

High Elevation Geoarchaeology: Alpine Landscapes and Human Use, Dollar Mountain, a Northwestern Wyoming Example

William Thomas Reitze¹ and Lawrence Todd²

2nd Annual Archaeological Sciences of the Americas Symposium, Tucson, AZ

September 2006

I) Introduction:

During the summer of 2003 a high altitude survey was conducted in Dollar Mountain Cirque to determine the extent of prehistoric use and occupation of the area. The field work was conducted as part of the Greybull River Impact Zone (GRIZ) Project and the Colorado State University field school. Dollar Mountain and its cirque are located at the head of the Wood River, a tributary of the Greybull River, in the Absaroka Mountains of Northwestern Wyoming. While preliminary survey reported some evidence of occupation, there were no published accounts of prehistoric habitation in this region at this altitude. The cirque itself has undergone a great deal of geomorphologic change; especially due to glacial action. The cirque's most prominent features are extensive glacial and periglacial deposits. The occupation of the cirque is intertwined with the creation and modification of these glacial moraines. Through field work this past summer seventeen sites were recorded. These include fifteen prehistoric lithic scatter and two historic mining sites.



Down Dollar Cirque

II) Geologic Setting:

The Absaroka Mountains were created by Tertiary volcanic uplift. The range is the remnants of one of the largest volcanic fields formed in North America during the Eocene. The bedrock geology of the area consists of directly deposited or uplifted volcanic rocks and secondarily deposited volcanic materials in the form of siltstones, lahars, and flow deposits. Dollar Mountain is a unique geological isolate in a sea of volcanic rock. Dollar Mountain is capped by an uplifted Paleozoic block with a stratigraphic sequence ranging from the Cambrian to the Pennsylvanian. This uplift contains sandstones, shales, and limestones, the sources of Dollar Mountain chert.



Snowfields of Dollar Cirque

III) Environment:

The elevation of the study area ranges from 2920 meters at the base camp to 3450 meters at highest surveyed moraine. Francis Peak, the tallest peak in the Absaroka Range, is to the northwest of the study area. The vegetation ranges from interspersed conifer forest and sagebrush steppe to high altitude plant communities of narrow grasses and sedges. The newer moraine deposits have yet to accumulate much soil and are colonized primarily by lichens. The temperatures at this altitude remain relatively low throughout the year and there is permanent snow in the cirque. The annual precipitation is 50 cm with mean annual temperatures of 35° Fahrenheit. To the west of the study area is an active rock glacier. During the survey, snowfield melt was observed as the artifacts were uncovered by the melting snow. The presence of large snowfields and glacial terrain created an unusual environment to conduct archaeology. Working conditions in the field were hampered not only by the rough terrain, but also the unpredictable weather. During the field session in June several snow storms, violent thunder storms and hail were encountered by the field crew.

IV) Methods:

Several methods were employed during the 2003 field season. Pedestrian survey was conducted across a large majority of the Dollar Mountain cirque. The survey was conducted with a 2 meter interval until artifact concentrations were located. These were then resurveyed at 70 cm intervals. The provenience of all located artifacts was then recorded with a Garmin Rino 110. The provenience of the artifacts found one of these sites, DM001, was then additionally recorded with a Sokkia total station. Topographic points were recorded by using an Ashtek sub-centimeter GPS. The densest artifact concentration at DM001 was recorded using a box method sampling technique, where a transect of 50 cm boxes were laid across the site. The number of flakes in each box was then recorded; tools and non-flake chip stone were documented. The raw materials were also noted. The remaining artifacts were recorded "in-field" as per the capture and release program; noting their metric attributes, raw material, and tool/debitage type.

V) Glacial Action:

Dollar Mountain Cirque is a prime example of glacially altered terrain. The level floor of Dollar Flats is a Pleistocene glacially carved erosional surface. As Wisconsin glaciers scoured out the cirques they created steep headwalls, a u-shaped profile, and this relatively flat cirque floor. Throughout the Upper Wood River hanging valleys offer evidence of repeated glaciation. Pleistocene glaciation has been correlated to the Pinedale type section in the Wind River Mountains and dated to 20,800 to 10,200 14C years before present. The cirque itself is filled with Neoglacial deposits and extensive periglacial protalus features. It is probable that these Neoglacial episodes have removed evidence of higher altitude archaeological deposits, as well as Paleoindian aged components.

