

4-1-2013

# Obsidian Hydration Analysis of Artifacts from Six Sites Between Walters Ferry and King Hill, Idaho.

Mark G. Plew  
*Boise State University*

# SHORT CONTRIBUTIONS

## OBSIDIAN HYDRATION ANALYSIS OF ARTIFACTS FROM SIX SITES BETWEEN WALTERS FERRY AND KING HILL, IDAHO

Mark G. Plew

### INTRODUCTION

During the past ten years excavations have been conducted at a number of archaeological sites along the Snake River between Melba and King Hill, Idaho. Though the majority of point types from these sites are typologically of Late Archaic age (2000-150 BP) few have produced little datable organic material, though all have produced obsidian artifacts and debitage. In some instances projectile points of what are typologically Early and Middle Archaic age have been recovered. This report discusses the results of obsidian hydration analysis of 32 specimens from six sites between Walters Ferry and King Hill, Idaho. The purpose of the study was to establish chronometric ages for undated sites and determine if contexts that have produced temporally mixed types actually reflect distinct temporal occupations.

### BACKGROUND

Introduced in 1960 (Friedman and Smith 1960) as a method of dating obsidian from archaeological contexts, its use in the Great Basin has a lengthy history where the method has been widely applied to the assessment of surface collections (e.g. Bettinger 1980; Jones and Beck 1990, 2003; Meighan 1983; Tuohy 1984; Zeier and Elston 1984). The use of obsidian hydration in Idaho has typically focused on contexts where no datable remains were recovered (e.g. Plew and Gould 1990) or the dating of individual artifacts (Yohe 1996). The recognition that hydration rims may vary by chemical composition, moisture and temperature, among other factors, has seen considerable critique of the use of the method (Anovitz et al. 1999; Lynch 1990; Morganstein et al. 1999; Ridings 1996; Stevenson et al. 1993). Others, however, continue to promote the utility of the technique (Hull 2001; Eerkens et al. 2008; Rodgers 2007). In this regard, Eerkens et al. (2008) recent study suggests a high correlation between radiometric dates and hydration dates on the south coast of Peru.

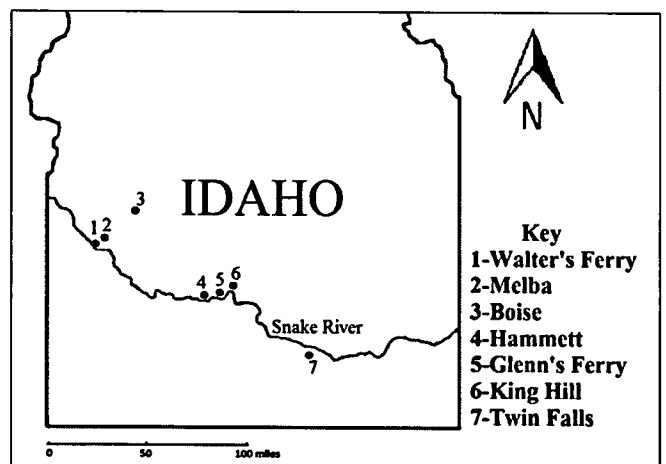


Figure 1. Map Showing Location of Sites.

### THE OBSIDIAN SAMPLE

Obsidian artifacts were selected from the assemblages of sites 10-CN-5, 10-EL-110, 10-EL-215, 10-EL-1367, 10-EL-1417, and 10-EL-1577—all sites located along the Snake River. Each site is characterized by Late Archaic point types (Desert Side-Notched, Rose Spring, Eastgate and Cottonwood Triangular types) and pottery at sites 10-CN-5 (Huter et al. 2000), 10-EL-1417 (Plew and Willson 2007) and 10-EL-215 (Plew and Willson 2013) while producing some Early to Middle Archaic items. With the exception of rock-lined hearths noted at site 10-EL-1577 none of the sites have produced formal features (Plew, Huter and Benedict 2002). Site 10-CN-5 is located south of Melba, Idaho (Huter et al 2000), while site 10-EL-1367 (Plew and Willson 2007), the Medbury site, is located at Hammett, Idaho (Plew and Willson 2005). The remaining sites are located within a two mile radius of King Hill, Idaho. Each site provides evidence of food processing and lithic reduction/retooling activities.

