darts. All six pieces appear to come from the shafts of darts; none appear to be from the atlatl thrower itself.

Two of the atlatl dart pieces are made from hardwood, which is probably willow based on similar finds throughout Owens Valley (Davis and Smith 1981; Moratto 1984). The first piece (Table 2 – Fragment 1) is 337.0 mm in length and is the longest of any of the six fragments recovered from the cave. The distal end has been tapered to a point by grinding (Figure 6). This was likely done not to produce a projectile point but so the shaft would fit into another piece of the atlatl dart, most likely a foreshaft which also contained the lithic projectile point. Diameter of the wood shaft above the tapered point is a symmetrical 10.0 by 10.0 mm. The second fragment of hardwood (Table 2 – Fragment 2) is 224.0 mm in

Figure 4. Obsidian blade #1 from Centennial Canyon Cave. Both lateral edges have been extensively retouched and show polish from use-wear.

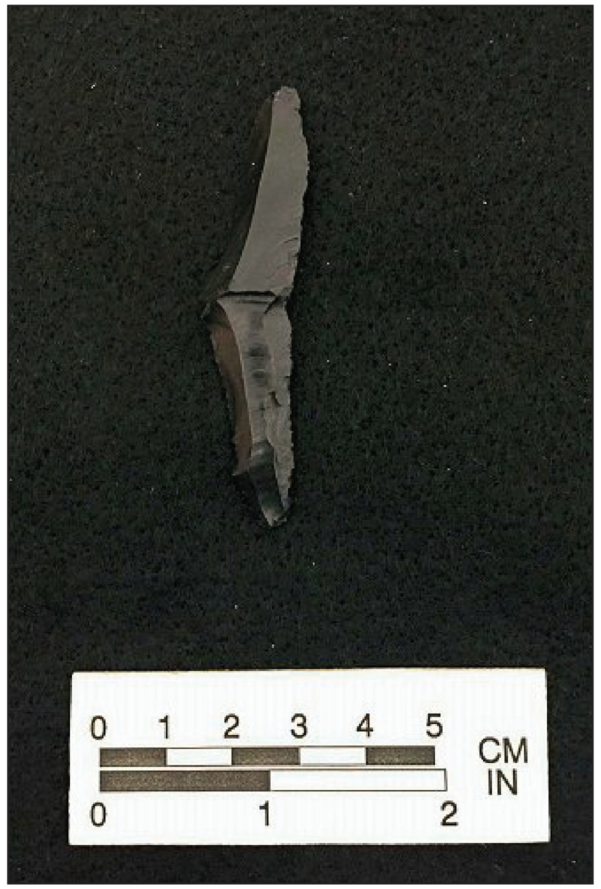

Figure 5. Obsidian blade #2 from Centennial Canyon Cave. Extensive retouch can clearly be seen on the right lateral edge.

Table 2. Measurements of atlatl dart fragments recovered from Centennial Canyon Cave, Inyo County, California.

Tool Type	Length (mm)	Diameter (mm)	Weight (gm)	Composition / Comments
Atlatl Dart Fragments				
Fragment 1	337.0	10.0 x 10.0	23.4	Hard wood; shaped to point
Fragment 2	224.0	10.3 x 10.5	14.3	Hard wood; broken both ends
Fragment 3	177.2	9.0 x 9.0	2.7	Cane; 2 sinew lashings
Fragment 4	34.0	9.5 x 10.0	0.6	Cane; 1 sinew lashing
Fragment 5	125.8	11.0 x 11.2	2.9	Cane; nock on one end
Fragment 6	99.0	8.0 x 8.0	1.0	Cane; highly weathered

length but has been broken at each end (Figure 7). Diameter of the piece is 10.3 x 10.5 mm, very similar to fragment one described above and may have been part of the same dart.

The remaining four atlatl dart fragments recovered from Centennial Canyon Cave are made from river cane (Figure 8). As such, unlike the hardwood fragments, all of the cane pieces are hollow. The largest (Table 2 – Fragment 3) measures 177.2 mm in length and has a symmetrical diameter of 9.0 by 9.0 mm. Two lashings made of sinew are still present on the fragment and can be clearly seen in Figure 9. The lashings do not appear to be related to an attachment of a dart point but appear to be present in order to strengthen the cane shaft. A second very small fragment (34.0 mm) also had a well-preserved sinew lashing (Table 2 – Fragment 4) (Figure 10). Like the other atlatl dart pieces described above, this small fragment has a near symmetrical diameter of 9.5 by 10.0 mm.

The remaining two cane fragments have lengths of 125.8 mm (Table 2 – Fragment 5) and 99.0 mm (Table 2 – Fragment 6), respectively. Fragment six also contains a purposefully-cut notch on one end

Figure 6. Hardwood atlatl dart fragment #1 from Centennial Canyon Cave. The distal end has been shaped to a point, probably for insertion into the projectile point foreshaft.

Figure 7. Hardwood atlatl dart fragment #2 from Centennial Canyon Cave. The shaft has been broken at both ends.

which is presumed to be a nock at the proximal end of the dart shaft (Figure 11). This fragment has a slightly larger diameter of 11.0 by 11.2 mm, which would also be consistent with the proximal end of a dart shaft. Fragment 6 has a diameter of 8.0 by 8.0 mm, but the fragment is highly weathered and appears to have been partially crushed. So its original diameter cannot be truly measured and is likely to have been in the range of 9.5-11 mm like the rest of the fragment found in the cave. No evidence of fletching is present on any of the six wood/cane fragments.

Cultural Affiliation

The artifact assemblage collected from Centennial Canyon Cave indicates a period of occupation dating to the Middle to Late Archaic (ca. 4000-2800 B.P.). Exploration elsewhere in the Coso Range and Owens Valley including nearby Hunter Mountain and Owens Lake, revealed a large number of small sites of similar age, although the Gypsum Cave point recovered from Centennial Canyon Cave is less common than members of the Elko series of projectile points which dominate this chronological period (Davis and Smith 1981; Moratto 1984).

The artifacts recovered from Centennial Canyon Cave are consistent with the Newberry period of

Figure 8. Atlatl dart fragments made from river cane from Centennial Canyon Cave.

Figure 9. Cane atlatl dart fragment with two sinew lashings.

Owens Valley as characterized by Jalama, Elko, Martis, and Gypsum Cave projectile points associated with large bifacial cutting tools, reworked blades, and scrapers. In the Intermountain West, these points have generally been dated in the range of 4000-650 B.P. (Holmer 1986; Jennings 1986; Elston et al. 1994; Justice 2002). The principal weapon system during the Newberry period is the atlatl and dart; no arrow points or ceramics are associated with this occupation.

No hammerstones, milling stones or manos were found at the site. The small number of artifacts (n=10) also supports the conclusion that the site does not appear to represent any type of a semi-permanent occupation. Rather it appears to be a seasonal ambush shelter which was focused on hunting desert bighorn sheep and other game along well-traveled trails coming in and out of the upper part of Centennial Canyon and in and around Upper Centennial spring.

Grant et al. (1968) reported over 14,000 petroglyphs from the Coso Mountain area that depict desert bighorn sheep, anthropomorphic figures, atlatls, shield patterns, and miscellaneous curvilinear, rectangular and pit and groove patterns. Many of these elements are arranged in scenes which depict hunting. Grant et al. (1968) suggested that due to the high volume of petroglyphs in the area, the Coso

Figure 10. Small cane atlatl dart fragment with a sinew lashing at one end.

Figure 11. Cane atlatl dart fragment with a purposefully-cut nock.

Mountains represented the center of a cult centered around hunting and ambushing game animals. While the presence of a hunting "cult" versus simple seasonal subsistence is difficult to prove, it is clear that the artifacts recovered from Centennial Canyon Cave, coupled with the presence of prominent petroglyphs depicting hunters, were directly associated with hunting game animals.

Acknowledgements

The writer would like to thank Mr. Mel Priddy of Richland Center, Wisconsin for allowing me to examine and photograph the artifacts from Centennial Canyon Cave. It is only through the cooperation with interested avocational archeologists like Mr. Priddy that many important artifacts are brought to light so that they may be studied and recorded for science.

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UPPER CENTENNIAL CANYON: A SMALL MIDDLE ARCHAIC TO LATE PREHISTORIC SITE IN INYO COUNTY, CALIFORNIA

Wilson W. Crook, III

Introduction

From December, 1983 through January, 1984 the author was part of an intensive exploration program for Mobil Oil for commercial quantities of gold in the area of Centennial Canyon, Inyo County, California. My part in this project was to sample the sediments and record the mineralogy in all the areas leased by Mobil Oil which included the entire length of Centennial Canyon (Figure 1). Three kilometers south of Lower Centennial spring (see paper in this issue of *The Journal*) is another major spring known as Upper Centennial spring. This water source is slightly larger than the one at the lower end of the canyon and a small rock structure was constructed near the spring probably by gold prospectors in the late 1800s (Figure 2). The spring flows year round and the water is potable (Figure 3). Animals, including desert bighorn sheep, deer, and wild mustangs were seen coming to the spring to drink. In the immediate area of the spring a large number of rock petroglyphs were observed depicting mainly figures of desert bighorn sheep (Figures 4-5).

In the immediate area of Upper Centennial spring, a small accumulation of lithic artifacts was discovered. The location of the site is situated where animal movement both in and out of Upper Centennial Canyon leading to and from the spring could be easily observed. The site is located three kilometers south of the Lower Centennial Canyon site described elsewhere in this issue of *The Journal*. This located is near the head of Centennial Canyon. Elevation at the site is approximate 6,280 feet above mean sea level. The nearest sizable population center and limited facilities is located in Lone Pine, roughly 45 kilometers to the north. The site gets its name from the major spring located nearby. During my time working in the area, I had the opportunity to meet with a local avocational archeologist who knew of the site and referred to it as the "Upper Centennial

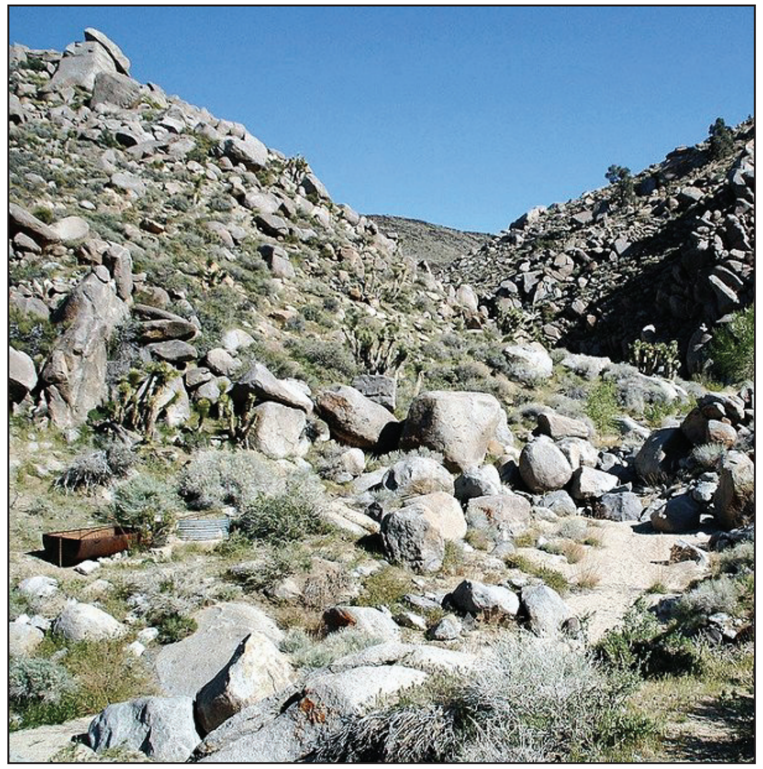

Figure 1. The rough trail leading up Centennial Canyon to Upper Centennial spring.

Figure 2. Remains of a rock house structure built by prospectors in the late 1800s near Upper Centennial spring.

Canyon" site. He informed me that this was the name the locals had called the site for years, so I have adopted the name traditionally assigned to the site in this paper.

