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Matthew T. Boulanger
Southern Methodist University, mboulanger@smu.edu

G. Logan Miller
Illinois State University, user@host.com

Philip Fisher
Washington State University, user@host.com

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A collection of early Holocene flaked-stone crescents from the northern Great Basin

Matthew T. Boulanger [a,*], G. Logan Miller [b], Philip Fisher [c]

[a] *Department of Anthropology, Southern Methodist University, United States*
[b] *Department of Sociology and Anthropology, Illinois State University, United States*
[c] *Department of Anthropology, Washington State University, United States*

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ABSTRACT

Several flaked-stone crescents from the northern Great Basin were recently identified within the James M. Collins artifact collection held in the Archaeological Research Collections, Department of Anthropology, Southern Methodist University. These artifacts are morphologically and technologically consistent with other pre-Columbian crescents reported from the region. The two obsidian crescents in the collection exhibit compositions that are consistent with obsidian from the Whitehorse/Double H source, located immediately south of where the artifacts were reportedly obtained. Analysis of the crescents for use wear suggests that they were used in a manner consistent with transversely hafted projectiles. Data reported here add to a growing body of information relating to the morphology, use, and preferred raw materials of flaked-stone crescents in the region.

1. Introduction

Flaked stone crescents are a particularly curious class of artifact, and there remains some debate as to what behaviors these tools were designed and created for (Amick, 1999; Beck and Jones, 2009; Smith and Baker: 15–16, 2017). In general, crescents are thought to date to the terminal Pleistocene and early Holocene (ca. 12,000–8000 YBP); and, at least in the northern Great Basin, there seems to be an association of crescent findspots with relict wetlands and post-glacial lakes dating to this time period (Beck and Jones, 2009; Sanchez et al., 2017; Smith and Baker, 2017; Smith et al., 2014). The association of crescents with wetlands and lakes seems to support their usage as transversely hafted projectile points for the taking of waterfowl (Moss and Erlandson, 2013), though it does not necessarily rule out their use for other purposes. As Beck and Jones (2009: 109) note, breakage and use-wear data from a large sample of crescents from the Sunshine Locality are consistent both with use of crescents as transversely hafted projectiles and with use of these tools as cutting implements.

Uncertainty over exactly what flaked-stone crescents represent stems from the facts that few of these artifacts have been recovered in controlled archaeological work, and those that have been recovered tend to have come from surface surveys. As Smith and colleagues (2014: 260) note, more than 1000 flaked-stone crescents are known from the archaeological literature; however, few of these have been adequately analyzed and described, and many more likely exist in artifact collections of private individuals and museums (Jew et al., 2015). Here, we report on a small collection of flaked-stone crescents recently encountered in the James M. Collins artifact collection. We provide technological and geochemical descriptions of these specimens, and report on the presence of microwear on some of the specimens that provides some indication of how these pieces were used.

2. Background of the collection

The James M. Collins Collection was donated to the Department of Anthropology at Southern Methodist University (SMU) in 1991 by Collins' widow. Collins was a U.S. Representative from 1968 until 1983 and amassed his artifact collection primarily by opportunistically trading for, or purchasing, materials from other collectors, dealers, and antique stores both in the United States and during various diplomatic trips around the world. A thorough inventory of the collection is not yet complete (Graves and Boulanger, 2017), but it appears that most of the materials in the collection come from North America and were acquired either directly from artifact collectors or through intermediaries (i.e., artifact dealers).

Contained within the Collins Collection is a small (8.75″ x 6″) frame

* Corresponding author.
E-mail address: mboulanger@mail.smu.edu (M.T. Boulanger).

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containing a total of 17 flaked-stone objects labeled as being crescents and crescent fragments from the northern Great Basin (Table 1). On the back side of this frame Collins had written that they were acquired from an individual in Idaho named "Coon" in 1988, and that they are "crescents [from] Coyote Lake, Nevada," that "Coyote Lake extends into south Oregon," and that "these pieces [were] found in Nevada." Below these notes is a depiction of what appears to be the Oregon-Nevada-Idaho border area, though not to scale.

At the time of this writing, these handwritten notes are the only contextual information available for these 17 specimens. With such a general description, the fact that these artifacts appear to have been acquired through a third party, and the presence of numerous other clearly modern "fakes" in the Collins Collection (including several "Grey Ghosts" [see Whittaker, 2004: 50–55]), we believe it would not be prudent to assume outright that these specimens are genuine Native American artifacts. We present here the results of several methods of analysis of these specimens to suggest that although the exact site-level provenance of these pieces is equivocal (and is perhaps unknowable), the crescents in the Collins Collection appear to be Native American artifacts attributable to the general Alvord Basin area of southeastern Oregon and northern Nevada.

3. Provenience

As noted above, Collins recorded these artifacts as having come from "Coyote Lake" in Nevada, a lake that he noted "extends into south Oregon." Collins acquired these pieces from an intermediary seller (Coon), thus it stands to reason that this provenience information is likely third-hand at best. As it is written the asserted provenience poses a problem: While there is a modern reservoir named Coyote Lake located in Elko County, Nevada (41.5902 Lat., −115.4482 Long.), it is directly south of the Idaho border and roughly 140 km (87 miles) straight-line distance to the Oregon border. Coyote Lake Reservoir (Nevada) was created by damming Coyote Creek, which drains southwestward into the Bruneau River. The Bruneau River flows northward into Idaho, and we cannot envision any way in which this "Coyote Lake" could be described as "extend[ing] into south Oregon." Thus, something is amiss with the provenience as written by Collins.

