Archaeological Site Taphonomy: The Interplay of Biologic Activity and Geomorphic Processes

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Borrowing organisms significantly influence the physical, chemical, and biological structure of ecosystems. In archaeology, sub-surface faunal alteration is often associated with site disturbance, particularly the loss of stratigraphic integrity. While horizontal and vertical translocation of cultural material can occur, faunal activity, coupled with geomorphic processes of erosion and deposition, is capable of preserving archaeological contextual information. Research conducted in 2006 investigated the interaction of landscape features, pocket gopher (Thomomys bottae) activity, and sedimentation processes on site formation at a high altitude lithic scatter in northwestern Wyoming. To determine the extent of faunal activity on archaeological sites, test units and auger probes were excited at the site. Topography was mapped to sub-centimeter accuracy. Pocket gopher mounds were extensively documented, the sediment associated with pocket gopher activity characterized, and test unit data were analyzed. The relationship between Functional Group, geographic position, and biological activity was examined to determine the surface and sub-surface extent post-depositional artifact movement. Research assesses the overall influence of faunal roxidents on archaeological site formation and in the interpretation of patterns present in the material record.

The GRSLE project area centers on the Greybull River drainage basin, part of the Greater Yellowstone Ecosystem in northwestern Wyoming. Prior to GRSLE, all archaeological research had been conducted in the remote, little accessible tributaries of the upper Greybull watershed. To date, graduate students and field school participants from Colorado State University have surveyed over 1,100 hectares, recorded over 45,000 artifacts, and identified nearly 225 previously undocumented sites in the Shoshone National Forest and Washakie Wilderness.

The GRSLE project area is located at the junction of three unique environments: a high altitude valley, the western margin of the Greater Yellowstone Ecosystem, and a portion of the North American Seismic Zone. The site, 48PA2874 (2100m), is located in a hummocky alpine parkland overlooking the Big Horn Basin. The site is characterized by gilgai forms, low-relief, bioturbated sediments, and a landscape of gopher mounds. The site was investigated in conjunction with the pocket gopher data. A GIS based sediment movement model was employed to predict the travel path and amount of material eroded from pocket gopher mounds. The model predicts the path of erosion by comparing elevations adjacent to a given starting point. The starting point (or source cell) is linked to a number representing the number of cells (not exceeding eight). The program then uses the same method to evaluate the cell containing newly moved material. Material is moved to cells with lower elevation. The model creates a database where each raster cell is represented by a number indicating the cumulative volume of deposited material deposited in each cell.

High Elevation Archaeology: Site 48PA2874

High altitude environments are shaped by unique physical processes. To investigate the affect of biologic and geomorphic processes on archaeological sites, the Colorado State University 2006 field school conducted systematic survey and test excavations at 48PA2874.

48PA2874: Test Excavation

Two 1 x 2 m test units were excavated in the catchment area of a small alpine sag pond. Unit placement was based on topographic characteristics, artifact density, and the presence of fossil mammalian activity. Researchers hypothesized that high altitude environments at a landscape scale, resulted from a series of mass movements, potentially influencing the present landscape. To obtain information on horizontal geomorphic processes test units were strategically placed at one of the numerous shallow, steep slopes typically formed by seasonally snowmelt. One unit, T26, was located upslope of the currently dry pond, the other unit, U27 at the water slope boundary. Unit T26 contained 331 pieces of flaked stone; U27 contained 46. A Late Archaic projectile point was recovered from U27 approximately 40cm below the ground surface.

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48PA2874: Test Excavation

A sample of these inactive tunnels, those inactive, in active burrows, three active mounds, and three active burrows were selected for analysis. Active burrows contained more clay than inactive burrows; active burrows contained significantly more sand. Similarly, active burrows contained more clay than their inactive counterparts, inactive burrows contained more sand.

The analysis showed some variation in sediment movement when the percent composition was altered. Sediment becomes most concentrated (blue cells = or in map’s small, tall, the areas with the highest elevation). The predicted path of material originating from the active gopher burrows in July 2006 clearly moves toward the ephemeral pond (black area on map). Imagining slight shifts in burrow locations, which is likely to occur, the excavation units were well placed to obtain information on the sedimentation.

Future Research

1. Return to field and record elevation every 50cm on a grid spanning the pond area. (This would negate the need for intensive excavation of the pond area.)
2. Sample additional pocket gopher mounds to gain information on the size of rocks displaced and pocket gopher mound.
3. Obtain additional information on macro-scale landscape processes through continued excavation of U27.