After my discovery of the site in December, 1983, I revisited the area a number of times. Artifacts were scattered across the surface in a relatively small 30 x 30 meter area. Several tests pits were dug, each showing no cultural material below a soil hardpan exposed between 10-20 cm below the surface. A surface collection of the site was made during the two months I was present in the area with a total recovery of 35 artifacts. The artifact assemblage consisted primarily of lithic artifacts (94 percent) plus one ceramic sherd and one small shell bead. The assemblage consists of Middle to Late Archaic dart points as well as a Late Prehistoric component. The artifacts are consistent with material found elsewhere in the region, notably at Owens Lake and Hunter Mountain (Justice 2002).

Geology

The site lies at the southern end of the Owens Valley in southwestern Inyo County, California. Owens Valley lies at the intersection of two large and traditionally recognized Western cultures – California to the west and the Great Basin to the east (Eerkens et al. 2008). The valley is the location of a number of important archeological and ethnological studies starting in the 1930s and especially over the past 30-40 years (Bagsdall and McGuire 1988; Bettinger 1989; Delacorte 1999; Eerkens et al. 2008).

The Upper Centennial Canyon site lies near the foothills of the Coso Range in the southwestern

Figure 3. Upper Centennial spring.

Figure 4. Large boulder near Upper Centennial spring depicting hunters and desert bighorn sheep.

corner of Inyo County, California. The site is surrounded by the north-to-south trending Coso Mountains which are composed of a mixture of quartz monzonites, alkaline feldspar granites, and meta-volcanics of Jurassic age (Duffield and Bacon 1981; Whitmarsh 1997). Parts of the area are covered by Tertiary flood basalts. Centennial Canyon dissects the Coso Range and is filled by granitic alluvium interspersed with large boulders from the surrounding mountains.

Owing to the high degree of volcanism in the area, the region surrounding Owens Valley contains many sources of obsidian which was extensively used by the prehistoric inhabitants of the area. It is not unusual for obsidian to account for 90 percent or more of all the lithic material at a site (Eerkens et al. 2008).

The area of Upper Centennial spring where the Upper Centennial Canyon site is located is covered in fine to very coarse-grained granitic Quaternary alluvium, most of which has altered to quartz sand and clay. Tests pits dug in the immediate vicinity of the site show that this alluvium is very unconsolidated for about 10-30 cm. The alluvium is then underlain by a hardpan of tan-colored clay which extends to an undetermined depth (>60 cm). No artifacts were found below the surface.

Artifact Assemblage

A total of 35 artifacts were collected from the Upper Centennial Canyon site (Table 1). All of the artifacts recovered from the area were found on the

Figure 5. Another boulder near Upper Centennial spring depicting desert bighorn sheep.

Table 1. Upper Centennial Canyon Site Artifacts by Composition and Tool Type.

Tool Type	Obsidian	Chert	Other	Total
Projectile Points				25
Elko	7	1	–	8
Jalama	2	–	–	2
Martis	–	1	–	1
Rose Springs	6	1	–	7
Desert Side-Notched	3	–	–	3
Cottonwood	1	–	–	1
Unidentified Points	3	–	–	3
Biface / Knife	3	–	–	3
Scrapers (all types)	5	–	–	5
Pottery	–	–	1	1
Shell Beads	–	–	1	1
TOTAL	30 (85%)	3 (9%)	2 (6%)	35

surface. Despite conducting a number of test pits in the vicinity of both Upper Centennial spring and the site, no artifacts were found at any depth.

Obsidian is by far the most common lithic material at the site, comprising 85 percent (n=30) of the total artifact assemblage. Obsidian can be found in the vicinity of the Coso Range and in nearby Owens Valley and thus the toolstone was likely procured locally (Eerkens et al. 2008). In the Coso Range, at least four sources of obsidian have been utilized in prehistoric times (West Sugarloaf, Sugarloaf, Cactus Peak, and Joshua Ridge (Elston and Zeier 1984; Hughes 1988; Gilreath and Hillebrandt 1997; Erikson and Glascock 2004; Eerkens and Rosenthal 2004). Of these, the West Sugarloaf and Sugarloaf sources have been seen as the most heavily utilized

Figure 7. Elko corner-notched points from the Upper Centennial Canyon site. All are made from obsidian except for the point on the far right which is made from a reddish chert.

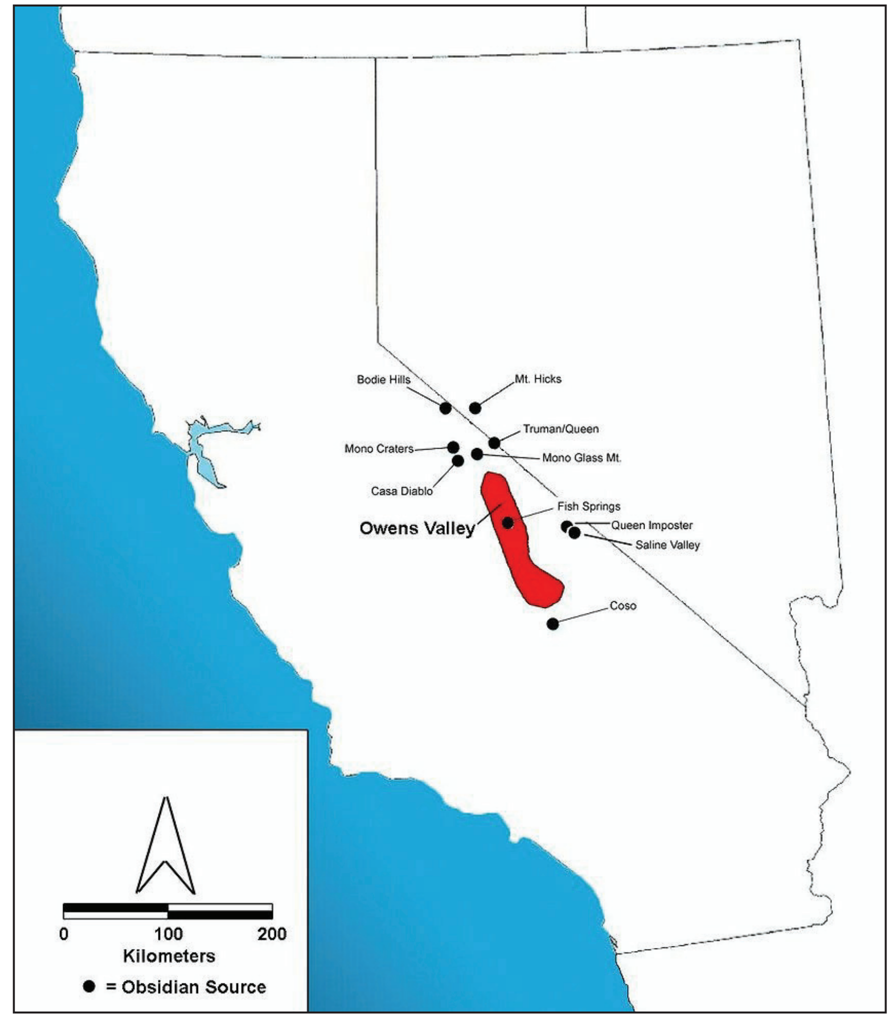

Figure 6. Known Prehistoric obsidian sources that would have been available to the inhabitants of the Upper Centennial Canyon Site. (after Eerkens et al. 2004)

(Eerkens et al. 2008) and these are the two sources closest to the Upper Centennial Canyon site. Another relatively close source, Fish Springs, is present in Owens Valley and does not require climbing a mountain range to get to it. However, the obsidian at this locality has been shown to be full of impurities and is of markedly lower quality (Bettinger 1989; Eerkens et al. 2008) (Figure 6).

Another 9 percent (n=3) are made from either a gray or a reddish-brown colored chert. Exploration of the entire length of Centennial Canyon showed that this material does not occur naturally in the area and thus was transported into the site. The remaining artifacts (n=2; 6 percent) are non-lithics and consist of a single plain, brown ceramic sherd and a single shell bead.

Within the recovered artifact assemblage, projectile points are by far the dominant tool type representing some 71 percent (n=25) of the total artifacts from the site. Of these, 22 projectile points were complete enough to be assigned to types associated with either the Middle to Late Archaic and/or the Late Prehistoric period. The majority of the dart points recovered from Upper Centennial Canyon belong to the Elko corner-notched projectile point type (Figure 7). Elko points are a small to medium triangular corner notched point with a flattened to elliptical cross-section. The blade may range from slightly excurvate to straight. Blades are commonly finely serrated, especially when made from obsidian. The shoulders are barbed, with the barbs terminating at a sharp point (see Figure7). The tips of the barbs are wider than the basal ears. Diagonal notches enter the blade from the corner and are generally deep and narrow. The stem is expanding with a straight to slightly concave base. This point generally has a random flaking pattern, but may vary to a parallel oblique pattern. Elko points from Upper Centennial Canyon range in size from 26-37 mm in length, 19-23 mm in width, and 5-6 mm in thickness. All but one of the Elko points recovered from the Upper Centennial Canyon site are made from obsidian (see Table 1).

Elko points have been dated to ca. 4000-1500 B.P. (Holmer 1986; Jennings 1986; Justice 2002). In the Owens Valley area, the basic cultural sequence has been well-established by Bettinger and Taylor (1974) and Bettinger (1989). The period characterized by Elko points is known as the Newberry in the Owens Valley region (Bettinger and Taylor 1974). The Newberry period is characterized by highly mobile populations which generally move in a north-south annual pattern including the settlement of a large number of seasonal campsites, usually near a source of water (Delacorte 1999). Both Lower and Upper Centennial Canyon fit well into this pattern.

Two examples of Jalama side-notched points were recovered (Figure 8). Jalama points are a small to medium triangular side notch point with an elliptical cross-section. The blade may vary from straight to excurvate. The shoulders range from horizontal to having a slight upward angle. The stem is expanded with a concave base. This point has a random flaking pattern. Jalama points have been found from the end of the Early Archaic through the Middle Archaic (ca. 6000-2500 B.P.) (Lathap and Troike 1984; Greenwood 1969; King 1990; Bouey and Basgall 1991). They most commonly occur along the southern California coast and decrease in abundance as you move inland with the area of Upper Centennial Canyon being close to their easternmost range (Harrison and Harrison 1966; Justice 2002). In Owens Valley, they are associated with Elko points in the Newberry period (Delacorte 1999; Eerkens et al. 2008).

A single Martis side-notched point made from gray chert was recovered from the site (Figure 8). This is a medium triangular corner to side notch point with an elliptical cross-section. The blade is primarily excurvate, but may become straight with heavy re-sharpening. The shoulders may range from slightly barbed to horizontal. The stem is expanding with a straight to slightly convex base. This point has a random flaking pattern. Martis points date to the Late Newberry period in Owens Valley (ca. 3000-1350 B.P.) (Elston et al. 1994; Justice 2002; Eerkens et al. 2008)).

A total of 11 arrow points were recovered from the site. Ten are made from obsidian and the eleventh from a reddish-brown colored chert. Seven of the points, including the one made from chert, belong to the Rose Springs type (Thomas 1981; Koerper et al. 1996) (Figure 9). This is a narrow small triangular corner notch point with a flattened to narrow elliptical cross-section. The blade is commonly thin and may vary from slightly excurvate to straight. The shoulders may vary from barbed to horizontal. The stem is most commonly slightly expanding, but may vary to straight (see Figure 9). The base may range from straight to convex. This point has a random flaking pattern. Rose Springs points from Upper Centennial Canyon range from 24-34 mm in length, 12-17 mm in width, and 3-5 mm in thickness. Rose Springs points are some of the earliest arrow points that appear in California (Yohe 1998) and have been dated to the Haiwee period in the Owens Valley region (ca. A.D. 450-1300) (Lanning 1963; Bettinger and Taylor 1974; Pierce 2003; Eerkens et al. 2008).

Figure 8. Jalama side notched points (left) and a Martis point (right) from the Upper Centennial Canyon site. Both of the Jalama points are made from obsidian while the Martis point is made from a non-local gray-colored chert.

Figure 9. Rose Springs arrow points from the Upper Centennial Canyon site. The point on the right is of reddish-brown chert; all the others are made from obsidian.