We propose that the information relating to the general location of "Coyote Lake" became corrupted through accumulated errors at some point during its conveyance from the original collector to Coon, and/or from Coon to Collins. Regardless of where it is described as being located or the direction in which it is described as draining, the toponym "Coyote Lake" is highly specific and seems unlikely to have been corrupted through the transmission of information. Importantly, there is a Coyote Lake located in southeastern Oregon, and this lake is within a drainage basin that extends into northern Nevada (Fig. 1). Coyote Lake (Oregon) is a small modern-day playa in Malheur County. During the late Pleistocene and early Holocene, this playa was a large proglacial lake (Lake Coyote) that was, at times, connected with the larger Lake Alvord within the modern-day Alvord Basin. The Alvord Basin extends roughly 116 km (72 miles) northeastward from northern Nevada, and was just one of the numerous proglacial lakes that characterized the Great Basin during the Pleistocene–Holocene transition. Associating Collins' "Coyote Lake" with the modern-day playa of the same name in Malheur County would therefore accommodate both the toponym and the statement that the lakebed straddles the Nevada–Oregon border, particularly if we consider that this information was transmitted to, and recorded by, a Texas collector with limited knowledge of the local geography.

Associating the crescents in the Collins Collection with Coyote Lake, Oregon also accommodates known archaeological findings in the northern Great Basin. Butler (1970) reported a large surface collection of flaked-stone crescents and other artifacts from Coyote Flat—the relict lakebed of proglacial Lake Coyote. Surface collections of crescents have also been recorded from the margins of nearby proglacial lakes Alvord and Lahontan (Jew et al., 2015; Moss and Erlandson, 2013; Pettigrew, 1984; Sanchez et al., 2017). We note that Sanchez et al. (2017) in an in-depth review of crescents from the California coast and the Great Basin do not report any such finds from near the Coyote Lake Reservoir in Nevada; however, they, as well as Jew and colleagues (2015), report sizable collections of these artifacts from the immediate area around Coyote Lake, Oregon.

We concede that the scenario laid out above is hypothetical, and that it is always difficult to rectify erroneous or confused information about the provenance of an artifact collection 40 years after it was recorded. Notwithstanding the notes made by Collins about being from Nevada, we believe that the scenario outlined above fits the available evidence and agrees best with the available archaeological information from other sites in the region. Until additional evidence regarding the provenience of these specimens comes to light, we propose treating them as if they derive from a surface collection made at or near modern-day Coyote Lake, Oregon.

4. Analytical methods

Each of the crescents and crescent-fragments was measured, weighed, and assigned unique catalog numbers. The material on which each crescent was made was generally described based on macroscopic and low-power microscopy observations. When possible, we assigned each specimen to the morphological forms distinguished by Tadlock (1966) and by Butler (1970). All specimens were examined under low-

Table 1
Catalog of crescents and crescent fragments from the northern Great Basin. Measurements in millimeters.

Catalog ID	Raw Material	Raw Material Description	Morphology 1	Morphology 2	Form*	Length	Blade Width	Thickness	3D Scan
92-1.144.01	Obsidian	Whitehorse	Biface	Crescent; Broken	1/C	28.1	19.1	7	Y
92-1.144.02	Obsidian	Whitehorse	Biface	Crescent	1/C	38.7	18.1	8.2	
92-1.144.03	Chert	Orange/red mottled	Biface	Crescent	1/B	64.2	30.5	5.7	Y
92-1.144.04	Quartzite	Red (burned?)	Biface	Crescent	1/C	48.4	19.1	7.1	Y
92-1.144.05	CCS	White/orange (translucent)	Biface	Crescent	1/A	48.8	21.1	7.6	Y
92-1.144.06	Chert	White/orange	Biface	Crescent; Broken	1/C	54.3	18.2	6.7	Y
92-1.144.07	Chert	White	Biface	Crescent; Fragment	1/C	18.2	10.1	4.3	
92-1.144.08	Chert	Reddish gray	Biface	Crescent	3/B	48.6	24.2	6.1	Y
92-1.144.09	Chert	Grey (semi-translucent)	Biface	Crescent	1/C	47.4	22.2	5.8	Y
92-1.144.10	Jasper	Brown	Biface	Crescent	3/E	39.7	20.5	4.7	Y
92-1.144.11	Chert	Multicolor red, orange, blue	Uniface	Crescent	2/D	37.7	23.9	5.5	Y
92-1.144.12	CCS	Orange (translucent)	Biface	Crescent; Broken	1/C	20.9	13.2	5	Y
92-1.144.13	Chert	White (translucent)	Biface	Crescent; Broken	1/C	39.9	18.4	5.9	Y
92-1.144.14	Chert	Grey/brown mottled	Uniface	Flake tool		31.5	13	4.1	Y
92-1.144.15	Chert	Red/Orange mottled	Biface	Knife; Resharpened		38.5	13.8	4.8	
92-1.144.16	Chert	White (opaque)	Uniface	Crescent; Broken	1/C	29.3	12.6	2.9	
92-1.144.17	Chert	White mottled	Biface	Crescent; Broken	1/C	37.8	15.2	8.4	Y

* Numerical value after Tadlock (1966:663). Letter value after Butler (1970: 38-39).

