VARIABILITY OF ARCHAEOLOGICAL VOLCANIC GLASS DISTRIBUTION IN THE CENTRAL ABSAROKA RANGE, WYOMING

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Abstract:

Three years of research, 2002-2004, have been conducted by students and faculty from Colorado State University on a variety of human impacts on the Greybull River drainage system in the Absaroka Range of Northwestern Wyoming. As part of the GRSLE Project (Greybull River Sustainable Landscape Ecology), archaeological surveys have been primarily concentrated in the Washakie Wilderness area of the Shoshone National Forest. Pleistocene glacial erosion and subsequent erosion has exposed an underlying volcanic substrate throughout the study area. However, no archaeologically significant source of volcanic glass (obsidian) is known within the study area. Research focused on the distribution of obsidian within and between over 150 sites has revealed a variety of patterns. The in-field, non-collection documentation strategy used at these sites assesses a number of archaeological attributes including raw material type, colors, and length. Obsidian composes approximately 10% of the raw material in the "average" flaked stone assemblage. Deviations from this norm and the distributional patterns are multi-scalar, exhibiting variability both spatially, between watersheds, and temporally, based on chronological dating of sites. The maximum size of obsidian artifacts is, on average, smaller than artifacts of locally derived cherts suggesting prehistoric curation prior to discard. Source characterization of this assemblage is necessary to further examine the significance to prehistoric land-use and mobility patterns in a regional context.

The GRSLE (Greybull River Sustainable Landscape Ecology) project study area falls largely within the Greater Yellowstone Ecosystem and faces many similar management challenges (Figure 1). The project is working within the Shoshone National Forest and Washakie Wilderness Area to identify the extent of archaeological resources. Archaeological surveys were conducted through the Greybull River watershed during the past three summers. We emphasize the importance of adaptive responses for preservation and conservation of all natural resources, of which archaeology is only one component. The survey teams, primarily field school students and researchers from Colorado State University, document the surface record using non-destructive and non-collection techniques.

Previous analyses of the data have revealed a substantial collection of archaeological volcanic glass throughout the study area. Earlier reports in the south portion of the study area, along the Wood River, suggested that some of the obsidian in the study area may have been derived from the Absaroka volcanics (Breckenridge 1974). To date, no widely known sources have been recorded in the immediate vicinity. Thus, the obsidian assemblage is considered exotic to the study area . The research here is an initial attempt to characterize the obsidian in the Upper Greybull watersheds.

Nearly 27,000 flaked stone artifacts have been observed and documented in the GRLSE project. Many of the sites were encountered during non-systematic surveying of the landscape. These encounters are often intensified by transects at 70cm spacing. The concentrated surveys and subsequent documentation record the archaeological landscapes.

Locally derived raw lithic materials include basalt, chalcedony, Irish Rock chert, Dollar Mountain chert and quartzite, silicified siltstone, and an unspecified volcanic rock. For this study, these materials are specified as Local Material. Silicified (often termed petrified) woods may be available in isolated pockets locally or may have been curated over larger distances.

Both quartzite and the fine-grained Morrison formation quartzites are exotic to the study area. The Bighorn Basin is the likely source for the generic quartzites. The nearest known source of the Morrison formation is in the Bighorn Mountain range.

The source for cherts undistinguishable as either Dollar Mountain or Irish Rock are not known. Some have been characterized as the distinct Madison formation cherts, but have been grouped with other cherts for the purpose of this study. The obsidian in the sample is considered to have been curated in the past.

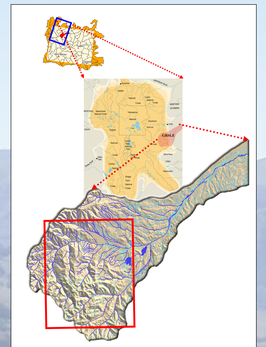

Figure 1. Study area including regional perspective. Red box is approximate location of Fig 2.

Figure 3. A large Late Archaic period site, the PC002 flaked stone is 16% obsidian.

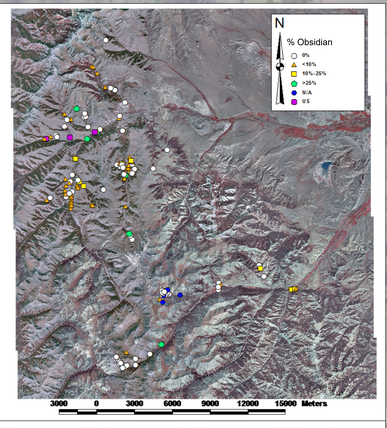

Figure 2. All sites recorded between 2002 and 2004, and the percent of the assemblage consisting of obsidian artifacts.

47.6% of the 147 prehistoric sites contain obsidian artifacts (Figure 2). The average site is comprised of 10.0% flaked obsidian. Elevation does not appear to be a factor in the artifact size variability of the entire obsidian assemblage.

During 2004, we began to collect samples of obsidian for future geochemical sourcing. 70 samples were collected from 28 sites representing a wide range of site type and location. Artifacts will be returned to their collected provenience when complete.

Figure 3. Site GR033 confluence of river and creek, is a Late Prehistoric occupation with more than 25% obsidian.

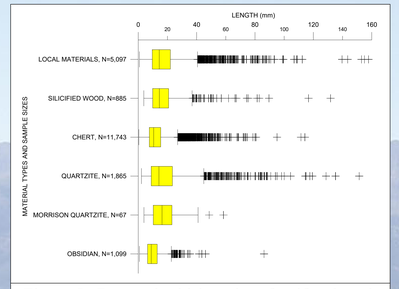

Figure 5. Box-and-whisker plot of artifact length by material type.