Submitter: M. Plew							May 2013		
Lab#	Sample#	Description	Unit	Depth	Remarks	Measurements	Mean	Source	
10-CN-5	1	NROL# 6	AF5		none	3.9 4.1 4.2 4.2 4.3 4.4	4.2		
10-CN-5	2	NROL# 8	AF34		none	2.5 2.5 2.5 2.6 2.6 2.6	2.6		
10-CN-5	3	NROL# 10	AF39		none	6.6 6.7 6.7 6.8 6.9 6.9	6.8		
10-EL-110	4	NROL# 3	AF9		none	6.0 6.0 6.1 6.1 6.1 6.3	6.1	SC(x)	
10-EL-110	5	NROL# 4	AF67		none	2.3 2.4 2.4 2.4 2.4 2.4	2.4	CM(x)	
10-EL-110	6	NROL# 5	AF208		none	4.3 4.3 4.3 4.3 4.4 4.5	4.4	OW(x)	
10-EL-110	7	NROL# 8	AF52		none	5.1 5.3 5.3 5.3 5.3 5.4	5.3	BB(x)	
10-EL-110	8	NROL# 9	AF118		none	2.1 2.1 2.3 2.3 2.3 2.4	2.3	OW(x)	
10-EL-110	9	NROL# 10	AF42		none	2.4 2.4 2.4 2.5 2.6 2.7	2.5	BSB(x)	
10-EL-215	10	NROL# 3	AF3		none	3.1 3.2 3.3 3.3 3.3 3.5	3.3	CM(x)	
10-EL-215	11	NROL# 4	AF4		none	8.1 8.2 8.4 8.4 8.5 8.6	8.4	BB(x)	
10-EL-215	12	NROL# 5	AF5		none	7.0 7.0 7.2 7.2 7.3 7.4	7.2	BB(x)	
10-EL-215	13	NROL# 12	AF12		none	8.1 8.1 8.1 8.2 8.4 8.4	8.2	BB(x)	
10-EL-1367	14	NROL# 1	AF1		none	6.0 6.2 6.3 6.3 6.3 6.4	6.3	OW(x)	
10-EL-1367	15	NROL# 2	AF2		none	8.8 8.8 8.8 8.9 9.1 9.1	8.9	BB(x)	
10-EL-1367	16	NROL# 3	AF3		none	5.7 5.8 5.8 6.0 6.0 6.0	5.9	CM(x)	
10-EL-1367	17	NROL# 4	AF4		none	6.1 6.1 6.2 6.2 6.3 6.3	6.2	BB(x)	
10-EL-1367	18.1	NROL# 5	AF5		band 1; surfaces	4.3 4.4 4.4 4.4 4.5 4.5	4.4	OW(x)	
10-EL-1367	18.2	NROL# 5	AF5		band 2; edge	6.4 6.6 6.6 6.6 6.7 6.7	6.6	OW(x)	
10-EL-1367	19	NROL# 43	AF10		none			MVB	
10-EL-1367	20	NROL# 44	AF29		weathered			DH	
10-EL-1367	21	NROL# 45	AF30		none	5.7 5.7 5.8 5.8 5.8 6.0	5.8		
10-EL-1367	22	NROL# 46	AF34		none			DH	
10-EL-1417	23	NROL# 52	AF11		none	2.0 2.0 2.1 2.1 2.1 2.1	2.1		
10-EL-1417	24	NROL# 53	AF30		none	approx. 12.0		VW	
10-EL-1417	25	NROL# 54	AF31		none	3.0 3.0 3.0 3.0 3.0 3.1	3.0		
10-EL-1417	26	NROL# 55	AF69		none	4.4 4.5 4.5 4.5 4.7 4.7	4.6		
10-EL-1417	27	NROL# 57	AF79		none	3.0 3.1 3.1 3.1 3.1 3.3	3.1		
10-EL-1577	28	NROL# 47	AF16		none	3.2 3.3 3.3 3.5 3.5 3.5	3.4		
10-EL-1577	29	NROL# 48	AF92		none	2.4 2.4 2.5 2.5 2.5 2.5	2.5		
10-EL-1577	30	NROL# 49	AF393		none	2.1 2.1 2.1 2.3 2.3 2.4	2.2		
10-EL-1577	31	NROL# 50	AF522		weathered			DH	
10-EL-1577	32	NROL# 51	AF537		none	4.4 4.4 4.4 4.5 4.5 4.7	4.5		