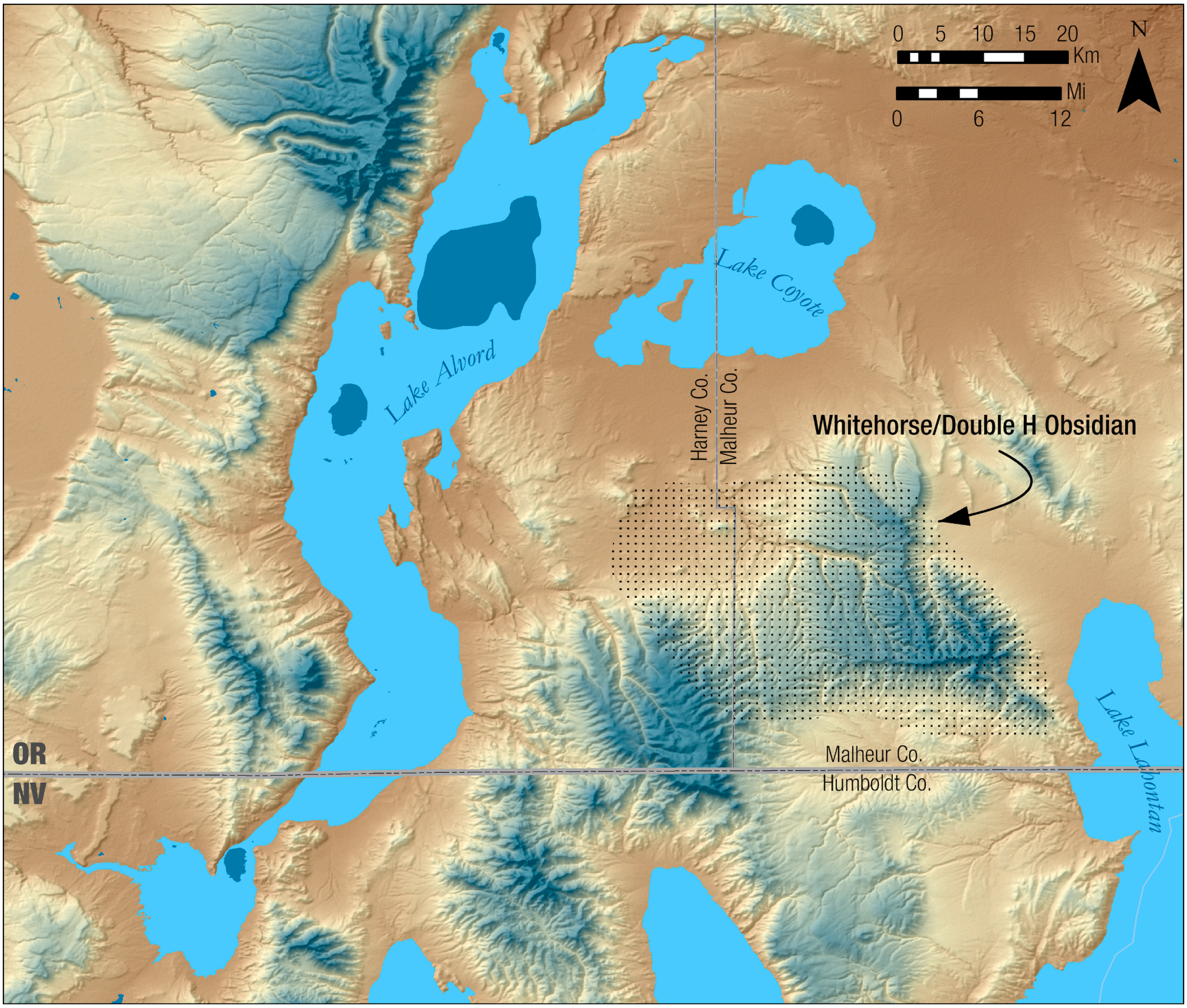

Fig. 1. Digital elevation model of southeastern Oregon and northern Nevada showing the maximum extents of postglacial lakes in the basin-and-range topography of the northern Great Basin (U.S. Geological Survey, 1999). Current playas are shown in dark blue. The nearest source area for Whitehorse/Double H obsidian is shown in the stipppled area (after Skinner). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

power (10×–30×) magnification for evidence of edge grinding.

We utilized lithic use-wear analysis to infer the functions of 15 of the 17 stone crescents/crescent-fragments. The two obsidian crescents in the collection were not examined for use wear, as we have an insufficient number of experimental comparative specimens made on obsidian to feel confident in interpreting use wear on archaeological obsidian specimens at this time. Following current standards, analysis utilized the complimentary techniques of both low- and high-magnification microscopy (Van Gijn, 2014). Low-magnification analysis, utilizing a stereomicroscope with magnification up to 60x, is useful for identifying patterns in edge damage and potential micropolishes to examine at higher magnifications (Odell, 1979; Van Gijn, 2014). High-magnification analysis, utilizing an Olympus BX51M metallurgical microscope, is useful for identifying polishes, striations, and edge wear associated with contact with different classes of materials in different motions (Keeley, 1980). Patterns of use-wear observed under magnification are interpreted through reference to specimens in an experimental collection (see Miller, 2014, 2015; Miller and Redmond, 2016) as well as from published descriptions (e.g., Keeley, 1980; Van Gijn, 1990).