VI) Geological Dating:

The highly dynamic environment of the cirque, the river valleys, and the high-altitude flats offer a unique opportunity to create potential relative archaeological chronologies based on dated geological landscape ages. The concept of geological dating and landscape evolution is not a new one, but works especially well in the study area. The archaeological record of Dollar Cirque rests on deposits of four ages. The first is the upper Pleistocene Pinedale glacial stade (20,800 to 10,200 14C years b.p.). The second is the Holocene Temple Lake stade that pre-dates the althermal and probably corresponds to the Younger-Dryas. The third is the Gannett Peak stade; a series of small advances that correspond to the "Little Ice Age" and dates between the mid-eighteenth through the mid-twentieth century. The final period corresponds to "modern" deposits and processes active in the cirque today. While no deposits were directly dated in the Upper Wood River similar geomorphic process allows correlation to the Wind River Mountains where the deposits have been directly dated. Based on the sites location in relation to the deposits, the maximum date can easily be determined. Further refinement of the chronology is possible by looking at the stratigraphic relationship of the sites. At site DM005, Gannett Peak protalus has advanced over archaeological material on a Temple Lake aged surface, providing minimum and maximum ages for the site. This also appears to be happening at site DM004 with Temple Lake material advancing over the archaeology on the Pleistocene aged surface.

Abstract

The Absaroka Mountains of Northwestern Wyoming have received limited archeological investigation. In 2003, as part of the Greybull River Impact Zone (GRIZ) project and ongoing Greybull River Sustainable Landscape Ecology Project (GRSLE), archeological survey was conducted at the head of the Wood River in Dollar Mountain and Dunrud Peak cirques and their associated moraines with elevations ranging between 3040m and 3350m. Seventeen sites were located and subjected to intensive in-field analysis. Projectile points associated with Early, Middle, and Late Archaic were recorded. Two of these sites represent historic mining activities; the remaining prehistoric sites consisted of extensive lithic scatters. A peak (Dollar Mountain) adjacent to the study area presents an as of yet undocumented source of lithic raw material with an outcrop of fine grained crypto-crystalline chert, which is found in large quantities at the sites. Dollar Mountain's unique geological history make it an isolated point source of sedimentary rock in a predominantly volcanic range. The dynamic geomorphic setting creates a landscape with surfaces that range in age from Tertiary to a few hundred years. Repeated episodes of glaciation during human occupation allow models of land surface age to be developed and applied directly to the archaeological record. A relative archaeological chronology can be developed directly from the geomorphology. This group of sites provides an opportunity to investigate a range of lithic raw material procurement, reduction, and transport activities through time in a high elevation setting.

Dollar Mountain



VII) Dollar Mountain Chert:

Dollar Mountain contains an unreported source of fine grained cryptocrystalline chert. It ranges in colors from a black through dark brown/tan into a red. The majority of the chert contains chalcedony inclusions, often quite large.

It appears outcropping at the source as well as in moraine deposits in Dollar Cirque and the Wood River extending as far as JoJo Creek and in terrace deposits extending into the Big Horn Basin.