Lab Accession No: OOL-753 Technician: Thomas M. Origer

TABLE 1. Hydration Measurements for Specimens from Sites 10-CN-5, 10-EL-110, 10-EL-215, 10-EL-1367, 10-EL-1417, and 10-EL-1577 (from Origer 2013)

Items selected for hydration analysis include Late, Middle and Early Archaic point types, though biface and flake fragments are included.

**LABORATORY METHODS**

Specimens were submitted to Origer’s Obsidian Laboratory for analysis. Thin section thickness was assessed using “touch” and “transparency” tests (Origer 2013: 1) with hydration bands measured using a strain-free 60-power objective and a Bausch and Lomb 12.5 power filar micrometer eye piece mounted on a Nikon Labophot-Pol polarizing microscope. A total of six measurements were taken at multiple locations along the edge of each section (see Table 1). Where possible, dates were calculated using known rates of hydration—calculating EHT (Effective Hydration Temperature) for site locations following steps outlined by Rodgers (2007). This provided the means by which dates could be calculated for Brown’s Bench, Big Southern Butte, and Owyhee obsidian specimens (Origer 2013: 2). Induced hydration data indicates that Big Southern Butte, Owyhee, and Brown’s Bench obsidians have hydration rates (1.05-1.5) greater than Michaels (1982, 1985) control source (Napa Glass Mountain, Napa, California). Given that the EHT of the Napa control source is 16.8 in comparison with Glens Ferry, Idaho at

17.4, the hydration band of each specimen was adjusted downward by 6% based on previous studies (Basgall 1990; Origer 1989, 2013).

Table 1 shows hydration measurements for all 32 specimens. Dates were calculated for specimens where induced hydration data exists. These include, as noted, Big Southern Butte, Brown’s Bench and Owyhee sources. Table 2 provides calculated dates for specimens from 10-EL-110, 10-EL-215, and 10-EL-1367.

Site Number	OOL Lab Number	Obsidian Source	Hydration Band (in microns)	Rate Adjusted Hydration Band	EHT Adjusted Hydration Band	Date (in years before present)
10-EL-110	6	OW	4.4	3.5	3.4	1,775
	7	BB	5.3	3.5	3.4	1,775
	8	OW	2.3	1.8	1.7	445
	9	BSB	2.5	2.4	2.3	810
10-EL-215	11	BB	8.4	5.6	5.4	4,475
	12	BB	7.2	4.8	4.7	3,390
	13	BB	8.2	5.5	5.3	4,310
10-EL-1367	14	OW	6.3	5.0	4.9	3,685
	15	BB	8.9	5.9	5.7	4,985
	17	BB	6.2	4.1	4.0	2,455
	18.1/18.2	OW	4.6/6.6	3.7/5.3	3.6/5.1	1,990/3,990

TABLE 2. Obsidian Hydration Band Adjustments and Dates (from Origer 2013)

