# Obsidian Hydration, Cut Sample Selection, and Technological Aspects of Debitage

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## ABSTRACT

Technological debitage analysis can be an aid in assessing discard context, as well as overall site integrity. Related to this is the well-known use of obsidian hydration to identify scavenging behavior. Obsidian hydration cut locations are often determined in the obsidian lab; the archaeologist soliciting the hydration assessment does not usually select the specific locations. By identifying features on the artifact that can be attributed to particular reduction techniques or methods and acquiring hydration measurements from these locations, transformational processes and prehistoric behavior are better elicited. An example from an archaeological site located in the Southern San Joaquin Valley of California is presented.


## INTRODUCTION

Almost since the inception of obsidian hydration dating it has been observed that multiple hydration rim widths can be identified on a single artifact. In 1960, after considering the effect of chemical and temperature differences on hydration band development, Evans and Meggers (1960:524) state "the principal source of potential error . . . is the re-use of artifacts of older manufacture." This continues to be a concern for researchers trying to refine obsidian hydration dating. In a recent article, A. K. Rogers notes that if a controlled sample of obsidian yields a range of ages, there is no way to tell whether the range is due to long site use or to variations in [intrinsic water]" (Rogers 2008:2009).

Initially, hydration rinds of different widths were seen as an obstacle to the success of obsidian hydration dating. Practitioners over time took multiple readings on the same artifact to try and obtain more accuracy and overcome rim width diversity; the multiple readings were averaged. Elizabeth Skinner (1986) noted that multiple rind widths on one obsidian artifact provide documentation of scavenging and reuse of obsidian. She observed multiple hydration band widths on late prehistoric projectile points. Skinner also observed that fragmentary early period artifacts occurred in late prehistoric contexts, presumably brought there from older sites. Archaeologists working with obsidian in Central California have been in the forefront of the study of the reuse of obsidian artifacts and the treatment of archaeological sites as potential raw material sources (see Waechter and Origer 1993 for an excellent overview of some of the earlier literature on this issue). Researchers working with obsidian who do not take into consideration its reuse over time may incorrectly identify a site as lacking integrity due to the diversity of hydration rim readings documented.

## TECHNOLOGICAL DEBITAGE ANALYSIS AND OBSIDIAN HYDRATION

Beyond documenting the presence of multiple hydration rind widths on one artifact, analysts can be proactive and obtain readings from specific scars or features that are diagnostic of a certain reduction episode. By doing this, technological analysis can be a powerful aid in hydration cut location placement on obsidian. Cuts to obtain readings can be placed on specific surfaces to date specific types of reduction providing a better understanding of technological behaviors over time. The combination of obsidian hydration dating, sourcing, and technological analysis can help determine if specific reduction approaches occurred in a certain time period and/or on stone from a specific source.

## THE EXAMPLE

In anticipation of highway improvements in Kern County, California, three archaeological sites near the town of Lost Hills were evaluated to determine if any were eligible to the National Register of Historic Places. The evaluation involved surface collection, shovel test probes, and the excavation of units. Although over 150 miles from any obsidian quarry, small pieces of obsidian were found at these archaeological sites, a common occurrence in prehistoric sites in the California Central Valley.

The collections generated from the archaeological work were selected for study because the senior author observed that several of the items catalogued as pressure flaked bifaces had actually been reduced further via bipolar reduction.

Over 60 readings were obtained from 40 artifacts. The obsidian source of each artifact was also determined. Three different analysts cut the artifacts and obtained rim measurements. Sometimes more than one analyst obtained a reading from the same general location. Differences between analysts never exceeded .1 microns.

The most common debitage and features observed and dated were biface reduction flakes, pressure flake scars and bipolar debitage.


Biface Reduction Flake | Ishi Hold Pressure Flake | Bipolar Debitage | Biface Scar on Biface

Prior to working with the obsidian collection from the Lost Hills sites, the senior author held certain assumptions or beliefs regarding obsidian scavenging and reuse.
1) Reuse of obsidian from earlier archaeological sites occurred in late prehistoric times due to the reduction in the size of projectile points (introduction of bow and arrow), the presence of obsidian debitage of a useable size in archaeological sites, and the superior qualities of obsidian for projectile points.
2) Bipolar reduction was the primary reduction approached used in the late prehistoric to recycle old pieces of obsidian. Bipolar reduction was not a frequently used reduction approach before late prehistoric times.

## DISCUSSION

The analysis indicates that the obsidian was obtained from three major sources. These are the Coso Volcanic Field at China Lake Naval Weapons Center, the Casa Diablo source at Mammoth Lakes, and the Queen source on the California-Nevada boarder.


Hydration readings documented that one of the three archaeological sites was occupied over a 7000-year period. This site (CA-KER-5582) had the largest sample of obsidian. Almost all the obsidian was found at a single locus of the site, Locus 1. Dates cluster within four periods of site use. Between each of these periods there was a period of time for which the obsidian data indicates the site was not occupied or visited. The table to the left illustrates the results of the obsidian hydration readings. Each line is a reading of a specific piece of debitage or a specific technological feature on a piece of debitage. Duplicate readings are not included in the table. Single artifacts with readings indicating reduction on more than date have the same background color in the table.

The period between initial reduction and further reduction of a single artifact varied from 6800 years to as little as 107 years. Most reuse was contained within each of the four time periods with two major exceptions—as noted, one piece was flaked again after 6800 years and another piece was flaked again after 5800 years. Most reflaking occurred within 800 years of initial reduction.

The distribution of the artifacts over the Locus 1 at CA-KER-5582 exhibited some patterning. The obsidian from the two oldest periods was concentrated in two locations. The obsidian flaked during the two youngest periods seemed to be scattered all over the Locus. Also, percussion biface reduction was confined to the two earliest periods.


## CONCLUSIONS

Conclusions of this inductive study are provisional at best. The following interpretations are offered:
1. The percussion biface reduction flakes indicate the bifaces were within the size range of dart points. Data from the Coso quarries suggest that, although the bow and arrow was introduced into the area about 2100 cal BP, Dart points continued to be manufactured until about 1400 cal BP. The youngest percussion biface reduction flake documented here is 1583 cal BP.
2. Results of the study indicate that bipolar reduction to reduce small pieces of obsidian occurred throughout the 7000 years the site was used. Bipolar reduction was not a reduction approach confined to the late prehistoric. This is the only approach that can reduce some small pieces of rock. The qualities of obsidian flakes were desired in the early Holocene as well as during bow and arrow times.
3. The patterning within Locus 1suggests that prior to 2800 cal BP the site was a habitation site. After 2000 cal BP the site was only used on a temporary basis. Its temporary use may have been as an obsidian quarry.

Identifying technologically diagnostic debitage and diagnostic features on pieces of debitage enhances the outcome of the obsidian dating process and provides superior results. It also avoids the pitfalls of letting the hydration analyst arbitrarily select the location to be cut on the piece of obsidian. The careful placement of multiple cuts at surfaces resulting from different reduction technologies can help identify what behaviors were contemporaneous and which were not. Sites where this is not taken into consideration may be identified as lacking integrity due to disparate obsidian hydration readings.

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