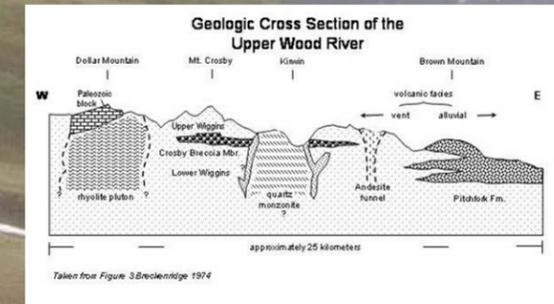


Table 1- Site Summary

Site no.	Geomorphic Setting	Formation	Relative Age (years)
DM001	Protalus Rampart	Temple Lake	8,000
DM002	Pleistocene Rubble	Pinedale	12,000
DM003	Pleistocene Erosional surface	Pinedale	12,000
DM004	Protalus Rampart	Temple Lake	8,000
DM005	Protalus Rampart	Temple Lake	8,000
DM006	Pleistocene Erosional surface	Pinedale	12,000
DM007	Protalus Rampart	Temple Lake	8,000
DM008	Pleistocene Outwash	Pinedale	12,000
DM009	Pleistocene Erosional surface	Pinedale	12,000
DM010	Protalus Rampart	Temple Lake	8,000
DM011	gravel bar	Gannett Peak	100
DM012	Pleistocene Erosional surface	Pinedale	12,000
DM013	river terrace	Temple Lake	8,000
DM014	Pleistocene Erosional surface	Pinedale	12,000
DM015	Pleistocene Rubble	Pinedale	12,000
DM016	gravel bar	Unknown	Unknown
DM017	Alluvial Cone	Unknown	Unknown
Dollar Flats	Pleistocene Erosional surface	Pinedale	12,000

VIII) Results:

Preliminary analysis of the archaeological assemblage at Dollar Mountain is summarized in Table 1. Of the seventeen sites analyzed, fifteen had a prehistoric component with thirteen of those having only a prehistoric component. Artifact scatters ranged from the Wood River to almost the highest snow free areas of the cirque. Of the five sites where the raw material was analyzed, chert from the Dollar Mountain outcrop accounted for 75% of the assemblage. At DM001, Dollar Mountain chert accounted for nearly 90% of the assemblage. Geological and geomorphological analysis allowed the creation of a rough temporal chronology of sites with datable material or diagnostic artifacts.



DM001



DM001



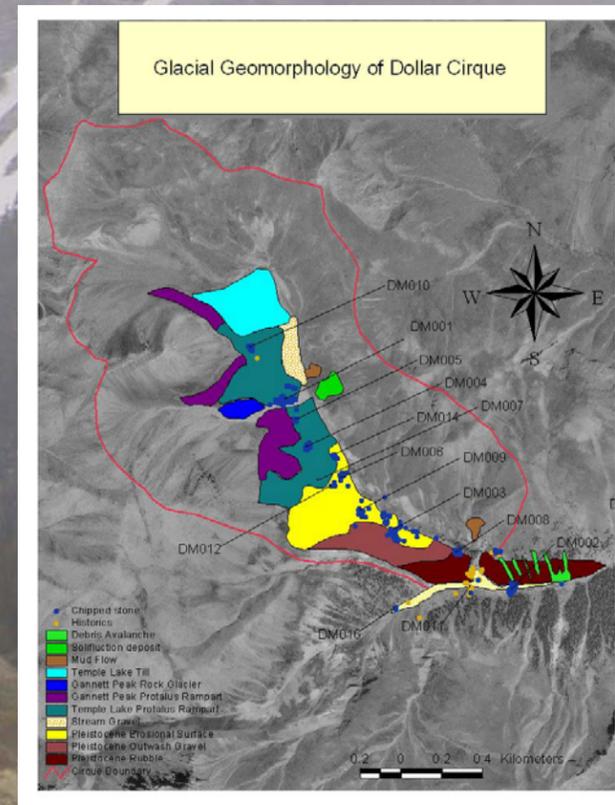
DM001

IX) Conclusion:

Prehistoric use of the study area is characterized by human occupation ranging from 2900 meters to an elevation of 3380 meters. Raw material analysis has shown the use of Dollar Mountain chert is quite extensive. The projectile points provide some chronology with diagnostic Early, Middle, and Late Archaic projectile points were found. Geological dating supports the diagnostic artifacts, with intermittent occupation of the cirque throughout the Holocene. The potential exists for documenting mobility and raw material use in this little studied region. Archaeological data such as this have the potential to contribute to broad scale analysis of the region. Already detailed studies of the glacial sequences of the Upper Wood River have been conducted. High altitude occupation and ecological data can provide models for understanding human land use patterns, over long periods of time in areas with fluctuating climates.



Early Archaic Projectile Point



Acknowledgments:

Special thanks to the crew, it wouldn't be possible without your help. Dr. Todd for all the guidance and pictures, the rest of the committee, all my reviewers, and especially the "A team" your ability to code in the hail is unparalleled.