## DISCUSSION

The items from site 10-EL-110 generally reflect a Late Archaic time frame. The notable exception is item number six, which is typologically described as Northern Side-Notched. In this analysis the item is of Late Archaic age. Of greatest interest are the hydration dates from sites 10-EL-215 and 10-EL-1367. Both Middle and Early Archaic artifacts which were typologically classified have hydration dates confirming those relative ages. Notably, the Middle Archaic artifacts recovered at 10-EL-215 date between 4475 and 3390 BP. Likewise, Middle Archaic materials from 10-EL-1367 date between 4985 and 2455 BP. In general, hydration bands for the remaining items in the collection tend to support Late Archaic time frames for sites 10-EL-1417 (3.1-2.1) and 10-EL-1577 (3.4-4.5). Band width comparisons suggest that artifacts from 10-CN-5 (2.6-6.8) and 10-EL-1367 (4.4-8.9) do contain both Middle Archaic items, even though Late Archaic items are most common. Though

based on a very small sample, it is of interest that Brown's Bench source materials appear as a source more common in the Middle Archaic, while Sinker Canyon, Cannonball Mountain, and Owyhee sources have hydration bands suggesting their use during Middle and Late Archaic times.

Given the tendency to assume that items of Early or Later Archaic ages found in what appear typologically dating to a particular time frame are often presumed to be only a replication of form or to have been curated to the location, this study suggests that hydration analysis may be useful in determining whether or not a site is characterized by multiple occupations/uses.

Mark G. Plew  
Department of Anthropology  
Boise State University  
1910 University Drive  
Boise, ID 83725  
mplew@boisestate.edu

## REFERENCES CITED

- Anovitz, Lawrence M., J. Michael Elam, Lee R. Riciputi, and David R. Cole  
1999 The Failure of Obsidian Hydration Dating: Sources, Implications, and New Directions. *Journal of Archaeological Science* 26:735-752.
- Basgall, M.  
1990 Hydration Dating of Coso Obsidian: Problems and Prospects. Paper Presented at the 24th Annual Meeting of the Society for California Archaeology, Foster City, California.
- Bettinger, Robert L.  
1980 Obsidian Hydration Dates for Owens Valley Settlement Categories. *Journal of California and Great Basin Anthropology* 2: 286-292.
- Eerkens, Jelmer W., Kevin J. Vaught, Rim R. Carpert, Christina A. Conlee, Moises Linares Grado, and Katharina Schreiber  
2008 Obsidian Hydration Dating on the South Coast of Peru. *Journal of Archaeological Science* 35:2231-2239.
- Friedman, Irving and Robert L. Smith  
1960 A New Dating Method Using Obsidian: Part I, the Development of the Method. *American Antiquity* 48:544-547.
- Hull, Kathleen L.  
2001 Reasserting the Utility of Obsidian Hydration Dating: A Temperature-Dependent Empirical Approach to Practical Temporal Resolution with Archaeological Obsidians. *Journal of Archaeological Science* 28:1025-1048.
- Jones, George T., and Charlotte Beck  
1990 An Obsidian Hydration Chronology of Late Pleistocene-Early Holocene Surface Assemblages. *Journal of California and Great Basin Anthropology* 12(1):84-100.
- Michels, J.  
1982 The Hydration Rate for Owyhee-Brown's Castle Obsidian at Archaeological Sites in the Uplands of the Northeastern Great Basin. *Mohlab Technical Report* No. 10, State College, Pennsylvania.
- 1985 Hydration Rate Constants for Big Southern Butte Obsidian, Butte County, Idaho. *Mohlab Technical Report* No. 9, State College, Pennsylvania.
- 1986 Hydration Rate Constants for Napa Glass Mountain Obsidian, Napa County, California. *Mohlab Technical Report* No. 14, State College, Pennsylvania.
- Morganstein, Maury E., Carolyn L. Wicket, and Aaron Barkatt  
1999 Considerations of Hydration-Rind Dating of Glass Artifacts: Alteration Morphologies and Experimental Evidence of Hydrogeochemical Soil-Zone Pore Water Control. *Journal of Archaeological Science* 26:1193-1210.
- Meighan, Clement W.  
1981 The Little Lake Site, Pinto Points, and Obsidian Dating in the Great Basin. *Journal of California and Great Basin Anthropology* 3(2):200-214.
- 1983 Obsidian Dating in California. *American Antiquity* 48:600-609.
- Origer, Thomas  
1989 Hydration Analysis of Obsidian Flakes Produced by Ishi during the Historic Period. Current Directions in California Obsidian Studies. *Contributions of the University of California Archaeological Research Facility* Number 48, Berkeley.
- 2013 Report on Results of Obsidian Hydration Analysis of 32 Specimens from Multiple Sites in Southwestern Idaho. Report on File, Origer's Obsidian Laboratory, Rohnert Park, California.