The chemical compositions of the two obsidian crescents (92-1.144.1 and 92-1.144.2) were assayed using a Bruker III-V X-ray fluorescence spectrometer. The Tracer III-V uses a Rh-based tube set to operate at 40 kV and 25 μa, and a thermoelectrically cooled silicon detector. Quantification of elemental abundances was performed through the use of a calibration constructed from 40 well-characterized obsidian specimens available through the Archaeometry Laboratory at the University of Missouri Research Reactor. Consensus values for these specimens are given in Glascock and Ferguson (2012), and the suitability of these pieces for quantifying the geochemistry of obsidian is discussed by Speakman (2012). This protocol allowed for the quantification of the following major, minor, and trace elements: K, Ti, Mn, Fe, Zn, Ga, Th, Rb, Sr, Y, and Zr. Specimens from the Little Glass Buttes (aka Glass Buttes var. 3) source in Lake County, Oregon were used as check standards during the assay, and three assays of NIST 610 were made to evaluate the accuracy of our calibration (Table 2).

Thirteen of the 17 stone crescent/crescent fragments were scanned using a three-dimensional (3D) scanner to create high resolution digital models of each specimen (Table 1). Each specimen was scanned using a NextEngine™ Ultra HD portable multi-laser scanner. The accuracy of these scanned objects is 0.001 cm with a point density of 100,000 points per cm^2.

The NextEngine scanner creates 3D models of the crescents by scanning each specimen at 45° intervals and creating a scan family of eight digitized point clouds and images. The scan family is then digitally

Table 2
Elemental compositions of two obsidian crescents from Coyote Lake, Double H/Whitehorse (Malheur, OR) obsidian source, Little Glass Buttes 3 (check standard), and NIST 610. All values in ppm unless otherwise noted, values listed as "bdl" are below the detection limits of the calibration.

	K%	Ti%	Mn%	Fe%	Zn	Ga	Th	Rb	Sr	Y	Zr	Nb
92-1.144.001[1]	3.782	0.098	0.049	2.038	140	21	16	167	3	70	436	23
92-1.144.002[1]	3.401	0.097	0.054	2.287	172	21	17	178	2	74	440	25
Whitehorse (n = 5)[2]	3.623 ± 0.042	0.093 ± 0.007	0.063 ± 0.003	2.286 ± 0.053	177 ± 15	21 ± 2	17 ± 3	181 ± 4	3 ± 1	69 ± 3	434 ± 5	24 ± 2
Whitehorse (n = 5)[3]	4.108 ± 0.2		0.06 ± 0.004	2.188 ± 0.027	146 ± 2		17.3 ± 0.2	182 ± 2			445 ± 7	
Little Glass Buttes 3 (n = 7) [1]	3.453 ± 0.156	0.09 ± 0.02	0.037 ± 0.008	0.654 ± 0.051	40 ± 14	15 ± 2	9 ± 1	97 ± 6	62 ± 3	22 ± 4	95 ± 7	8 ± 1
Little Glass Buttes 3 (n = 22)[2]	3.597 ± 0.069	0.072 ± 0.009	0.035 ± 0.007	0.677 ± 0.053	37 ± 13	16 ± 3	9 ± 2	98 ± 4	65 ± 4	22 ± 2	96 ± 3	6 ± 1
Little Glass Buttes 3 (n = 16)[3]	3.581 ± 0.129		0.033 ± 0.001	0.624 ± 0.012	32 ± 8		8.5 ± 0.2	95 ± 1	72 ± 13		121 ± 6	
NIST 610 (n = 3) [1]	bdl	0.073 ± 0.009	0.064 ± 0.011	bdl	477 ± 16	433 ± 5	459 ± 7	438 ± 3	516 ± 10	424 ± 2	440 ± 5	463 ± 10
NIST 610[4]	0.046 ± 0.002	0.045 ± 0.001	0.044 ± 0.001	0.046 ± 0.001	460 ± 18	433 ± 13	457 ± 1	426 ± 1	516 ± 1	462 ± 11	448 ± 9	465 ± 34

[1] X-ray fluorescence at SMU.
[2] X-ray fluorescence at MURR, unpublished data.
[3] Neutron activation at MURR, unpublished data.
[4] GeoRem recommended values (Jochum et al., 2011).

clipped to remove noise and minor flaws such as reflections due to raw material type. The scan family was then edited and fused into a single watertight 3D object that removes overlapping and redundant data using the ScanStudio 2.0.2 software. The RapidWorks software version 4.1.0 was then used to save the object as a 3D file. The full methodology for scanning and creating 3D models of lithic tools can be found in Fisher (2018). Complete 3D models are available online for all researchers to encourage access to and use of this collection for future research and the dissemination of data amongst researchers.

5. Results

As noted above, a total of 17 specimens are present in the collection (Fig. 2). Of these, seven appear to be more or less intact and unbroken, nine show fractures that have not been reworked, and one specimen is a transversely fractured crescent tip. Fourteen of the specimens are made on either chert (n = 11), cryptocrystalline silicate ([CCS] n = 2), or jasper (n = 1); the distinctions between these materials being based largely on transparency, coloration, and presence of inclusions. Two specimens are made on obsidian, and one is made on a fine-grained quartzite.

The majority (n = 14) of the specimens were produced and shaped through bifacial flaking. The remaining three are worked only on one side (i.e., unifacial). Two specimens in the collection appear to be incorrectly identified as crescentic objects. Specimen 92-1.144.14 is a unifacially worked flake that, despite having a somewhat ovoid shape, does not exhibit clear evidence of intentional shaping to produce a tool. This piece may be better classified as an expedient unifacial flake tool. Specimen 91-2.144.15 also does not appear to be an intentionally shaped crescent tool, again, despite having a roughly crescent-like outline. This bifacially flaked piece shows evidence of retouch and grinding across most of its circumference. One half of this tool shows relatively parallel and well-flaked margins that converge to a prominent tip. This piece appears to be a small knife-like tool that has been heavily reworked.