Three of the other four arrow points recovered from the site belong to the general cluster of Desert side-notched points (Baumhoff 1957; Baumhoff and Byrne 1959; Meighan 1965) (Figure 10). This is a thin, small isosceles or equilateral triangular side-notched point with a flattened cross-section. The blade is primarily straight, but may vary to slightly excurvate. Many examples are finely serrated. Parallel notches are well below the mid-point and are narrow and deep commonly forming a narrow, u-shaped neck. The shoulders are horizontal with an expanded stem. The basal edges are commonly squared with a straight to slightly concave base. This point is manufactured using percussion flakes shaped and finished with pressure flaking forming a random flaking pattern. The three points from Upper Centennial Canyon are made on thin flakes and range from 20-28 mm in length, 10-14 mm in width, and 2-3 mm in thickness. Desert side-notched points range from ca. 1100-1200 A.D. up through the Historic period (Justice 2002; Eerkens et al. 2008).

The last arrow point recovered from the site is a Cottonwood point (see Figure 10). This is a thin small to medium triangular point with a flattened cross-section. The overall shape may vary from an isosceles triangle (twice the height as width) to equilateral triangle (same height as width). The blade is most commonly excurvate, but many examples have straight blades. The base may range from slightly concave to slightly convex. This point has a random flaking pattern.

In addition, a total of 3 points could not be typed as they were mainly broken mid-sections and lacked any definite form. However, based on their thickness and style of flaking, they most probably represent Elko type points from the Newberry period occupation at the site.

Other artifacts recovered from the Upper Centennial Canyon site include three broken bifaces, five flake side-scrapers, one ceramic sherd, and one shell beads. The latter is very small and circular (7 mm x 7 mm), thin (1-2 mm), with a small central perforation (1-2 mm). As there are no freshwater shells in the area, the bead must have come from a distant source of water such as Owens Lake (24 kilometers to the north) or even the Pacific Ocean (300 kilometers to the west). No manos, milling stones, hammerstones or bone implements were found.

While the bifaces were all broken and their usage could not be determined from use-wear analysis, it is well-known in the Owens Valley region that bifaces, notably of obsidian, also served as sources of flakes for additional knapping and specifically replacement of projectile points (Delacorte 1999; Elston and Zeier 1984, Yohe 1998). Obsidian cores are rarely found in sites in the region and thus large bifaces served as a source of flakes to replace projectile point lost or broken during hunting (Eerkens et al. 2008).

The plain brown ceramic sherd belongs to Owens Valley Plain Ware, the single most common ceramic from the Owens Valley area of Southern California (see Figure 10). Owens Valley Brown Ware makes

Figure 10. Desert side-notched arrow points (n=3) and a single triangular Cottonwood point from the Upper Centennial Canyon site. All the points are made from obsidian.

its appearance in California around A. D. 1300 and is indicative of the Marana period (ca. A.D. 1300 through the mid-1800s) (Eerkens et al. 1999; Pierce 2003). Owens Valley Brown Ware was originally described by Riddell (1951; Riddell and Riddell 1956) from the Cottonwood Creek (CA-INY-2) site to the west of Owens Lake. The ceramic is associated with a change from the Rose Springs type arrow point to the Desert side-notched (Basgall and McGuire 1988; Bettinger 1989; Bettinger and Taylor 1974). As such, it heralds the end of the Haiwee period in Owens Valley and the beginning of the Marana period (Bettinger and Taylor 1974; Bagsdall and McGuire 1988). Few complete examples of Owens Valley Brown Ware exist but most vessels are believed to be small, globular jars with either flat or rounded bases (Pierce 2003). The sherd contains charcoal as a temper material which is also characteristic of Owens Valley Brown Ware (Pierce 2003).

Debitage is present at the site but is not abundant. The material found consists largely of biface thinning flakes made from obsidian. The lack of extensive debitage coupled with absence of hammerstones and grinding stones supports the conclusion that the site represents a seasonal campsite that was focused on hunting the large game animals (desert bighorn, deer) present in Centennial Canyon and the Coso Range.

Cultural Affiliation

The artifact assemblage collected from Upper Centennial Canyon indicates a period of at least seasonal occupation ranging from the Middle Archaic through the Late Prehistoric period (ca. 4000-700+ B.P.). Exploration elsewhere in the Coso Range and Owens Valley including nearby Hunter Mountain and Owens Lake, revealed a large number of other small sites with very similar artifact assemblages.

Roughly half of the artifacts present at the Upper Centennial Canyon site belong to the Middle to Late Archaic (Newberry) period of Owens Valley as characterized by Jalama, Elko, and Martis projectile points associated with large bifacial cutting tools, and scrapers. In the Intermountain West, these points have generally been dated in the range of 4000-650 B.P. (Holmer 1986; Jennings 1986; Elston et al. 1994; Justice 2002). No arrow points or ceramics are associated with this occupation.

A second phase of inhabitants utilizing the site is associated with the Late Prehistoric period. The initial part of this occupation is the Haiwee period as characterized by Rose Springs arrow points and the lack of associated ceramics (Pierce 2003). A second Late Prehistoric occupation of the area is represented by Deseret side-notched and Cottonwood arrow points and Owens Valley Brown Ware ceramics. These artifacts belong to the Marana period of the area and date to after A. D. 1300 (Bettinger and Taylor 1974; Pierce 2003).

As noted above no hammerstones, milling stones or manos were found at the site. The small number of artifacts (n=35) also supports the conclusion that the site does not appear to represent a permanent occupation at any period during its use. Rather it appears to be a seasonal campsite which was focused on hunting (ambushing) desert bighorn sheep and other game along well-traveled trails coming in and out of the upper part of Centennial Canyon and in and around Upper Centennial spring.

Grant et al. (1968) reported over 14,000 petroglyphs from the Coso Mountain area that depict desert bighorn sheep, anthropomorphic figures, atlatls, shield patterns, and miscellaneous curvilinear, rectangular and pit and groove patterns. Many of these elements are arranged in scenes which depict hunting. The Coso petroglyphs also reflect a change in style over time illustrating the adoption of the bow and arrow over the atlatl. Grant et al. (1968) suggested that due to the high volume of petroglyphs in the area, the Coso Mountains represented the center of a cult centered around hunting and ambushing game animals. While this assumption is difficult to prove, it may indicate a more significant interpretation for the people of Owens Valley by suggesting that there is more cultural continuity in the archeological assemblages than previously recognized (Moratto 1984). The artistic tradition represented in the Coso petroglyphs suggest that the historic Shoshonean peoples of the Owens Valley region may have cultural origins that extend back to local prehistoric sequences are represented at the Upper Centennial Canyon site.

Acknowledgements

The writer would like to thank the late Dr. Richard R. Bower for his aid in showing me Centennial Canyon, its petroglyphs, and the surrounding environs. Dick Bower was my supervisor at Mobil Oil from the late 1970s through 1985 and had a great degree of experience not only in Great Basin geology and mineralogy but its archeology as well.

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AN OWENS VALLEY BROWN WARE VESSEL FROM HUNTER MOUNTAIN, INYO COUNTY, CALIFORNIA

Wilson W. Crook, III

Introduction

In December 1983, the late Dr. Richard R. Bower took me to the area of Hunter Mountain in southeastern Inyo County, California. Dick knew of a site located on a flat at the base of the mountain which sat astride a major alluvial fan complex. The site occurred within the area leased by Mobil Oil for mineral exploration throughout the Owens Valley area. The site is located north of California 190, about 5 kilometers northeast of Panamint Springs. Exploration of the site area revealed a number of large basalt milling stones and manos as well as several large rocks which had pecked cupules for grinding (Figures 1-3). Several Desert side-notched arrow points made from obsidian and a single Cottonwood triangular point made from chert were present on the surface (Figure 4). Nearby the arrow points, a large number of ceramic sherds were discovered in close proximity to one another. Given the presence of a central basal sherd and a number of rim sherds, it was apparent that all the sherds probably came from a single vessel. Throughout the several months I spent working in the Owens Valley of southern California, I encountered or observed a large number of pothunters and looters. Therefore it was decided to do a salvage excavation of the vessel, attempt to reconstruct it, and record its presence in the archeological record. A total of 303 sherds were recovered from the surface, most less than 3 cm on a side. Several test pits dug in the immediate vicinity of the vessel failed to reveal a single additional artifact – ceramic or lithic – below the surface.

Over the years, I approached a number of California archeological associations about publishing information on the vessel with little or no interest (most did not ever return telephone calls, answer letters, or more recently, answer email inquiries). Therefore, this short note serves as a description of the discovery and the characteristics of the ceramic vessel.

Ceramic Vessel Description

The ceramic vessel found at the Hunter Mountain site in Inyo County, California, is a utility ware jar of the type known as Owens Valley Brown Ware (OVBW). The vessel is plain with no decoration other than a few scraping and brush marks on the exterior surface. Due to its highly fragmented condition, only the base and parts of the body and rim could be reconstructed (Figures 5-7). Specific characteristic of the vessel are listed below:

Figure 1. Large milling stone made from basalt present at the Hunter Mountain site, Inyo County, California.

Figure 2. Broken pieces of milling stones made from basalt on the surface of the Hunter Mountain site.

Figure 3. Chipped cupules for grinding seeds at the Hunter Mountain site.

SITE NAME OR SITE NUMBER: Hunter Mountain, Inyo County, California

VESSEL NUMBER: N/A

VESSEL FORM: Small flat-bottomed jar

PASTE: Angular quartz sand and minute flecks of charcoal

RIM AND LIP FORM: Straight (direct); no indication of rim being everted or inverted

EXTERIOR SURFACE COLOR: Brown (7.5YR 5/3) to Light Brown (7.5YR 6/3)

INTERIOR SURFACE COLOR: Generally same as exterior; in places slightly darker (7.5 3/3 Dark Brown) due to the presence of organic residue

CORE COLOR: Slightly darker than interior or exterior surfaces indicating firing in a low oxygen, reducing environment then pulled from the fire to cool

WALL THICKNESS (IN MM): Rim, 5.2-6.0 mm; Body, 5.5-7.0 mm; Base, 15.9 mm; the thickness data suggests the vessel was built from the base upwards to the rim (Krause 2007)

INTERIOR SURFACE TREATMENT: Smoothed

EXTERIOR SURFACE TREATMENT: Unevenly smoothed; some scraped and brushing marks

ESTIMATED VESSEL HEIGHT (IN CM): 14.9

ESTIMATED ORIFICE DIAMETER (IN CM): 10.0

BASE DIAMETER (IN CM) AND SHAPE OF BASE: Circular, 6.4

DECORATION (INCLUDING MOTIF AND ELEMENTS WHEN APPARENT): None

TYPE AND VARIETY: Owens Valley Brown Ware (OVBW)

Figure 4. Desert side notched arrow points (left) and a Cottonwood triangular point (right) from the Hunter Mountain site.

Figure 5. Partially reconstructed base of the Owens Valley Brown Ware jar from Hunter Mountain, Inyo County, California.

Owens Valley Brown Ware is the single most common ceramic found in the Owens Valley area of southern California. The type was originally described by Riddell (1951; Riddell and Riddell 1956) from the Cottonwood Creek (CA-INY-2) site to the west of Owens Lake. Radiocarbon dated sites in Owens Valley indicated that Owens Valley Brown Ware makes its appearance in California around A. D. 1300 and persisted until the 19th century (Bettinger and Taylor 1974; Basgall and McGuire 1988; Delacorte 1999). The ceramic is associated with a change from the Rose Springs type arrow point to the Desert side-notched and Cottonwood triangular points (Baumhoff and Byrne 1959; Bettinger and Taylor 1974; Basgall and McGuire 1988; Bettinger 1989; Justice 2002). As such it marks the end of the Haiwee period (ca. 1350-700 B.P.) in Owens Valley and the beginning of the Marana period (ca. 700 B.P. to contact) (Bettinger and Taylor 1974; Basgall and McGuire 1988; Eerkens et al. 1999). The Marana period is characterized by small, mobile family based settlements, and short-term specialized activity sites such as pinyon nut gathering and hunting (Basgall and McGuire 1988; Bettinger 1989; Delacorte 1999). In addition to Desert side-notched arrow points, Owens Valley Brown Ware is almost always found in association with milling stones, either made from slabs of basalt or as cupules pecked into a rock (see Figure 3) (Overly 2003; Pierce 2004).