*Plew, Mark G., and Russell T. Gould*

- 1990 Archaeological Test Excavations at the Clover Creek Site. *Idaho Archaeologist* 13(1):1-15.

*Plew, Mark G., Pamela Huter, and Richard Benedict*

- 2002 Archaeological Test Excavations at 10-EL-1577 near King Hill, Idaho. Boise State University, Boise.

*Plew, Mark G., Sharon Plager, Tedd Jacobs, and Christopher A. Willson*

- 2006 Archaeological Excavations at 10-CN-6, Middle Snake River, Idaho. *Monographs in Archaeology* No. 3, Boise State University.

*Plew, Mark G. and Christopher A. Willson*

- 2005 Archaeological Test Excavations at the Medbury Site (10-EL-1367), Southwest Idaho. *Idaho Archaeologist* 28(2):15-22.

- 2007 Archaeological Test Excavations at the Swenson Site (10-EL-1417) Near King Hill, Idaho. *Idaho Archaeologist* 30(1):3-14.

- 2013 Archaeological Excavations at 10-EL-215 Near King Hill, Idaho. *Monographs in Archaeology* No. 5, Boise State University.

*Ridings, Rosanna*

- 1996 Where in the World Does Obsidian Hydration Dating Work. *American Antiquity* 61:136-148.

*Rodgers, Alexander*

- 2007 Effective Hydration Temperature of Obsidian: A Diffusion Theory Analysis of Time-Dependent Hydration Rates. *Journal of Archaeological Science* 34:656-665.

*Stevensen, Christopher M., Elizabeth Knaus, James J. Mazer, and John K. Bates*

- 1993 Homogeneity of Water Content in Obsidian from the Coso Volcanic Field: Implications for Obsidian Hydration Dating. *Geoarchaeology* 8:371-384.

*Tuohy, Donald R.*

- 1984 Implications of Obsidian Hydration Readings and Source Determinations for 28 Presumed "Early Man" Projectile Points. In *Obsidian Studies in the Great Basin*, R.E. Hughes, editor, pp. 193-221. University of California Archaeological Contributions No. 45, Berkeley.

*Willson, Christopher A. and Mark G. Plew*

- 2007 Archaeological Excavations at the King Hill Creek Site (10-OE-110): A Late Archaic Occupation near King Hill, Idaho. *Monographs in Archaeology* No. 4, Boise State University, Boise.

*Yohe II, Robert M.*

- 1996 X-Ray Fluorescence and Obsidian Hydration Results of the Analysis of a Turkey-Tail Biface from the Waterhouse Collection. *Idaho Archaeologist* 19(1):11-14.

*Zeier, Charles D., and Robert G. Elston*

- 1984 An Analysis of Obsidian Hydration Processes at the Sugarloaf Obsidian Quarry, Inyo County, California, Report on File, Intermountain Research, Silver City, Nevada.

Copyright of Idaho Archaeologist is the property of Boise State University, Department of Anthropology and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.