Sourcing Results for 408 Obsidian Artifacts from Southwestern Wyoming

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In the past 10+ years Current Archaeological Research, Inc. has sourced 408 pieces of obsidian. By examining the results, patterns can be determined. In 1997 Thompson, Pastor and Creasman published "Wyoming Basin-Yellowstone Plateau Interaction: A Study of Obsidian Artifacts from Southwestern Wyoming" in Tebiwa 26(2). They determined that the use of obsidian increased through time, that Wright Creek (Malad, ID) and the Jackson area were the primary sources exploited and that the Green River cobble source was locally used. Aside from the local Green River cobble source, Malad and the Jackson area are the closest sources, both ca. 125 miles away from the general project area. When our results are compared to their findings, similar conclusions are reached. Additionally, the more "exotic" sources were found more in association with Archaeological District 48SU4000, which supports the notion that the district was a prehistoric "rendezvous" area.

The 1997 Thompson, Pastor and Creasman report "Wyoming Basin-Yellowstone Plateau Interaction: A Study of Obsidian Artifacts from Southwestern Wyoming". Their study of obsidian reached three main conclusions:

1)Wright Creek (Malad, ID) and the Jackson area were the primary sources exploited.
2)The Green River cobble source was locally exploited.
3)The use of obsidian increased through time.

We used newly aquired data to see if it supported their conclusions.

1).Wright Creek (Malad, ID) and the Jackson area were the primary sources exploited.

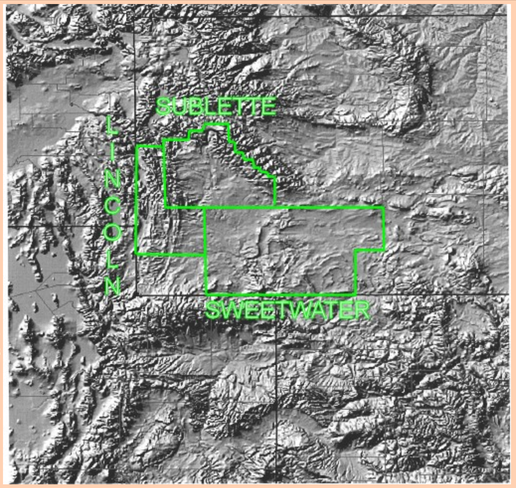
The newly aquired data showed that Malad, ID is the predominate source (n=163), Teton Pass, WY second (n=88), with lesser amounts from Green River/Phillips Pass, WY (n=54), Bear Gulch, ID (n=30), Crescent H, near Jackson WY (n=28), Obsidian Cliff, WY, (n=26) and sparse items from Wild Horse Canyon, UT (n=6), Browns Bench, UT/NV (n=3), West Gros Ventre, near Jackson (n=3), Packsaddle Creek, ID (n=2), unknown sources (n=2) and single artifacts from Timber Butte, ID, Lava Creek (in Yellowstone), WY and Huckleberry Ridge (in Yellowstone) WY. The Green River/Phillips Pass is denoted that way because they have the same signature. The results supports their conclusions.

2) The Green River cobble source was locally exploited.

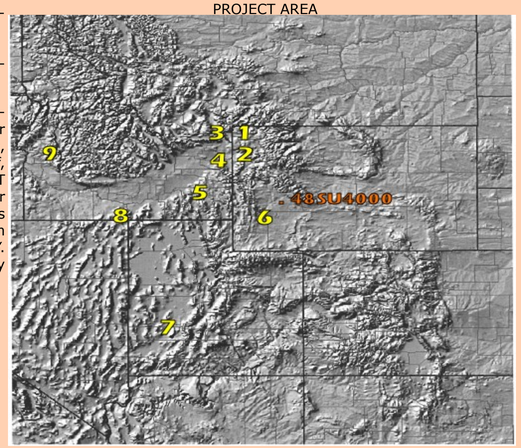
The Green River/Phillips Pass signature accounted for 13% of the overall materials. However, if one just looks at the results from Lincoln County, the Green River/Phillips Pass accounts for 47% of the materials from that county, where the source is apparently located. Malad only accounts for 28% and the three Jackson sources account for 21%. The only other sources from Lincoln County were Bear Gulch (2%) and Obsidian Cliff (2%). The sites that had Green River/Phillips Pass obsidian are mainly clustered within 10 miles south southwest of Fontenelle, WY and the vast majority of sites from Sweetwater County with Green River/Phillips Pass obsidian are located near the Lincoln County Line and ca. 10 miles south of Fontenelle. Again, the results supports the 1997 conclusions.