Of the remaining 15 artifacts, 12 are representative of Tadlock's Type I (Quarter-Moon) form, one is representative of his Type II (Half Moon), and two are of his Type III (Butterfly) forms (Table 1). None of these specimens exhibits the complex curvature, asymmetry, notching, and serration observed among crescents found in California (Mohr and Fenenga, 2010: 104). Only one specimen (92-1.144.07), a fragmentary wing, exhibits a lateral projection (sensu Jew et al., 2015) or serration near its tip. Although this projection is small, it is clearly intentionally shaped by pressure flaking. Three of the crescents are shaped on thin tabular pieces of chert through steep-angle flaking along their margins, with few (if any) flakes approaching the midline. Specimens 92-1.144.03 and 92-1.144.16 exhibit original geological bedding plains (and in the case of 92-1.144.03, a weathered calcareous rind). Specimen 92-1.144.11 appears to have been made by steep-angle flaking on a large flake. The remaining pieces show well-controlled flaking and are generally thin and lenticular in cross section.

Grinding (as evidenced by dulling, rounding, and step- and hinge-fracturing) was noted on several of the specimens. When present, grinding is generally restricted to the inner (concave) and outer (convex) margins of the medial portions of the crescents. One specimen (92-1.144.11) shows evidence grinding along the lateral edges. Two specimens (92-1.144.16 and 92-1.144.17) show no evidence of grinding along their margins. Grinding and dulling of the edges does not appear to be solely associated with platform preparation during production of these specimens, as it is present on both unifacial and bifacial specimens with and without subsequent flaking.

Six of the crescents exhibit transverse bending or burination fractures along their wings. One specimen (92-1.144.08) has what appear to be impact fractures at the tips of both wings, resulting in several step- and hinge fractures on both faces of the crescent. The obsidian crescents show significant fracturing and shattering, resulting in the removal of large portions of their original shapes. Obsidian crescent 92-1.144.02 has a major fracture around an internal phenocryst on its convex (outer) margin. This fracture appears to have removed most of the original convex edge of the specimen. The other obsidian specimen is transversely fractured; and, based on the inverse bulb of percussion and the direction/radius of ripples within the fracture scar, this fracture originated perpendicular to the obverse face of the crescent.

5.1. Microscopic use wear

Evidence of utilization is present on 11 of the 15 artifacts examined. No evidence of utilization was observed on either specimen 92-1.144.14 or 192-1.144.15. As noted above, morphological and technological attributes of these two pieces suggests that they are not crescent tools. Artifact 92-1.144.16 exhibits a bright spot of surface abrasion likely caused by stone-on-stone contact. No wear traces were observed on 92-