The Owens Valley region contains several clay-bearing areas, some of the best being along the western side of the valley where clay is derived from the weathering of the granitic plutons comprising the Sierra Nevada Range. Clays can also be found in the valley floor near seep springs, playas, salt pans, and along the banks of the Owens River. The most common temper used in the paste is angular medium to coarse (0.5-2 mm) grains of quartz which occur in abundance at the toes of alluvial fans throughout the valley. Dean (2002) and Pierce (2004) noted that sometimes small pieces of charcoal were also added

Figure 6. Partially reconstructed rim sections of the Owens Valley Brown Ware jar from Hunter Mountain, Inyo County, California.

Figure 7. Partially reconstructed sections of the body and larger wall sherds of the Owens Valley Brown Ware jar from Hunter Mountain, Inyo County, California.

to the clay as temper. Both the exterior and interior of vessels were smoothed and many vessels show signs of scraping and/or brushing. Firing was typically completed by placing the vessels over an open fire and then removing the vessels later for cooling (Pierce 2003, 2004).

Depending on the quality of the clay utilized and the duration period of firing, the color of Owens Valley Brown Ware vessels can vary from gray to dull red-brown to brown or even black especially with prolonged exposure to fire after firing (Lilheblad and Fowler 1986; Pierce 2003, 2004). In almost every instance, Owens Valley Brown Ware lacks any form of decoration which makes reconstruction challenging. This is further complicated by the fact that ceramics of the type break easily into small sherds less than 5 cm on a side as was the case with the vessel described herein. Therefore few examples of complete Owens Valley Brown Ware exist but most vessels are believed to have been small jars with either flat or rounded bases (Riddell 1951; Pierce 2003). Rim diameters range from 10-47 cm, averaging about 24 cm (Pierce 2003). Vessel size has been noted to decrease with time (Bettinger 1976). As vessel size decreased, body walls became thinner. Wall thickness ranges from 3.2 mm to 11.4 mm, with an average of 6.3 mm (Pierce 2003). Rim thickness is usually similar to the body of the vessel; bases are often much thicker (Pierce 2003). Given their propensity for breakage, crack sewing is common in Owens Valley Brown Ware although the vessels described herein had no perforations.

Almost all Owens Valley Brown Ware was used in cooking food, primarily boiling seeds and nuts, though roots, berries, and greens were also collected and cooked (Bettinger 1975, 1976, 1977). Pinyon nuts in particular were heavily exploited by the aboriginal inhabitants of Owens Valley and the development of pottery goes hand-in-hand with the increased use and dependence on pinyon nuts (Bettinger 1976; Pierce 2003). Boiling and slow cooking the seeds and nuts collected significantly maximizes their nutritional yield (Arnold 1985; Stahl 1989). Substantial stands of pinyon pines are present throughout the White and Inyo Range directly above the site. There is also some ethnographic evidence that several drinks, such as Tule mint tea, were also prepared by boiling leaves in pottery vessels (Pierce 2003).

In summary, the intensification of the seed processing and the widespread use of ceramics in Owens Valley went hand-in-hand. As prehistoric peoples became more and more dependent on seed gathering and processing, especially as a mainstay food during the winter, their reliance on pottery increased (Bettinger 1976). Initially pottery was used only at main residential camps. Ultimately, it became the essential component of the aboriginal tool kit at all archeological sites after A. D. 1300 (Pierce 2003, 2004). The basic form of Owens Valley Brown Ware remained essentially unchanged for roughly 550 years until its used was discontinued with contact and the acquisition of metal cooking vessels.

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HOUSEHOLD ITEMS OF THE BORDER VILLAGES IN THE BIG BEND

Louis F. Aulbach and Linda C. Gorski

Introduction

From the 1880s until the National Park Service acquired the land for the Big Bend National Park, there were a number of communities in Texas along the Rio Grande River from Lajitas to Boquillas. Although only a few scant ruins remain today, the fragmentary evidence of the household items the residents used in the everyday life in these villages can give us an insight into the lives of these people and can help us to understand how they survived, and often thrived, in an environment that we, today, might view as extremely harsh and forbidding.

Over the two past decades, the authors have surveyed and photographed an extraordinary array of household items and personal effects in a large number of community sites in the Big Bend National Park. From this assemblage, we believe we can describe, in a modest way, the typical household with the utensils and products that were commonly used in the day-to-day activities of the home.

As the Indian Wars came to an end in the West and the railroads were built across Texas, ranchers, miners and settlers moved into the border region of the Big Bend. For over fifty years, from about 1885 to 1942, there was an expansion of activity in the southern Big Bend as mining operations, wax factories, ranches and large scale farms were established and thrived in the area. Each of these commercial enterprises required workers in direct roles and a large network of persons employed in support functions (Aulbach 2007:12-29).

Many of those who worked in the Big Bend were drawn to the area from the interior of Mexico. They lived with their families in villages along the Rio Grande or in communities close to the mines, ranches, farms and wax factories. Although they brought a cultural heritage from Mexico, these settlers and workers created a distinct style of life in the Rio Grande border villages. Yet, little research has been done to describe the basic lifestyle of these people and their communities.

Over the past two decades, a small group of us who are avocational historians and archeologists have explored and examined the ruins of several of the border communities. We have located over thirty sites in the Big Bend that appear to have been inhabited by Mexican-American families, and we have attempted to document the vernacular housing construction styles as well as the artifacts and household implements which were in general use by these people.

Initially, we recorded the ruins of the structures and homes of the villages. But then, we began to wonder "Who were these people?" and "What was life like out there in the desert?" We realized that the debris scattered on the ground in these settlements and communities provided clues to the way of life of the people. So we re-visited several of the sites to record the evidence of everyday activities and life in these villages. For this report, we have selected the artifacts from nine communities along the Rio Grande and its tributary Terlingua Creek. The residents of these communities were predominantly Texans of Mexican heritage or Mexican immigrants. This paper describes a wide range of their household items, and from this assemblage of artifacts, a picture of the material culture of the population comes to light.

Life in the Rio Grande Border Villages

There is very little written about the inhabitants of these communities. The histories of the area generally focus on the mining ventures or the Anglo settlers, but delve little into the lives of the workers and their families who also lived in the area. One exception was W. D. Smithers, a San Antonio photographer and journalist who lived for many years along the Rio Grande. Smithers had a special interest in documenting life along the river, especially the life of the Hispanic people there. Two of his photographs are the basis for the analysis that we present here. Both are from his book *Chronicles of the Big Bend* (Smithers 1999).

The first photo in his book is of a dugout house at Glenn Springs (Smithers 1999:117). As the wife of the family prepares food for breakfast, the basic utensils of her kitchen are arrayed in front of her home. Life in the Big Bend often took place outside of the small shelter of the *jacal*. From the lower left, the photo shows a bucket, a wash basin, a pot, a Dutch oven, another pot, a pitcher, a kettle and serving bowls. Beside the *jacal* are other household items such as a washtub, a shovel, an iron, a broom, an ax, a crock, and a trunk.

The second photo in Smithers' book is of the interior of a typical Mexican house, circa 1920 (Smithers 1999:77). This other glimpse of a "typical" house appears to show the slightly more prosperous household of the Holguin family near Sierra Chino. The items in their household include such items as dishes on the table, a bucket, a wash basin, a large pot, pots and pans on the stove, a cabinet with a coffee pot on the side, shelves containing food containers, dishes and dinnerware, and a large pitcher. A broom lies beside the cabinet, a Dutch oven hangs from a beam and a lantern hangs behind the Dutch oven.

These photos give us a guide to what we might find on the ground today. Many other items of general use are scattered about, as well. We have identified over two hundred recognizable artifacts in these nine communities and it appears that there is a consistent type of household "culture" across the entirety of the Rio Grande basin from Lajitas to Boquillas. Every artifact in this survey was examined, photographed and returned to its place on the ground surface as required by federal law.

The names for these villages and communities have been assigned by us and they do not necessarily reflect the "official" names of the sites. The names simply give us a way to know exactly which physical location we are referring to when we collected and sorted our data. The sites are designated as Valenzuela, Dryden, Molinar, Abajo, Sublett Farm, La Coyota, El Ojito, Old San Vicente, and San Vicente (Figure 1).

We have sorted the household items into eleven categories: Buckets and wash basins, Enamelware and graniteware, Kitchen items, Food products, Pottery, Personal items, Household tools, Equipment and field tools, Ceramics, Ceramics with maker's marks, and Firearms. Artifacts from each of these categories are presented below.

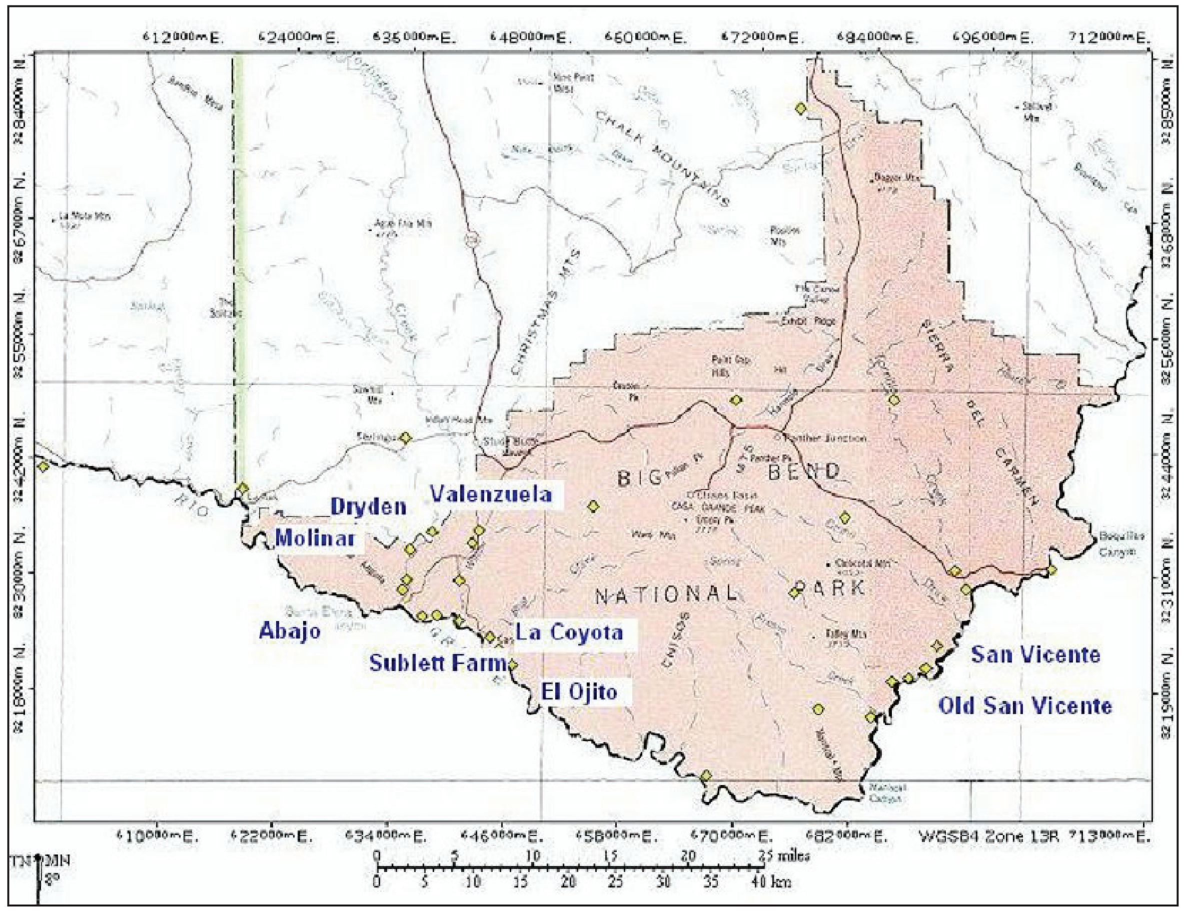

Figure 1. Location of sites surveyed.

Buckets and Wash basins

Buckets and washtubs were found in almost every site that we surveyed. These items are very utilitarian and the abundance of the remains of these containers indicate their widespread use. The wire handled two gallon bucket was the most common steel bucket (Figure 2). The standard 15 gallon galvanized round washtub was the most popular washtub (Figure 3).


Figure 2. A two gallon bucket with a wire handle.


Figure 3. A fifteen gallon wash tub.

Enamelware and Graniteware

Kitchen utensils were often made of steel coated with enamel, known as enamelware or graniteware. The durability and relatively low cost of enamelware would have made these items popular. These items are found in all of the communities in our survey (Stewart 2011).