3) The use of obsidian increased through time.

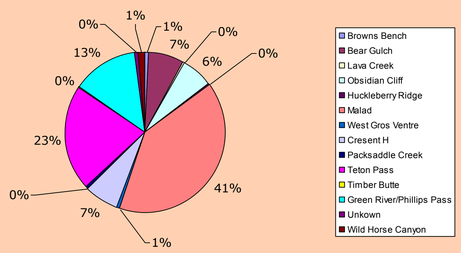
The 50 projectile points consisted of 1 from the Paleoindian Period, 1 from the Terminal Paleoindian Period, 6 from the general Archaic Period, 3 from the Early Archaic Period, 10 from the Late Archaic Period, 1 from the Late Archaic/Late Prehistoric Period and 28 from the Late Prehistoric Period. This shows an exponential increase in obsidian use through time. Once again, the results back the earlier conclusions.

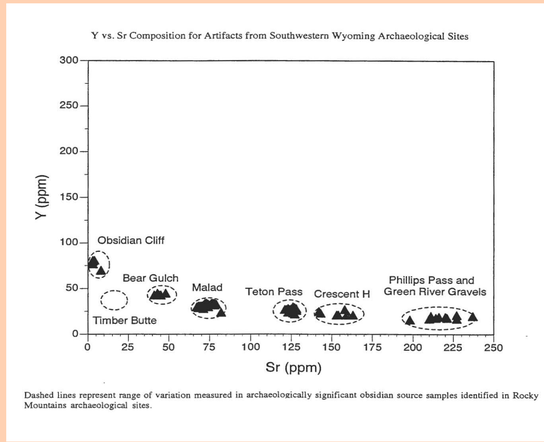


PROJECT AREA

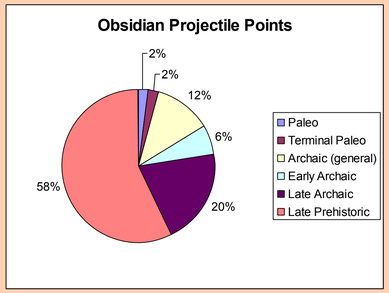


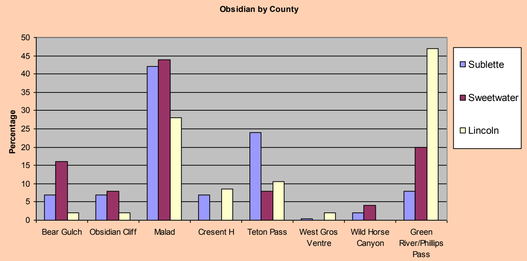
1. Yellowstone (Obsidian Cliff, Lava Creek, Huckleberry Ridge)
2. Jackson (Teton Pass, Crescent H, West Gros Ventre)
3. Bear Gulch
4. Packsaddle Creek
5. Malad
6. Green River
7. Wild Horse Canyon
8. Browns Bench
9. Timber Butte

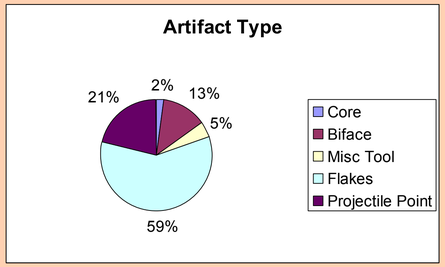




Dashed lines represent range of variation measured in archaeologically significant obsidian source samples identified in Rocky Mountains archaeological sites.







"The obsidian was sent to Geochemical Research Laboratory directed by Richard E. Hughes, Ph.D., RPA in Idaho for sourcing. The analysis was performed using a QuanX-EC edxrf spectrometer equipped with a silver (Ag) x-ray tube, a 50 kV x-ray generator, digital pulse processor with automated energy calibration, a Peltier cooled solid state detector with 145 eV resolution (FWHM) at 5.9 keV. The x-ray tube was operated at different voltage with current settings to optimize excitation of the elements selected for analysis. In these cases analysis were conducted for the elements rubidium, strontium, yttrium, zirconium and niobium. Certain artifacts were analyzed for barium and to generate iron vs. manganese ratios. X-ray tube current was scaled to the physical size of each specimen.