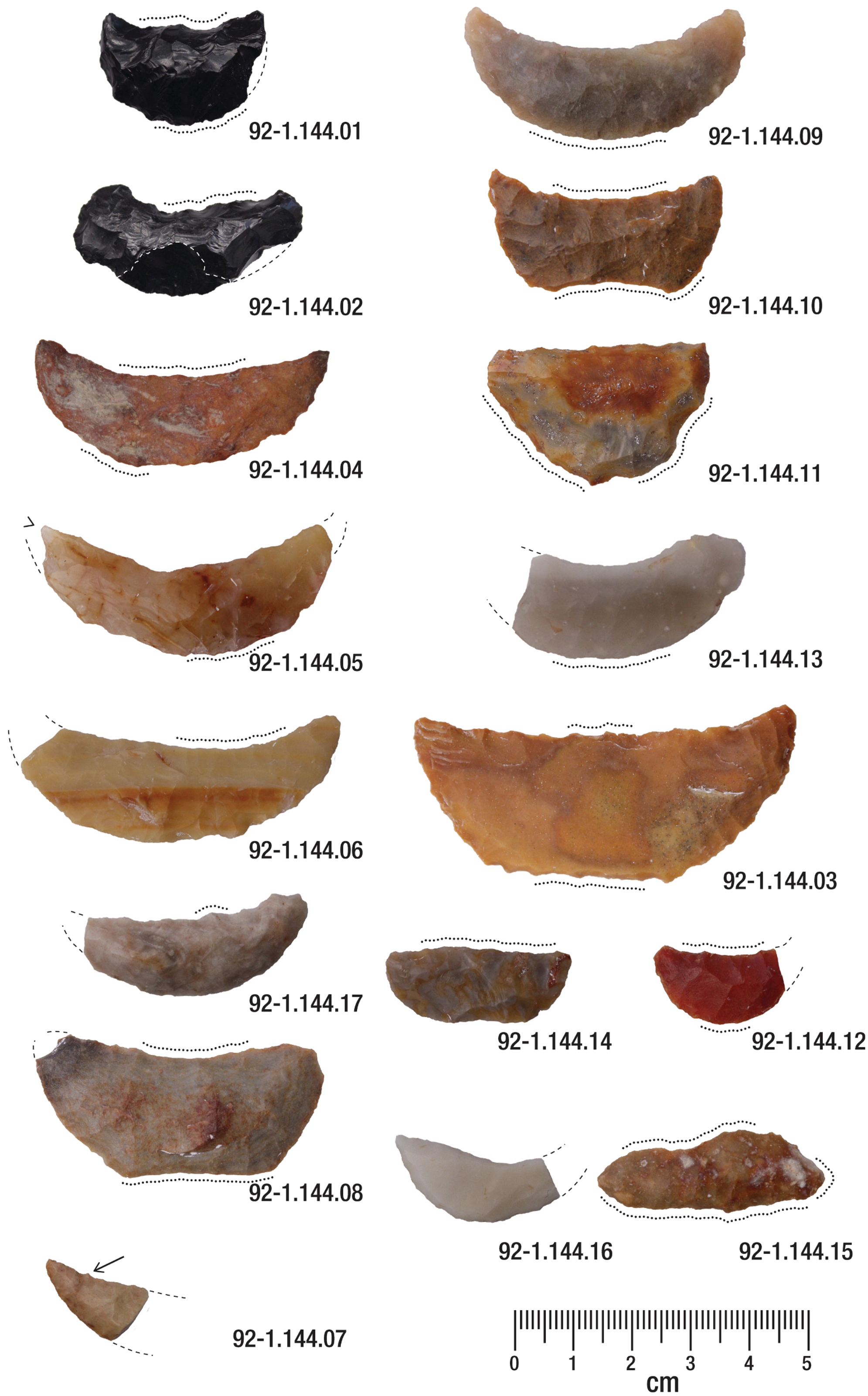

Fig. 2. Crescents and crescent fragments from Coyote Lake, in the James Collins Collection. Dotted lines indicate the extent of grinding.

1.144.04, but we note that this specimen is made on what appears to be a very-fine-grained quartzite that shows evidence of possible fire/heating damage. Such damage would potentially obscure microwear traces on this relatively coarser-grained lithic material.

Of the remaining 11 crescents and crescent fragments on which wear traces were observed, there is remarkable homogeneity in the wear patterns—especially considering that these they represent different morphological forms (i.e., Butler, 1970; Tadlock, 1966) and manufacturing trajectories (flakes vs. bifacial preforms). There are two general use-wear types—hafting and ridge rounding—correlating with two different regions of each utilized crescent (Figs. 3–5). Hafting wear was identified by the presence of bright spots from repetitive micro-abrasion, a phenomenon identical to that observed through controlled experimentation by Rots (2010). “Hafting bright spots are formed by flint (or haft material)

particles which detach from the stone tool within the hafting arrangement and subsequently cause intense localized friction with the stone tool” as abrasive forces wear down and flatten the micro-topography to form bright spots of polish (Rots, 2010:85). In other words, the flatness of the polished surface makes these areas appear quite bright because they directly reflect the light to the metallurgical microscope. The 11 remaining crescents all exhibited bright spots within the middle third of their body, indicating the presence of a hafting element across the center of each piece (Figs. 3A, 4A, 5A). In short, the location of hafting wear on these 11 crescents suggests that they were likely hafted transversely.

The second wear type observed on the remaining 11 crescents occurs on flake ridges on the wings of each crescent. These flake ridges exhibit rounding and a light, matte polish (Figs. 3B, 4B, 5B). Similar wear patterns are experimentally associated with artifact transport. For example, Wolski and Kalita (2015:303) note that “micropolish, rounding, and smoothing…on arrowheads…should be considered very unusual, especially on the…ridges.” They replicated this wear pattern, which they first observed on Late Neolithic and Early Bronze Age arrowheads from Poland, by placing eight hafted arrows in a leather quiver and walking with these for 60 h. Ridge rounding has been noted

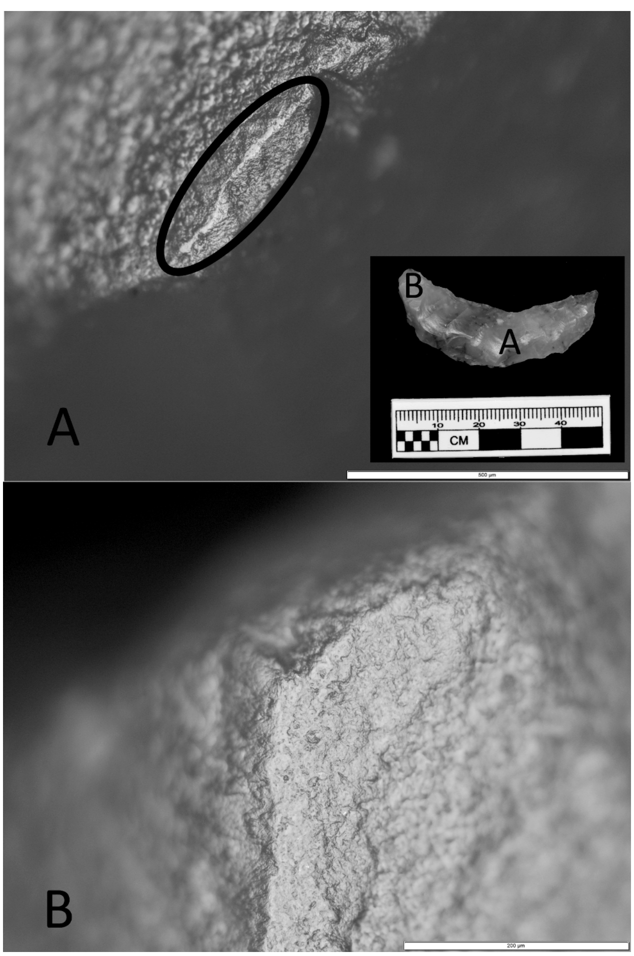

Fig. 3. Use-wear on 92-1.144.0005. A) Hafting bright spot (circled) on the body of the tool as indicated by A in the inset photo. Magnification is 100x. B) Ridge rounding and polish on the wing as indicated by B in the inset photo. Magnification is 200x.