A wide range of pots, pans and serving utensils were found. The color patterns showed a variety that included dark blue, white and gray enamel. A coffee pot with basket, a drinking cup, serving spoons, a white enamel plate, a one quart pot with handle and a large pot with a white enamel lid were typical of the types of enamelware in use in these communities (Figures 4-9).


Figure 4. Coffee pot and basket.


Figure 5. Gray enamel cup.


Figure 6. White enamel spoon.


Figure 7. White enamel plate.


Figure 8. Gray enamel pot with handle.


Figure 9. Large gray enamel pot with white enamel lid.

Wash basins made of enamelware were also common throughout the area. These basins were standard granite gray, but also sky blue and white, navy blue and white, all white and dark green (Figure 10). In one case, a wash basin had been manually altered by drilling holes in the base to create a colander (Figure 11).


Figure 10. Gray enamel wash basin and a sky blue and white basin.


Figure 11. Blue enamel colander.

Kitchen Items

There were a number of specialty kitchen items that were used in the preparation of food and the storage of food products. A traditional food processing tool like a *metate* or grinding stone was complemented by more modern equipment such as 10 inch cast iron Dutch ovens and Kerr Glass Jars (Figures 12 and 13). The markings on the fragments of two Kerr jars, found in different sites, indicate that the jars were made after 1913, the year that the Kerr Glass Manufacturing Company moved to Sand Springs, Oklahoma. The company began producing jars from the high-quality glass sand found in the Arbuckle Mountains (Encyclopedia of Oklahoma History & Culture 2011).

Food Products

The preparation of food was an important activity and some of the basic ingredients used in cooking were commercially available products. The embossed bottles and tin cans reveal some of the contents of the typical pantry.

Two brands of baking powder were common: KC Baking Powder, which was produced from 1899 to 1950 (Spokane County (WA) 2007), and Clabber


Figure 12. Grinding stone.

Girl (Figure 14). Clabber Baking Powder was produced from about 1879, but the change of the name to "Clabber Girl" with new packaging did not occur until 1923. It is a popular brand even today (Answers 2011).

Figure 14. Clabber Girl and KC Baking Powder tins.

One can easily imagine the uses for flour, canned milk and syrup in these homes that were far away from the local grocer. The broken bottles of Karo Syrup attest to its use. Prior to the introduction of Karo Syrup in jars about 1900, one had to take a jug to the grocer to have it filled from barrels of the grocer's syrup. Karo quickly became "America's favorite" for use in glazes, candies, pies, and on waffles and pancakes (KaroSyrup 2011) (Figure 15). The rusted tin lid from a White Swan Flour can shows that this brand of flour, which was marketed from 1906 to 1989, was available here (Jones 2000). Eagle Brand Milk, a Borden Company product that was first made in 1856, was an evaporated milk that could be stored for long periods of time (EagleBrand 2011) (Figure 16).

Fragments of Circle A Ginger Ale bottles indicate that this soda water was a popular refreshment. Robert S. Lazenby invented Circle A Ginger Ale in 1884 and named his company after it (Figure 17). In 1885, he added "Dr. Pepper's Phos-Ferrates" to his line of drinks. He re-named the company the Dr. Pepper Company in 1902 to reflect the popularity of that drink, and the company discontinued Circle A Ginger Ale in 1940 (Soda Traderz 2011).


Figure 13. Ten inch Dutch oven lids.

Although one might think that beer bottles would be more common among the ruins, we only found one brown beer bottle. Beer began to be bottled in brown bottles after 1930 (Broken Secrets 2011). The propensity for beer bottles to be broken (or used as target practice) may explain their scarcity.

A small tin of Hershey's chocolate shows that small treats were appreciated in these remote parts.

Figure 15. Karo Syrup bottle.

Figure 16. Eagle Brand condensed milk can.

Figure 17. Circle A Ginger Ale bottle.

Figure 18. Hershey's chocolate tin.

Figure 20. Pottery with green leaf pattern.

Figure 19. Stoneware crock.

Hershey began producing chocolate in tins in 1895 (Etsy 2011). This tin is much later (Figure 18).

Pottery

The pottery found in the villages included large stoneware crocks as well as earthenware bowls and brightly colored ornamental pots (Figures 19-21).

Figure 21. Pottery with a red and black pattern.

Personal Items

A large number of items were objects of a personal nature. Decorative pieces such as belt buckles, an embossed metal button and a pink button indicate that there was some interest in more refined dress, at least, on occasion (Figures 22-24).

Figure 22. Belt buckles.

Figure 23. Embossed metal button.

Figure 24. Small pink button.

The medications present in the households give us an idea of the common ailments that the residents had to cope with. In the desert environment of the Big Bend and the hard physical labor typical of farming, mining, and ranching, the commercial medications are not unusual. Bottles of ointments and medicines included *Aciete Mexicano*, St. Joseph's Aspirin, Vicks Vapo-Rub, and Mentholatum.

Aciete Mexicano ("Mexican oil') is a traditional remedy for indigestion that can also be used externally for insect bites and sore muscles (Figure 25) (Taos Herb Company 2011).

Figure 25. Bottle of Aciete Mexicano.

A small, personal size jar of Mentholatum was probably carried in one's pocket. A blend of the soothing and anti-inflammatory effects of menthol and petrolatum (petroleum jelly), Mentholatum sales took off immediately after it was introduced in December, 1894, and is still popular today (Figure 26) (Wikipedia 2011a).

Figure 26. Mentholatum jar.

The familiar cobalt blue jar of Vicks has been around for decades. In 1905, Lunsford Richardson put together a product combining menthol and a base of petroleum jelly that opened sinus passages and increased circulation in the chest. Sales took off dramatically. He named the product after his brother-in-law Joshua Vick -- Vick's Vapo Rub (Figure 27). It gained fame during the 1918 Spanish influenza (Wikipedia 2011a).

Figure 27. Vicks Vapo Rub jar.

Other personal care products fall somewhere between medicinal value and personal grooming. McLean's Volcanic Oil dates from the midnineteenth century and it was used well into the twentieth century to provide relief from aches and sprains, and stiff muscles. Dr. James Henry McLean began marketing his own patent medicines by 1854, including Dr. McLean's Volcanic Oil Liniment (Figure 28). After his death in 1886, the product continued to be sold by the Dr. J. H. McLean Medicine Company (Edward C. Atwater Collection 2008:475-476). It is a turpentine oil liniment.

Figure 28. Volcanic Oil bottle.

A bottle from the Chattanooga Medicine Company tells a more interesting story. Chattanooga's primary product was Wine of Cardui, a 38-proof patent medicine that was a remedy for "female diseases" and painful menstruation. Its success is accredited to its high alcohol content. The main purchasers were respectable women who did not frequent liquor stores. The product was made and sold from 1879 to about 1939 (Figure 29) (Irwin 2011).

Figure 29. Chattanooga Medicine bottle.

Personal grooming products were also found. The familiar white Ponds Cold Cream jar was a small luxury for the lady of the house. Pond's Cold Cream was marketed from the early twentieth century. Extensive advertising made it a popular health and beauty product that is still very popular today (Figure 30) (Wikipedia 2011c).

Figure 30. Ponds Cold Cream jar.

A tiny vial of Hoyt's Nickel Cologne shows us that the men felt the need to spruce up, too. E. W. Hoyt and Company introduced the five cent and ten

cent sizes of their popular "German cologne" in the early 1900's. The company, based in Lowell, Massachusetts, was in business until 1951 (Hoyt 2011).

Other items of a personal nature were the tobacco tin and the votive candle. The pocket size tobacco tin was manufactured beginning in 1913 and it continued to be sold into the late 1950's (Figure 31) (Waechter 2011). Votive candles from the Reed Candle Company of San Antonio were first produced in 1937, and they are still sold in abundance today (Figure 32) (Manta Media Inc. 2011).

Figure 31. Tobacco tin.

Figure 32. Reed Candle Company votive candle.

Household Tools

As might be expected, the tools and equipment used around the house were found. Small items such as a clothespin spring, a bed spring, and decorative patterned tin are evidence of the daily activities in the home. Lanterns were also quite common. Several Dietz lanterns and parts thereof indicated that the brand of lanterns was widely available in the area. Dietz began producing lanterns in 1859, and the Monarch model was very common (Figure 33) (Kirkman 2011).

Figure 33. Dietz lanterns.

Equipment and Field Tools

Field tools and farm equipment are indicative of the occupations of the villagers. Ordinary farm tools, such as axe heads, hoes, and shovels, would have been the tools of the trade for those who worked at the vegetable farms along the floodplain. More specialized tools, however, such as the A.H. Patch Corn Sheller, indicate a high level of efficiency in the processing of food crops (Figure 34) (Montgomery County Historical Society 2011).

Figure 34. The A. H. Patch Corn Sheller.

Ranching activity is also evident in the artifacts found. Sheep shears and various horse-related equipment indicate the presence of ranching activity in the area. Horseshoes are common, but there also were homemade twisted wire snaffle bits and saddle belt loops (Figure 35).

The advent of motorized vehicles, cars, and trucks, is seen in the debris left around the sites. Numerous discarded parts, such as doors, seat

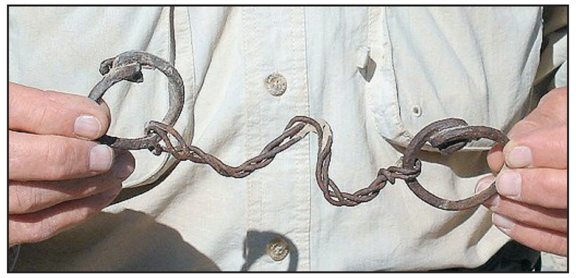

Figure 35. Homemade snaffle bit.

springs, leaf springs, one gallon gas cans and automobile bodies, litter the sites that are near the roads leading to Terlingua.

Ceramics

The border villages were a long way from the larger, more refined towns of Alpine and Marathon. Terlingua was a rough and tumble mining town, and not very sophisticated at that. Today, about seventy years after the residents of the border moved on to other places, the ruins of their homes suggest a primitive and hard-scrabble existence on the edge of the civilized world. Yet, the most surprising features to be found in the ruins of all of these communities are the household ceramics. The variety, beauty, delicacy, and refinement of the porcelain dishes found throughout the region is extraordinary.

All of the artifacts that we found are fragmentary pieces. The ceramics do, however, have a wide range of patterns and designs on them. There are many pieces that are decorated with various transfer patterns of red, blue, and green (Figures 36 and 37). Other pieces have colorful and intricate floral patterns. Very delicate china pieces were also found that are perhaps from miniature or children's sets Figure 38).

Ceramics is defined as the art of making any object from clay by baking it. However, the term "ceramics" includes a number of variations, either in design or materials. Some of the ceramic pieces found in the Big Bend are a type known as semi-porcelain. Semi-porcelain is commonly referred to as "ironstone." Although the fired clay body does appear somewhat vitreous (glass-like), it is actually a refined earthenware and not to be confused with true porcelain. The broken edge of semi-porcelain which exposes the inner core allows it to be readily distinguished from porcelain. Potteries began experimenting with a porcelain-like ware that could be cheaply mass-produced. Charles Mason patented this new ware in 1813, which he called "Ironstone China." Americans quickly became consumers of semi-por-

Figure 36. Ceramics with transfer patterns.

Figure 37. Ceramics with floral patterns.

Figure 38. Delicate pieces of ceramics.

Figure 39. Semi-porcelain ceramics.

celain. After the Civil War, Ohio and New Jersey became the center of production in the U.S. (Figure 39) (Peterson 2011).

China or porcelain is often used in ceramics designed for tableware. Both terms describe the same product that is a combination of clay, kaolin, feldspar, and quartz. After a series of firings at extremely high temperatures and for long periods of time, the molded body becomes vitrified. And, unlike stoneware, the china becomes very white and translucent.

The term "china" comes from its country of origin, and the word "porcelain" comes from the Latin word *porcella* meaning seashell and it implies a product which is smooth, white, and lustrous. The term "porcelain" is preferred in Europe while "china" is favored in the United States. In the general hierarchy of ceramic products, china is at the highest level because of its delicate beauty and the extreme care and skill required to produce it (Noritake Co., Limited 2011a, 2011b).

