11-29-2021

Letter Report, re: Analysis of Three Obsidian Artifacts from the High Plains Project

Matthew Boulanger
mboulanger@smu.edu

SMU
DEDMAN COLLEGE OF HUMANITIES & SCIENCES
Department of Anthropology

Matthew T. Boulanger
Department of Anthropology
Southern Methodist University
Dallas, Texas 75205

Christy Bednar
Archaeological Research Collections
Southern Methodist University

November 29, 2021

Re: Analysis of three obsidian artifacts from the High Plains Project

Dear Christy,

I have completed the XRF analysis of the three obsidian flakes you provided from the High Plains Project conducted by Fred Wendorf in the early 1970s. I've assigned these pieces analytical identifiers in our database as LLE001, -002, and -003.

Each specimen was analyzed using a Bruker Tracer 5i handheld portable X-ray fluorescence spectrometer. The Tracer 5i uses a Rh-based X-ray tube operating at 50 kV at 35 μa, and a silicon drift detector. Spectra collected by the spectrometer are quantified using a custom calibration based on a suite of 43 well-characterized obsidian reference specimens developed by the Archaeometry Laboratory at the University of Missouri. Artifact specimens are analyzed on the Tracer 5i for at least 90 seconds. This protocol and the obsidian calibration routine permit quantification of the following minor and trace elements: Ti, Mn, Fe, Zn, Ga, Rb, Sr, Y, Zr, Nb, Ba, and Th. Analysis of our in-house check standard, a solid piece of Glass Mountain obsidian, is reported in Table 1.

Results of the analyses are provided in Table 2. The closest match I can identify for these three pieces is the Antelope Creek East (aka Mule Creek 1) source in western New Mexico. I have analyzed 26 pieces obtained from this specific source, and the average of these assays is reported in Table 2 to facilitate direct comparison with the artifacts.

Without much context for these pieces, it is difficult to draw any firm anthropological conclusions. However, I can say that the Mule Creek source locality is likely the largest "source" for obsidian in the Southwest – with usable obsidian nodules occurring in deposits spread from Greenlee County, Arizona to the Mogollon Mountains in Grant and Catron Counties in New Mexico. Moreover, the archaeological distribution of obsidian

from the Mule Creek locality is widespread – from as far west as Scottsdale, to at least as far east as Las Cruces, New Mexico. Thus, finding it on the Llano Estacado in central and eastern New Mexico is fully in line with what we know about its archaeological distribution.

As I mentioned to you previously: if there are any more obsidian artifacts from Fred's project that could be analyzed, I would be happy to do it.

Sincerely,

Matthew T. Boulanger

Table 1. Elemental abundances determined for the obsidian check-standard (solid obsidian from Glass Mountain, California) and preferred values for the RGM-1 standard from GeoRem and MURR. All values in ppm unless otherwise noted.

	Ti	Mn	Fe	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Th
RGM	1485	323	12838	34	14	145	111	21	239	9	843	16
RGM	1517	289	12826	36	15	150	111	20	238	8	871	15
GeoRem	1591	300	13086	33	16	150	105	23	228	9	827	15
MURR	923	287	13200	32	14	157	110	27	214	10	808	16

Table 2. Elemental abundances (in ppm) for obsidian artifacts from the High Plains Project and for the Mule Creek 1 (Antelope Creek East) source. < LOD indicates values at or below detection limits.

	Ti	Mn	Fe	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Th
LLE1	310	363	7176	37	16	241	11	41	103	26	< LOD	28
LLE2	491	368	6407	31	15	226	12	37	99	25	60	25
LLE3	251	380	7089	38	16	248	12	38	106	26	< LOD	31
Mule Creek 1	647	380	6489	34	16	225	10	38	98	24	73	29