-The average maximum length of all flaked stone artifacts is 14.7mm in length. The average obsidian artifact is 10.6 mm.

-Obsidian exhibits the smallest range in length of all the material types in the study area.

-Local materials and quartzites have the largest ranges of artifact length.

-Evidence suggests that the distinct Obsidian outlier, at 86.2mm in maximum length, is the product of recorder error.

-The variety in length distribution between obsidian and local materials suggests differing reduction or use strategies.

-Materials further from their source should have less cortex than locally derived materials.

-99.1% of the obsidian group contain no dorsal cortex. Only 1 incomplete, distal end of a flake was described as having 100% cortex covering the dorsal surface.

-Less than 2% of all material assemblages have greater than 25% cortex.

-Local materials and quartzites show the greatest variability in cortex presence.

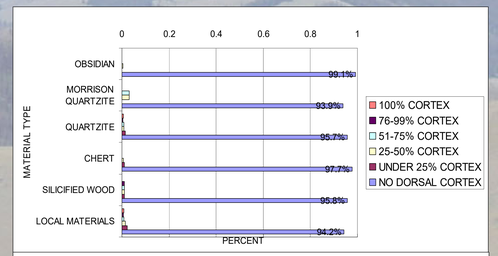

Figure 6. Percent dorsal cortex per material type.

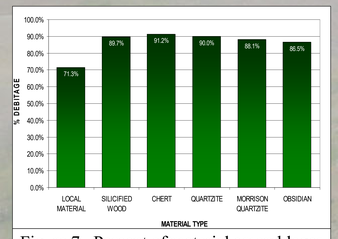

Figure 7. Percent of material assemblages composed of debitage.

-As with cortex value, differences can be expected between local and exotic materials in the amount of debitage per modified stone artifact assemblage.

-Over 86% of the obsidian documented within the GRSLE artifact set is flaked stone debris.

-Most of the other non-local materials exhibit a similar pattern of greater than 85% of the dataset are formed by flaked stone debitage.

-Debitage percent is lowest in the local material assemblage, compared with other raw materials.

-Local materials have the lowest percentage of projectile points, supporting the idea that local materials are being used for more expedient purposes.

-21% of the non-debitage obsidian assemblage has been identified as projectile points.

-Only one amorphous Obsidian core was recorded in the study area. The complete core was 17.1mm at its maximum length and exhibited no cortex. This suggests a high degree of reduction before discard.

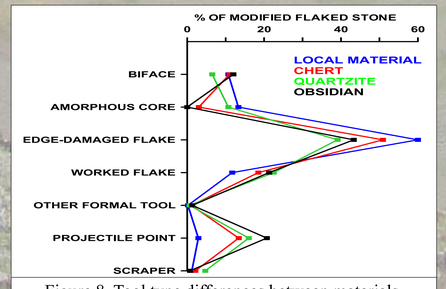

Figure 8. Tool type differences between materials.

The study area is located within 500km from several obsidian source areas. Minor sources include Park Point within 100km, and Cougar Creek and Packsaddle Creek within 20km from the GRSLE project boundary. The major source areas and approximate distances from the research area are: Obsidian Cliff in Yellowstone National Park **150km** to the northwest; Bear Gulch in Fremont County, Idaho 250km to the northwest; American Falls in Power County, Idaho 350km to the southwest; and Teton Pass in Teton County, Wyoming **200km** to the southwest.

If we could source obsidian simply by proximity and notoriety of the source, most of the GRSLE collection would come from Obsidian Cliff or Teton Pass. Hunter-gatherer behavior was likely more dynamic as food availability, game movements, and various social factors complicated the trajectory of obsidian discard through the region.

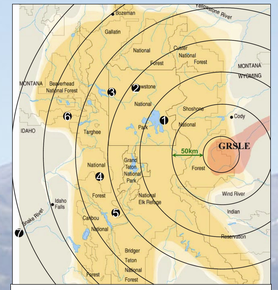

Figure 9. Distance to obsidian sources indicated by 50km increment bands: 1.Park Point; 2.Obsidian Cliff; 3.Cougar Creek; 4.Packsaddle Creek; 5.Teton Pass; 6.Bear Gulch; 7.American Falls
(Cannon 1993; Sanders 2001).

Figure 10. Sample of recorded obsidian artifacts.

While field observations of raw material color are often subjective and unreliable, a few generalizations can be made about the color variation in the GRSLE obsidian dataset. Most of the artifacts have been recorded as black, however, less than 7% were characterized as gray, brown, tan, or clear. A black opaque description was given to 10%. Overall, 80% of the assemblage was described as a semi-translucent or transparent black.

Future Direction

Defining the basic patterns of the obsidian assemblage from the GRSLE study area is only the first step in understanding the significance of archaeological volcanic glass to the record as well as to past lifeways. Important considerations for future studies include:

Exotic materials are an important component of the lithic landscape;

Obsidian artifacts were being used differently than local, and often less expensive non-local, materials;

There is a paucity of published obsidian studies for the central Absaroka range and the Greybull River watershed;

Sites associated with the Late Prehistoric time period (Burnett 2004) in this area have higher rates of obsidian per assemblage than sites of other periods; and,

To understand regional significance of the distribution, samples must be tested for geochemical source correlation.

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