Ceramics with Maker's Marks

Several ceramic fragments that were found in the study area had an intact maker's mark from which we are able to identify the details of the piece's origin and manufacture. The marked ceramics that were identified are examples of both semi-porcelain and china dinnerware.

One special ceramic piece, although it is not actually a marked piece, is a highly recognizable pattern. That is the Blue Willow Pattern, and one group of broken fragments are from a porcelain plate of that style (Figure 40). The "Willow Pattern" has been the stock-pattern of nearly every British Pottery manufacturer since it was first engraved by Thomas Minton in 1780.

The traditional willow design always features a large beautiful Chinese home with a willow tree, a small bridge with three figures, a humble servant's house at the foot of the bridge, a small Chinese boat and the famous love birds above the willow tree. The story goes something like this: Long ago, in the days when China was ruled by emperors, a Chinese mandarin, Tso Ling, lived in the magnificent pagoda under the branches of the apple tree on the right of the bridge, over which droops the famous willow tree, and in front of which is seen the graceful lines of the fence. Tso Ling was the father of a beautiful girl, Kwang-se, who was the promised bride of an old, but wealthy, merchant. The girl, however, fell in love with Chang, her father's clerk. The lovers eloped across the sea to the cottage on the island. The mandarin pursued and caught the lovers and was about to have them killed when the gods transformed them into a pair of turtle doves (The Potteries.Org 2011).

Homer Laughlin was a major U. S. manufacturer of Blue Willow patterns in the 1930's, and there is a good chance that this piece may have been a product of his factory.

The Homer Laughlin pottery company began in 1869 in East Liverpool, Ohio, and quickly gained a

Figure 40. A Blue Willow pattern piece.

reputation for quality ceramic dinnerware and toilet ware in the United States. The company moved to Newell, West Virginia in 1907. By 1903, the company's china was sold by the F. W. Woolworth Company, the country's fastest growing variety store chain. As a marketing tool, the American Cereal Company of Chicago was packing oatmeal bowls in Mother's Oats boxes as fast as Homer Laughlin could produce them. During the 1920's and 1930's, Homer Laughlin china could be purchased from the Sears Roebuck catalog. As a result of these alliances, Homer Laughlin became the largest ceramic factory in the world. Its most famous line is Fiesta Ware, introduced in 1936, and it is still in the Homer Laughlin product line today (Figure 41) (Homer Laughlin China Company 2011).

From the maker's mark, it is possible to tell the date of manufacture of the Homer Laughlin china fragment found in the Big Bend. From 1910-1920, the company followed a simple pattern for marking their wares. On the maker's mark, the first number identified the month of manufacture, the next two numbers identified the year, and the third figure identified the plant where the piece was made. Plant number "4" was N, number "5" was N5, and the East End Plant (in East Liverpool, Ohio) was "L". Our artifact with the mark "6 20 L" was made at the East End plant in June, 1920 (Nancy's Antiques & Collectibles 2011).

The Derwood Pattern dinnerware was produced by the W. S. George Company of East Palestine, Ohio. William Sherman George purchased the controlling interest in the East Palestine Pottery Company in 1904 and renamed the Ohio company the W. S. George Pottery Company. The company produced semi-porcelain dinnerware, hotel ware, and toilet wares. In 1955, the company went bankrupt and liquidated its holdings and closed in 1960 (Figure 42) (Wikipedia 2011d).

Figure 41. Homer Laughlin china.

Figure 42. Derwood pattern dinnerware.

The Wellsville China Company, located in Wellsville, Ohio, acquired the building of the Pioneer Pottery Company in 1900, and for several decades it made semi-porcelain dinnerware, including many patterns for hotels and restaurants. In 1959, the company was bought by the Sterling China Company, but it continued operation as an individual business until 1969 when it closed due to outdated equipment (Figure 43) (Olde Tyme Collectibles 2011).

Figure 43. Wellsville China Company.

Vodrey Pottery Company had its beginnings in the nineteenth century. William, James and John Vodrey converted an abandoned East Liverpool, Ohio church into a pottery factory. By the spring of 1858, the Vodrey and Brother Pottery Company was operating at full capacity, producing Rockingham and yellow ware. In 1876, the pottery company began production of white ironstone. In 1896, the company changed its name to the Vodrey Pottery Company and semi-porcelain became a part of its offerings. Vodrey Pottery produced domestic and commercial dinnerware and chamber ware until 1928 when it closed its doors for good (Figure 44) (Wikipedia 2011e).

Figure 44. Vodrey Pottery Company.

The Pope Gosser Company was organized in Coshocton, Ohio in 1902 by Charles F. Gosser and Bentley Pope. In the beginning it experimented with high quality decorative pieces. Later, the company concentrated on semi-porcelain dinnerware. The company closed in 1958 (Figure 45) (D&J's Antiques & Things 2011).

Figure 45. Pope Gosser Company.

The Mellor & Company brand was manufactured by the Cook Pottery Company of Trenton, New Jersey. Cook Pottery was organized in early 1894 with Charles Howell Cook as the president and F. G. Mellor as the vice president. The company mark consisted of the British Lion and a Unicorn with a shield bearing the monogram of the Cook Pottery Company and the name "Mellor & Co." below. This mark was used on the company's semi-porcelain dinnerware (Barber 1904:54). The company closed during the Great Depression (Figure 46) (Trenton City Museum 2011).

George C. Murphy acquired a pottery plant in East Liverpool, Ohio in 1894 that became the George C. Murphy Pottery Company (Barth 1926). The company made semi-porcelain dinnerware. In 1901, the company became a part of the East Liverpool Potteries Company, but the merged company failed about 1903 (Figure 47) (Pratt 2011).

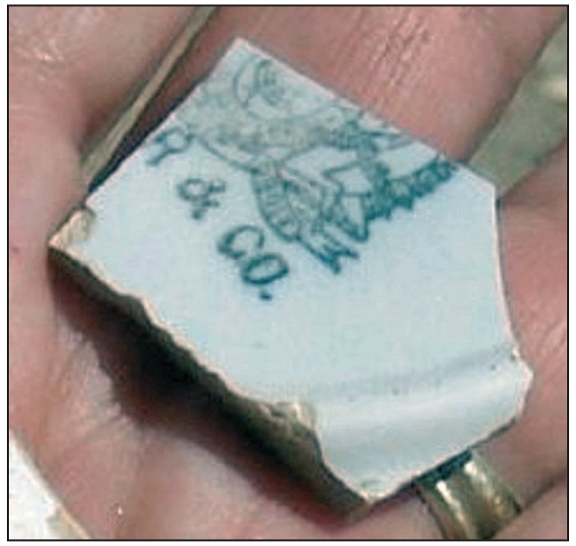

Figure 46. Cook Pottery Company.

Figure 47. The George C. Murphy Pottery Company.

Although a large percentage of the ceramics in the border villages was made in the United States, there also were ceramic goods that were imported from other parts of the world.

One artifact is marked with the Nippon Rising Sun mark (Figure 48). The Nippon mark, referred to as the Sunrise or Rising Sun mark, is pale blue in color with "Hand Painted" written above the mark and "Nippon" (meaning "Japan") below the mark. It is possible that this china is a product of the Noritake Company. In 1904, the forerunner of the Noritake Company was established in the village of Noritake, a small suburb near Nagoya, Japan. The goal of this first factory was to create western style dinnerware for export. It took until 1914, however, to create the first porcelain dinnerware plate that was suitable for export.

The earliest dinnerware plates were mostly hand-painted, often with liberal applications of gold. By the early 1920's, Noritake introduced assembly line techniques that allowed for the mass production of

Figure 48. Nippon Rising Sun china.

high quality, yet affordable dinnerware (Noritake Co., Limited 2011a). The Rising Sun mark was not used after 1921 (WorthPoint Corporation 2011). Noritake remains a producer of fine china for markets worldwide.

Fragments of porcelain pieces from the Netherlands were found at multiple sites among the Big Bend communities. These ceramics came from the Petrus Regout Company of Maastricht, The Netherlands (Figure 49). Petrus Regout opened a modernized earthenware factory in 1836. By the mid-1850's, Regout was producing the high-quality earthenware. In 1899, the company, until then known under the name of Petrus Regout, was renamed "De Sphinx." By then, the company had already been using the image of a recumbent sphinx as its logo for twenty years. In 1969, after more than 130 years, the production of household earthenware came to an end. The company now manufactures only sanitary ware and tiles (Memory of the Netherlands 2011).

Firearms

Firearms were very much a part of life on the frontier. From the soldiers who patrolled the Big Bend from Camp Neville Springs to the Texas National Guard and the U. S. Army during the Pancho Villa era, armed forces made the border secure for settlers and ranchers. The ranchers and settlers also had firearms to protect livestock from predators, for hunting game and, occasionally, for self-defense in a sometimes hostile environment. Shell casings found in the border villages indicate that there was a large

Figure 49. Petrus Regout china pieces.

variety of rifles, pistols, and shot guns in the Big Bend. The head stamps from these shells provide us with the details of the types of weapons in use.

The .30-40 Krag rifle was developed in the early 1890's for U. S. Army by the Krag-Jørgensen Company of Norway (Figure 50). After performing poorly in the Spanish-American War in 1899, this rifle was replaced by the higher velocity .30-03 in 1903 (Wikipedia 2011f).

Figure 50. A .30-40 Krag cartridge.

The WRA .44 WCF was the Winchester Repeating Arms Company's first center fire metallic cartridge. It was introduced in 1873 for the Winchester 1873 rifle that was known as "the gun that won the West." The cartridge was also used in the Single

Figure 51. WRA .44 WCF cartridge.

Action Army revolver. It was popular among settlers, lawmen and cowboys because of the convenience of being able to carry a single caliber of ammunition for both a rifle and a pistol. This versatile cartridge is still in use today (Wikipedia 2011g).

The WRA .45 Colt was a Winchester Repeating Arms Company handgun cartridge adopted by the U. S. Army in 1873. It succeeded the WRA .44 WCF and is still in use today (Figure 52) (Wikipedia 2011h).

Figure 52. WRA .45 Colt cartridge.

The REM UMC No. 12 Nitro is a 12 gauge shotgun shell. The Union Metallic Cartridge Company began producing the Nitro shotshell between 1891 and 1905. UMC merged with the Remington Arms Company in 1911, but did not use the REM-UMC head stamp until 1916 so this shell was manufactured in 1916 or later (Figure 53) (Farrar 2011).

The Winchester No. 12 Nublack is a 12 gauge shotgun shell produced by the Winchester Repeating Arms Company. The WRA Nublack shotshells were produced between 1905 and 1938. The gauge designation was changed from "No. 12" to "12 GA" in 1920 so this shotshell was made prior to 1920 (Figure 54) (Farrar 2011).

The Peters 250-3000 was made by the Peters Cartridge Company. It was introduced about 1932 and sold under the Peters name until the late 1960's (Figure 55) (Reload Bench 2011).

Figure 53. REM UMC No. 12 Nitro shotshell.

Figure 54. Winchester No. 12 Nublack shotshell.

Figure 55. Peters 250-3000 cartridge.

The Peters Cartridge Company also produced a .38 caliber cartridge called the Peters .38-40. Introduced in 1874, it is very similar to the .44-40 from which it was derived (Figure 56) (GunBroker 2011).
The WRA .30 WD and WRA .30 WCF cartridges were .30 caliber cartridges made by the Winchester Repeating Arms Company. The .30 WCF was first

Figure 56. Peters .38-40 cartridge.

marketed in early 1895. It is commonly known as the .30-30 Winchester and is one of the most common deer cartridges in the US. The company used the ".30 WCF" head stamp mark until about 1946 (Figure 57) (Wikipedia 2011i).

Figure 57. WRA .30 WD cartridge.

The WRA .38 S&W SPL was made by the Winchester Repeating Arms Company. The cartridge for the Smith & Wesson .38 Special was introduced in 1899. It became the standard service cartridge for police departments in the 1920's, and it was popular until the early 1990s (Figure 58) (Wikipedia 2011j).

Figure 58. WRA .38 S&W SPL cartridge.

The REM UMC .32 SPL was manufactured by the Remington Arms Company. This cartridge was produced from 1911 to 1960 (Figure 59) (Clocks Are Us 2011).

Figure 59. REM UMC .32 SPL cartridge.