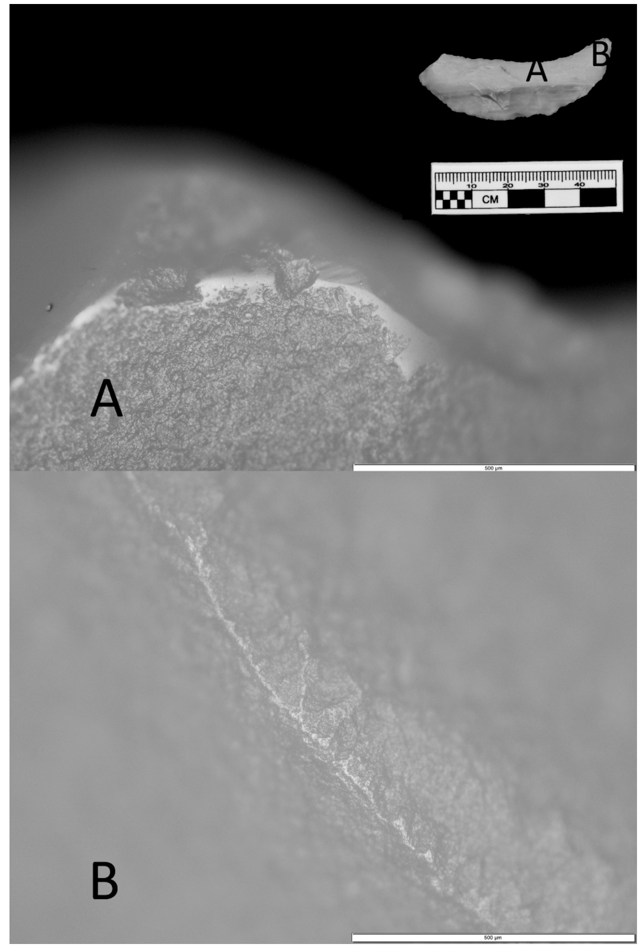

Fig. 4. Use-wear on artifact 92-1.144.0006. A) Hafting bright spot on the edge of the body of the crescent as indicated by A in the inset photo. Magnification is 100x. B) Light polish and rounding along a ridge on the wing of the crescent as indicated by B in the inset photo. Magnification is 100x.

in transport experiments by Mazzucco and Clemente (2013) as well. In each of these cases, contact with the container and/or other artifacts resulted in wear to the high points and flake ridges.

It is worth highlighting that none of the crescents in this assemblage exhibit evidence for utilization in cutting or scraping any type of material. Thus, there is no evidence that these were surgical tools, butchering tools, scrapers, or plant harvesting implements as others have suggested (see Sanchez et al., 2017:110). None of the crescents display microscopic linear impact traces (Rots and Plisson, 2014; Van Gijn:45, 1990) or other direct microscopic evidence of projectile use. Microscopic linear impact traces form when small flakes, detached upon impact with and penetration into a target, are pulled across the surface of the tool leaving bright streaks of stone polish.

5.2. X-ray fluorescence

Compositions of the two obsidian crescents are presented in Table 2. Alongside these data, we provide elemental abundances for a check-standard (Little Glass Buttes 3) and for an internationally available standard reference material (SRM 610 glass). Our elemental data suggest that both obsidian crescents exhibit chemical compositions consistent with the Whitehorse/Double H obsidian source located in Humboldt County, Nevada and Malheur County, Oregon (Fig 1). Although we do not, at present, have a representative sample of obsidian from this source group, we note that our data show agreement with previous analyses of this source conducted by XRF and NAA at the

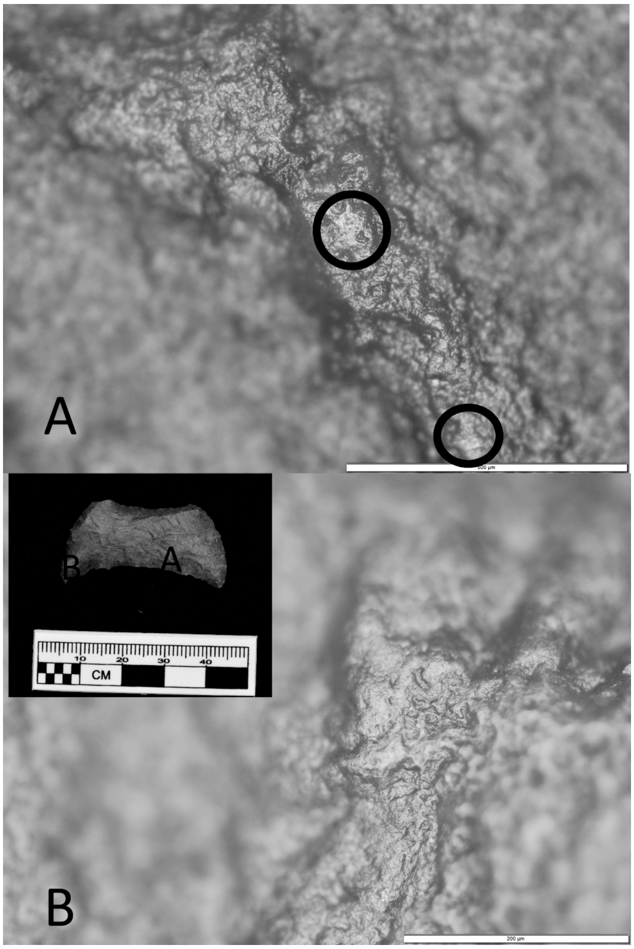

Fig. 5. Use-wear on artifact 92-1.144.0010. A) Hafting bright spots (circled) on the body of the crescent as indicated by A in the inset photo. Magnification is 100x. B) Rounding and polish on the wing of the crescent as indicated by B in the inset photo. Magnification is 200x.