X-ray spectra are acquired and elemental intensities extracted for each peak region of interest, then matrix correction algorithms are applied to specific regions of the x-ray energy spectrum to compensate for inter-element absorption and enhancement effects. After these corrections are made, intensities are converted to concentration estimates by employing a least-squares calibration line established for each element from analysis of up to 30 international rock standards certified by the U.S. Geological Survey, the U.S. National Institute of Standards and Technology, the Geological Survey of Japan, the Centre de Recherches Petrographiques et Geochimiques (France) and the South African Bureau of Standards.

Comparisons between the artifacts that were collected in the field and known geochemical groups were made using diagnostic trace element concentration values that the Geochemical Research Laboratory has in it resources. Artifact-to-obsidian source correspondences were considered reliable if diagnostic mean measurements for artifacts fell within 2 standard deviations of mean values for source materials. Diagnostics are used to specify those trace elements that are well measured by x-ray fluorescence, whose concentrations show low intra-source variability and marked variability across sources. Diagnostic elements are those whose concentration values allow one to draw the clearest geochemical distinctions between sources. Although Zn, Ga and Nb ppm concentrations also were measured for each specimen, they are not considered diagnostic because they don't usually vary significantly across obsidian sources. Composition measurements are reported to the nearest ppm to reflect calibration-imposed resolution capabilities of non-destructive energy dispersive x-ray fluorescence spectrometry. The resolution limits of the x-ray fluorescence instrument for the determination of Zn is about 3 ppm, Ga about 2 ppm, Rb about 4 ppm, Sr about 3 ppm, Y about 3 ppm, Zr about 4 ppm and Nb about 3 ppm. When counting and fitting error uncertainty estimates for a sample is greater then element specific resolution limits given above, the larger number is a more conservative indicator of composition variation and measurement error arising from differences in sample size, surface and x-ray reflection geometry" (Hughes 2008).

When one looks at the items sources, 59% were flakes, 21% were projectile points, 13% were bifaces, 5% were other tools types and 2% were cores. Of the cores, 63% were Malad, 25% were Teton Pass and 12% were Green River/Phillips Pass. This supports the idea that the large pieces of obsidian were brought back from Malad and Jackson. Approximately 88% of the primary flakes were Green River/Phillips Pass. So it would appear that initial reduction to transportable sized samples was occurring at the source. The large differences between the number of cores from Malad and the Jackson area in comparison to the local Green River source suggests different procurement actions. It could suggest that the Jackson area were part of the yearly rounds with early reduction stages occurring at the source while the Malad might have been obtained as a result of trade, with the trade item consisting of transportable raw material.

An interesting pattern emerges when one looks at the locations of some of the exotics. A total of 83% of the Wild Horse Canyon obsidian was from sites in the Archaeological District, 48SU4000. District 48SU4000 is a unique setting in the Green River Basin and consists of large areas of bedrock outcrops with possible rock shelters. Prehistoric ceramics were recovered from several of the sites located in the District, including 500+ sherds each from two sites. This is extremely rare for the region. The Wild Horse Canyon obsidian came from three sites, of which two of the sites contained ceramics. A total of 50% of the unknown sources also were located in the District. It has suggested that the District was a rendezvous location for the Late Prehistoric Native Americans. Wild Horse Canyon is one of the farthest away obsidian sources and the unknown source is apparently not a source commonly used in the study area. With those materials types appearing primarily in the District, it would support this premise. A total of 67% of the Browns Bench obsidian was recovered from Site 48SU2230. Current Archaeological Research, Inc. excavated that site in 2001. The site was a high density lithic reduction station primary used in the Late Archaic Period. It is interesting that the far source of Browns Bench was mainly found at a Late Archaic local lithic procurement site. The reason for this can not be inferred, but it does suggest either that long distance trade was occurring earlier then first thought or that the people of this time period had a large range of mobility.

Hughes, R.

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