The CCI rimfire cartridge is a .22 caliber cartridge made by Cascade Cartridge Inc. This ammunition, with its distinctive "C" head stamp, was first produced in 1963, and it is popular for hunting varmints (Figure 60) (Wikipedia 2011k).

Figure 60. CCI 22 caliber rimfire cartridge.

Conclusions

The variety and quality of the household artifacts associated with the Rio Grande border villages in the Big Bend is quite remarkable. The surprising sophistication of the dinnerware and the unexpected variety of personal items, among all of the other items we researched, gives us a greater appreciation of the way of life in these often-dismissed "Mexican" villages along the Rio Grande. This overview of the material culture of this population is only the beginning, a starting point. We are certain that further analysis and additional research will lead to even more remarkable insights into the lives of these Texans.

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A HISTORIC CACHE OF EDDY COUNTY, NM SLUICE GATES

S. Alan Skinner, PhD

Abstract

Five years ago, Enterprise Products Operating, LLC (Enterprise) proposed constructing a pipeline in Eddy County, New Mexico north of the community of Loving. The project route extended east/west across bottomland fields, a brush-covered whaleback ridge, and a caliche gravel deposit before reaching the west edge of the Pecos River floodplain.

During the survey, a previously unrecorded late nineteenth and mid-twentieth century site (LA 181185) was discovered immediately north of the proposed centerline on the surface of the whaleback ridge. The site consists of a collection of thirty four out of place irrigation ditch sluice gate mechanisms, which probably date to the late-1800s. The mechanisms include metal frames which were set in concrete. Water in an *acequia* was apparently controlled with manually operated sheet metal gates or wood plank gates. The other part of the site consists of historic artifact scatters that include broken and complete glass bottles, rusted food cans, bundles of bailing wire, and the body of a glass syringe. The syringe was made by Becton Dickinson & Co. sometime after 1925. Several of the amber glass bottles are apothecary bottles that have raised lettering that reads "100 MILS" and "125 MILS" on the body and shoulder respectively. Based on the bottle and syringe association, it is concluded that livestock, likely horses or cows, were inoculated at the site sometime in the mid-twentieth century. Based on a review of southeastern New Mexico history and with the concurrence of the Bureau of Land Management, AR Consultants, Inc. recommended that the site is not eligible for inclusion on the National Register of Historic Places.

Introduction

During the course of a pipeline survey in Eddy County, New Mexico, an unusual historic archaeological site was encountered and recorded as LA 181185 (Skinner et al. 2015). The site consists of an accumulation of irrigation sluice gate mechanisms and an extensive associated artifact scatter. Based on the lack of information potential, and since a large portion of the site is out of primary context, the site was not recommended for inclusion on the National Register of Historic Places (NRHP). The study was conducted by AR Consultants, Inc. for the Whitenton Group of San Marcos, Texas. The pipeline was being constructed for Enterprise Products Operating LLC and it crossed both Bureau of Land Management (BLM)-controlled property as well as private property.

As indicated in the title to this article, the sluice gates and gate parts are considered an artifact cache that was placed in this location with the thought that they would somehow be retrieved and reused. Archaeological caches such as those described by Lintz (Christopher Lintz, personal communication May 18, 2020) are usually found in locations where they are not obvious and usually have been buried under the present ground surface, but can be retrieved and then used. In many cases, cached chert artifacts had been partially shaped in anticipation that they would be further knapped and turned into useable tools. In the case of site LA 181185, the artifacts were set aside in a location close to arable land but in an elevated, rocky setting where they would not have served their designated purpose. The complete mechanisms were stored in a patterned arrangement that makes this a cache site. This is a situation where the cached artifacts were hidden in plain sight.

The site is located on a rocky whaleback ridge which is covered with Upton gravelly loam (Chugg et al. 1971) (Figure 1). The Upton soil is described as having a thin 12 cm thick layer of light brownish gray loam (A horizon) over pale brown gravelly loam (Bk horizon) that rests on pinkish white caliche at 33 cm. Soil in the nearby valleys is described as Reagan loam which has a 20 cm thick A horizon atop light brown clay loam. Reagan loam soils are deep, well drained, permeable calcareous soils that are found on broad flats and filled valleys. Native vegetation in the immediate vicinity of the site consists of desert shrubs and grasses (Figure 2). Creosote bush is the most common plant present. The field is used for livestock grazing but the vegetation is not rich or

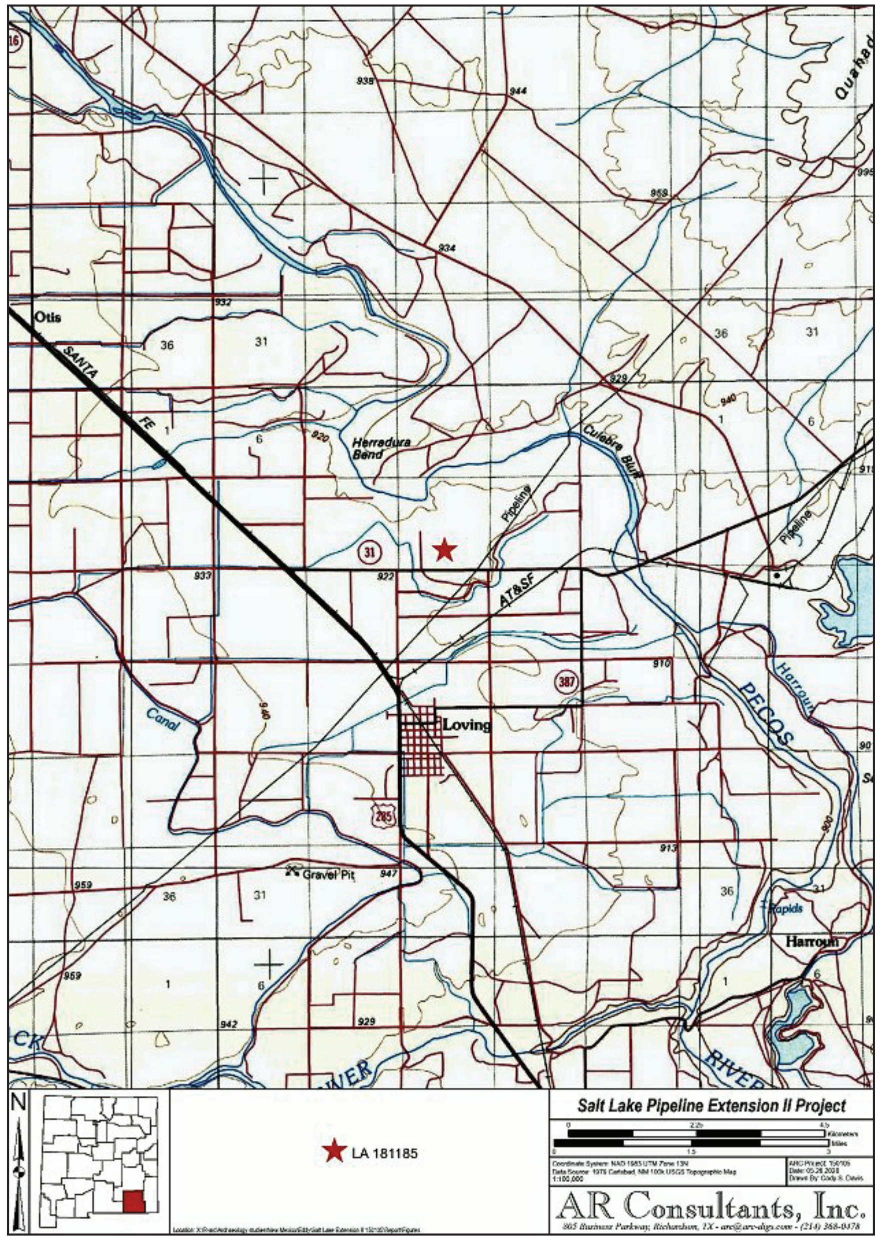

Figure 1. General site location shown on a section of the Carlsbad, NM 100k USGS map.

nutritious and livestock density is on the basis of one animal for a large number of acres.

New Mexico became part of the United States after the Mexican American War which was settled by the Treaty of Guadalupe-Hidalgo in 1848. Subsequent homesteading opened the Carlsbad area up to settlement by non-native ranchers and farmers. These settlers transported cattle to eastern markets by way of the Loving-Goodnight and Chisholm trails. These trails, combined with the advent of railroad access to the area and the Homestead Act of 1909, led to an increase in dry farming, irrigation farming, and vast livestock ranching. New Mexico became a state in 1912 but by the 1930s, homesteading and livestock herding had been decimated by persistent drought.

The site is located approximately 3.2 km (2 miles) north of Loving, NM. The setting is immediately north of an existing pipeline in an open brush-covered upland ridge that is 3.2 km (2 miles) west of the Pecos River channel. The pipeline corridor is the only significant surface disturbance noted in the area but downslope to the west the sloping ridge was terraced in the past in order to control rainfall runoff. Irrigated fields are located in valleys west and east of the ridge.

Figure 2. Vegetation in the site vicinity with farmland in the background and with a low berm from an earlier pipeline crossing in the foreground.

Feature and Artifact Description

The site consists of two parts which are designated Areas A and B (Figure 3). Area A includes a low pile of 11 rusty complete and partial metal box frames (Figure 4 and Figure 5), a scattered concentration of five metal box frames, a concrete slab encircled by concrete chunks, and a row of 18 almost complete sluice gate mechanisms consisting of metal frames, concrete foundations, and metal and wood sliding gates (Tim Nowak, personal communication 2015; Stephen Bogener personal communication 2015). The mechanisms were made by anchoring a horizontally-oriented metal box frame in a wet concrete tread that had pre-formed concrete cylinders or slabs at either end (Figure 6 and Figure 7). Sixteen of the sluice gate mechanisms consist of metal frames as described below.

The major part of the metal frame is a sheet of now rusty metal that measures 44-49” long and 20-24” wide. This surface is referred to as the “face.” In some cases the metal extends 1-2” beyond the edge of the face and was bent at a 90 degree angle. The frames are held together with metal rivets and thick metal straps. The rivets are spaced at less than 1” intervals. Sheets of metal were riveted to all the edges of the frame. The frame and the sides were reinforced with metal straps that were anchored to the ends of the face piece. A rectangular opening that averaged 11 to 14.5” wide by 38” long was created by a welding torch cutting out the major part of the face sheet. The opening in a frame is shown in the

Figure 4. The central part of the southern 11 box frame pile. Wood is shown bolted to the short-sided face of several frames, but apparently the concrete part of the sluice gate had been removed or fell off.