University of Missouri Archaeometry Laboratory (M. Glascock, personal communication, 2018).

6. Discussion

Results of our analyses of the 17 flaked-stone pieces in the Collins Collection suggest that these specimens share similar characteristics and attributes with other crescent artifacts found in the northern Great Basin. We feel that the significant similarities that support not only the authenticity of these pieces, but also their asserted provenience of the northern Great Basin include raw material preferences, physical attributes for hafting, and overall morphological similarity to other crescents reported from this region.

Several researchers have noted an apparent preference for chert or other durable CCS material by the makers of crescents. As noted above, 13 of the 15 crescents reported here are made on chert or CCS. Only two are made on obsidian. The prevalence of cryptocrystalline raw materials in these specimens is similar to that which is reported in other collections from the region. Butler's (1970) report on crescents from Coyote Flat indicates that 87% (n = 73) are made on chert, whereas 8% (n = 7) were made on obsidian. Of the 43 northern Great Basin crescents discussed by Jew and colleagues (2015), 81% (n = 35) are made on chert or CCS and 16% (n = 7) are made on locally obtained obsidian. Farther afield, Beck and Jones (1997) note that 96% (n = 152) of the crescents they examined in the collections of the Nevada State Museum were made on chert, and only six were made on obsidian.

Our geochemical data suggest that the two obsidian crescents are made on volcanic glass derived from the Whitehorse/Double H geochemical source group. If the specimens were, as we contend, obtained from the Coyote Lake, Oregon region, this particular obsidian is available immediately to the south, and is the closest known obsidian source to the lakebed. We therefore view the source assignments as circumstantial evidence in support of our conclusion that the pieces were collected at or near the Lake Coyote playa (i.e., Coyote Flat) in Oregon.

Future analysis of the chert and CCS crescents could help to lend credence to this hypothesis of provenience, but geochemical lithic-sourcing studies involving chert and CCS in the Great Basin remain somewhat in their infancy (e.g., Jones et al., 2003). Nonetheless, when obsidian crescents have been recovered from controlled contexts, they tend to be derived from locally available sources. Jew and colleagues (2015: 136), for example, report the results of sourcing seven obsidian crescents from southeastern Oregon and northwestern Nevada, and their data indicate a preference for obsidian sources within approximately 50 km of sites.

Edge grinding, when observed, is isolated along the convex and concave faces of the crescents. No evidence of cutting and scraping wear was observed on any of the specimens. One crescent (92-1.144.08) exhibits impact fractures on both tips/wings, and all of the fractured crescents exhibit transverse bending and burination fractures towards the tips/wings. These fracture patterns have also been noted in other assemblages of crescents across the Great Basin (Amick, 1999; Beck and Jones, 1997). Lenzi's (2015) experimental research found that bending and burination fractures along the tips/wings of crescents occurred both when these tools were used as knives (handheld and longitudinally hafted) and as transversely hafted projectiles with tips facing outward. Our usewear analysis, however, fails to identify any clear evidence for use of these tools for scraping or cutting along the edges of the points.

These observations point to the use of the Coyote Lake flaked-stone crescents as transversely hafted projectiles (Moss and Erlandson, 2013; Sanchez et al., 2017; Tadlock:672, 1966). Indeed, if Clewlow's (1968) assertion that crescents were used as stunning points meant to knock birds down and inflict blunt-force trauma as opposed to penetrating tissue (see also Moss and Erlandson, 2013), then the lack of evidence for microscopic linear impact traces is expected.

7. Conclusion

The 17 flaked-stone pieces in the Collins Collection represent 15 crescents and crescent fragments, as well as one unifacial blade and one bifacial cutting implement. All of the pieces appear consistent with genuine pre-Columbian Native American artifacts as opposed to modern creations. Grinding and edge wear visible under low-power microscopy, as well as microwear analysis reveals that 73% (n = 11) exhibit evidence for transverse hafting. The presence of impact fracturing on some of the specimens is also consistent with their use as hafted projectiles. Rounding of flake-scar ridges observed on these specimens is visually consistent with what has been documented on other transported projectiles, indicating that the central portion of the crescents were protected from transport abrasion, while the outer thirds of them were not. The two obsidian crescents in the collection both derive from the Double H/Whitehorse source, available from geological contexts directly south of Coyote Lake, Oregon.

The data presented here suggest the crescents in the Collins Collection were most likely used as hafted projectiles, consistent with observations of other crescents from the northern Great Basin. Similarly, the association of these crescents with a terminal Pleistocene/early Holocene lakebed is consistent with other finds in the region, adding additional data points to this association between a specific terminal Pleistocene/early Holocene landforms and this tool type.

Our analysis of the crescents in the Collins collection provides details important to the overall understanding of the acquisition, manufacture, and utilization of chipped stone crescents in one portion of the Great Basin. No single collection or assemblage of crescents can provide all of the answers to pertinent questions about this tool type. While the crescents from the Collins Collection are only a handful of such artifacts, from insecure provenience, we suggest that the analyses reported here provide additional supporting evidence regarding how these tools were made and used. Moreover, we would argue that the detailed analysis of specimens, such as these, curated in artifact collections have the potential to contribute potentially significant information in the construction and evaluation of archaeological hypotheses. Thus, additional detailed analyses of crescents from professional and/or amateur collections across the region are needed to fully evaluate broad patterns and local variation associated with this enigmatic tool type.

Acknowledgments

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