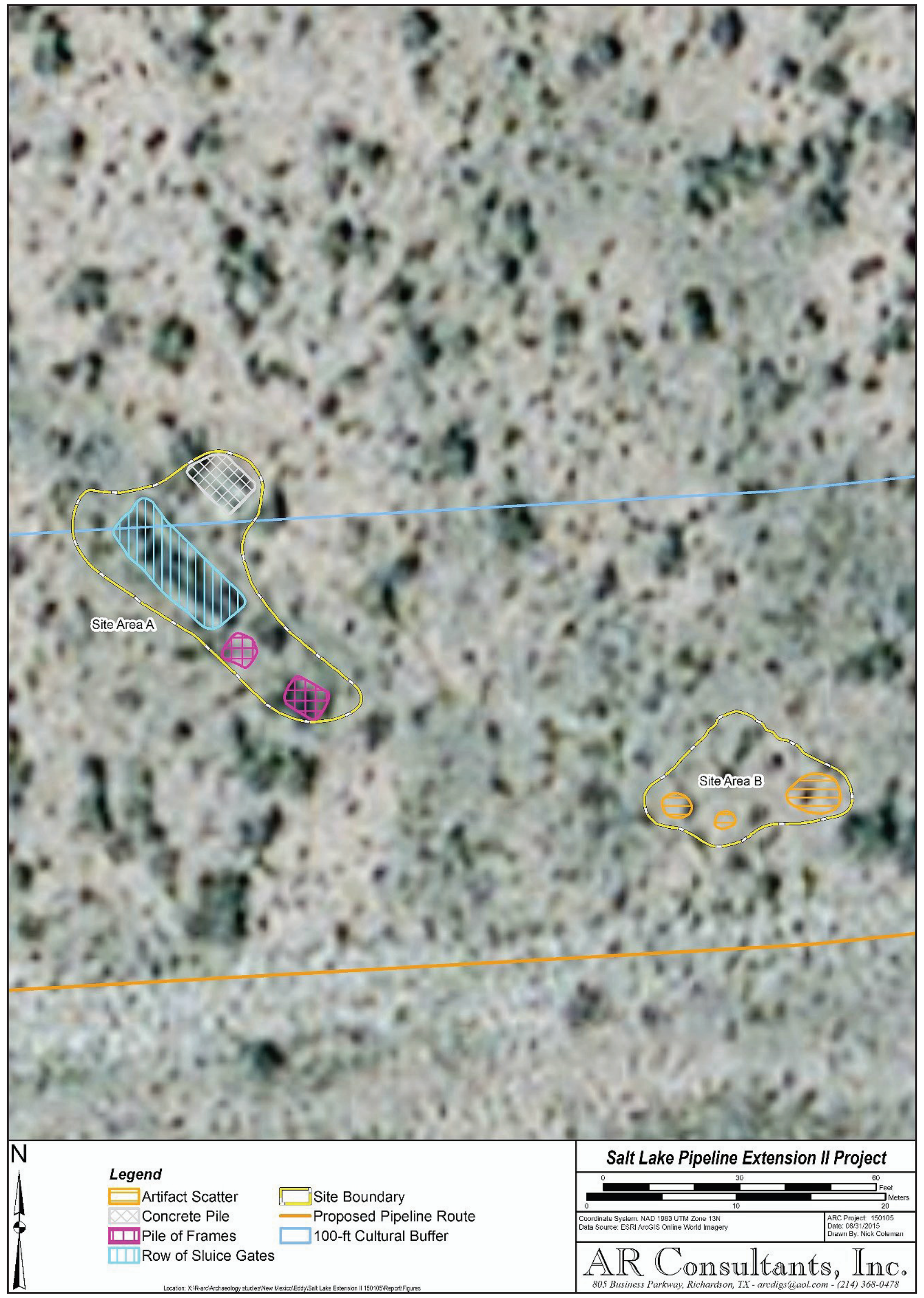

Figure 3. The location and extent of Areas A and B at site LA 181185 shown on a recent aerial photograph.

center of Figure 6. Wood slats were installed on the inside and outside of the short sides of the opening and are/were held in place with nutted bolts. These pieces of wood span the height of the opening and provided a track for the metal sluice gate leaf. The single remaining example of the metal leaf gate (Figure 8 and Figure 9) is a thin piece of steel that measures 14.5" by 37". Three nutted bolts are located 2" below the upper edge of the leaf and must have anchored a board that provided a crude wooden bar/handle for moving the gate leaf up and down.

Two of the sluice gates near the northern end of the row (Figure 10) were made in generally the same manner and to similar dimensions but the frame was made of a 1.5" wide piece of angle iron. The frame was reinforced inside and outside with precast con-

Figure 5. Looking northwest from the southern frame pile toward the south end of the row of sluice gates.

Figure 6. The row of individual sluice gates placed side by side looking northwest from the southeast end. Each metal frame represents a separate sluice gate.

Figure 7. The concrete cylinders in the left foreground anchored one end of a sluice gate and a similar cylinder was on the opposite end of the metal frame. The cylinders were connected to a concrete tread on top of which the frame was mounted. View is to the southeast.

crete blocks. The leaf gate was made of 3 pieces of 2" thick pine that were joined by two perpendicular slats that were nailed to the pine boards. The nails were wire and indicate a late 1800s or early 1900s construction date (Wells 1998:87). The wooden gates were held in place by two slotted 3" square boards that were bolted to the adjacent concrete block. Each board has a 2" wide groove that is ¾" deep and the partially threaded bolts are 8-8.5" long. Handles were not apparent on the faces or the top of the wooden sluice gates.

While exploring the spaces between each of the gates in this row which characterizes the cache nature of the features in Area A, a surly rattlesnake was encountered hidden in the shadow of one of the wooden gates (Figure 11).

The broad artifact scatter includes a roughly circular pile of caliche rock that covers an area of 118 m² (1,275 ft²). The purpose of the rock pile is unknown but it may represent one or more wagon loads of rock (Figure 12).

Figure 8. The metal knife gate in place with wooden slats at each end of the rectangular opening in the frame. The three bolts near the top of the gate must have held a piece of wood in place for use as a handle and probably to reinforce the gate.

Figure 10. The two angle iron frames are shown in the center of the picture. A rectangular concrete block is inside the left end of the closer frame and two wooden sluice gate leafs are adjacent to the frames.

Two artifact concentrations are present in the scatter. The westernmost artifact scatter is located between the tip of the rock pile (see Figure 12) and the existing pipeline (approximately 35 feet) and extends for a distance of 34 feet to the east (Figure 13 and Figure 14). The scatters contain broken and complete glass bottles, rusted metal food cans, bundles of thin wire, and broken bottle glass. Most of the glass is amber but occasional pieces of clear and green glass are also present. All the bottles are from two-piece molds and some have threaded openings while others have patent lip openings. In addition, a variety of mostly flattened rusted metal cans that were probably opened with a double wheel design can opener are present along with bundles of baling [bailing] wire, and the glass body of a single glass syringe (Figure 15). Two threaded neck drink (?) bottles are present; one is clear glass and it retains a metal cap, while the other is amber in color but has no cap. A complete bottle with a patent rim and raised "100 MILS" and "125 MILS" lettering is also present (Figure 16). Three heavily rusted cans are included in the scatter area as are more than a dozen pieces of amber glass.

The glass body of the syringe is 2.5" long and is labeled "1 1/2cc", "BD Yale", and "Becton Dickinson & Co." According to BD [Becton Dickinson] Milestones (2015), the BD Yale Luer-Lok Syringe

Figure 9. Nick Coleman pointing to a raised metal sluice gate at the northwest end of the row of sluice gate mechanisms.

Figure 11. Coiled rattlesnake discovered in the shadow of the wooden sluice gate that was moved and shown sunlight on the snake.

was patented in 1925. It is uncertain whether the syringe body at the site was manufactured sometime after 1897, when the Becton Dickinson (BD) Company was first established and began making syringes, or if it postdates the 1925 patent date for the Luer-Lok Syringe. The Luer-Lok Syringe was patented because of the new way the needle was attached to the glass body.

The easternmost artifact concentration measures roughly 15 feet east/west and 35 feet north/south and appears to be solely on the surface. Parts of at least six metal cans of various sizes are on the surface along with two pieces of green glass, several pieces of clear bottle glass, and at least 58 pieces of amber bottle glass. Some of the broken glass came from 5" tall amber glass bottles with a flat or a patent rim (Fike 1987: Figure 2.7) on top of the neck and with the following raised lettering: "100 MILS" on the upper part of the bottle wall and "125 MILS" on the shoulder of the bottle. These are apothecary bottles but the original contents are unknown. The apothecary bottles have the marking of the Obear-Nester Glass Company that used the capital N inside a square as their insignia between 1915 and 1978 (Society for Historic Archaeology 2015). The cans may have contained food; they do not appear to have contained petroleum products based on the can opener removal or partial removal of the lid. Other glass bottles noted at the site were manufactured by the Owens Illinois Glass Company between 1929 and 1960 and by the Hazel-Atlas Company between about 1923 and 1982 (Society for Historic Archaeology 2015).

On initial inspection, the baling wire appeared to simply constitute miscellaneous pieces of wire dumped in a haphazard manner. However, closer inspection revealed that they represented a piece of wire that had been joined by winding the ends together; this is referred to as "knotting or twisting" the ends. Discussions with Louis Birdwell of Enterprise Operating (Louis Birdwell, personal communication, September 2015) determined that these wire bundles represented wire bands that held rectangular hay bales together. Rather than discarding baling wire,

Figure 12. Rock pile located within the limits of Area A.

Figure 13. Overview of the western artifact scatter looking northeast. An apothecary bottle is in the left center of the picture.

Figure 14. The center of the western artifact scatter showing cans, glass bottle fragments, a bundle of baling wire, and the glass syringe body (circled) looking north.

the wire had been folded back on itself and made into a bundle of one wire or of multiple wires. Then the wire was discarded with the expectation that it would not be caught up in farming or pipelining equipment. Based on the bundles being associated with the existing pipeline, it is likely that the hay had been used to cover the loose backfilled trench fill and reduce erosion. Similar wire bundles were found as part of two IMs on the east slope of the same ridge within the BLM western tract and adjacent to the pipeline. Hay balers using wire came into use in the 1930s and became common after World War II ended. Consequently, ARC has concluded that the artifact scatter is more than fifty years old and probably post-dates the mid-1940s.

The two activity areas at site LA 181185 were definitely not contemporaneous. The sluice gates relate to late 1800s farm irrigation technology that was abandoned when the Carlsbad Irrigation District was initiated in the early 1900s. The artifact scatter is attributed to two different activities. The brown glass apothecary bottles contained medicine of some type and because they were associated with the glass syringe body, they are tentatively attributed to farm animal inoculation probably in the 1920s-1930s. In contrast the wire bundles, threaded neck bottles, and rusted metal food cans are attributed to pipeline installation sometime soon after 1945.

The Area A part of the site presents an undocumented accumulation of concrete and metal framed sluice gates at some distance from irrigated lands and in an apparent arrangement that may indicate that the structures might have been stockpiled for reuse or salvage. The sluice gate mechanisms must have been removed from an actively farmed area after it became apparent that they were not effective in controlling water flow or after a better form of water control feature was introduced to the market (Ackerly 1996:87, 124). For some unknown reason, the sluice gates were not discarded by being disposed of in a dump but were placed in a row which might indicate that the individuals who had built them or were using them were considering some form of reuse or possibly because they intended to further study their manufacture. Little relevant information about the history of sluice gate design and experimentation has been discovered (Sojka et al. 2002; Morgan 1993) but Stephen Bogener (2003) believes that this style of

Figure 15. Close-up of the glass syringe body.

sluice gate was used in the late 1800s. Similar structures were documented during Historic American Engineering evaluation of the Carlsbad Irrigation District (U.S. Department of the Interior 1991). In the late 1800s, local water systems were common in the Pecos River valley south of Carlsbad and a series of floods washed out dams that provided water to the ditches (Hufstetler and Johnson 1993; Hundertmark 1972) Flooding ultimately left thousands of acres of abandoned farmland and drove hundreds of farmers out of the valley (Ackerly 1996:89).

Figure 16. Apothecary bottles showing 100 MILS and 125 MILS raised lettering.

Summary

The discovery of a row of displaced, or cached, sluice gate mechanisms on a rock ridge north of Loving, New Mexico presents an unanswered questions about the significance of site LA 181185. The gate mechanisms are certainly not in their original contexts and are unlikely to have been reusable. However, the sluice gates were purposely arranged in a row so they could be easily accessed. Possibly at this same time, eleven of the mechanisms were disassembled and piled nearby. Thus the context of the gates was lost. If instead the gates had been in place in a farmed field, and the field had been flooded and the gates hidden under flood debris, the gates would probably have been buried in place and preserved. This would have been an occurrence similar to that which occurred at the Olsen-Chubbuck site near Kit Carson, Colorado (Wheat 1972) where a group of prehistoric bison were driven into a gully where they were butchered and subsequently the gully and the remaining skeletons and artifacts were silted in. Despite the disparity in age between the two sites, essentially 10,000 years, both sites would certainly have been deemed historically significant. Unfortunately, site LA 181185 is no longer in its primary context but its discovery serves to highlight the need to know more about this late nineteenth century technology and its presence in the Pecos River valley.

Acknowledgements

After the discovery of site LA 181185, numerous architects, environmentalists, and archaeologists who work in the Southwest and the Southern Plains were asked their opinions of the function of the concrete/metal frame/wooden structures found in Area A of the site. Most everyone was unsure of the function and could not remember ever seeing such

features. Most engineers agreed that they might be water control sluice gates but they weren't sure. Ultimately, Tim Noack with Alan Plummer Associates, Inc. in Fort Worth indicated that he had seen such sluice gates in West Texas. This was further confirmed by Stephen D. Bogener, PhD who worked with the Bureau of Reclamation on the Carlsbad Irrigation District before he wrote "Ditches Across the Desert" while he was at Texas Tech University. He is now at Texas A&M University at Canyon and maintains his interest in the Lower Pecos River Valley history. Everyone who reviewed the site pictures on-line is to be thanked for their time and interest.

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