Integrating site sampling and landscape taphonomy: bridging gaps between culture, cognition, and landscapes in the Absarokas

Katy Waechter  kwaech@live.com
Colorado State University

Abstract: Discrete disturbances such as the 2006 Little Venus Fire in northwestern Wyoming generate opportunities to integrate human occupational history with landscape changes. This study combines aspects of archaeological and behavioral ecology to investigate multiple stable states of local landscapes at prehistoric sites. Examining pre- and post-fire artifact distributions, beaver dam modifications, and fire effects provides insight into mechanisms that shape a site's record of human occupation. Knowledge of site structure is tied to various taphonomic processes that determine artifact visibility. Using the Statistical Precision Model, a prehistoric site's artifact assemblage can be used to understand cultural activities that create and structure archaeological sites.

Landscape feature and proportions of feature assemblages

Because artifacts are typically clustered around features, this study used Statistical Precision Model based on group sampling.

• Degree of proximal homogeneity of item classes affects variability of the assemblage from feature to feature.
• Variability affecting the sample can occur in sampling size (number of clusters examined), within-feature homogeneity, and cluster size.
• The most significant risks in using this model include emphasis on in-uniformity homogeneously with large clusters, as well as varying sample sizes skewing perceived abundance and heterogeneity of clusters.

Taphonomic processes that alter understanding of site structure at 060-07

Background:

Systematic and non-systemic survey. GRISLE 2008 crew recorded artifact assemblage at 060-07 using electromagnetic distance measure (~2 mm accuracy). Artifactual classes include chipped stone, glass beads, metal, and bone. Chipped stone showed the most variability and diagnostic artifacts, and occurred in clusters of various densities and exhibit distinct patterns within the site.

Since recording of surface artifacts was not in random and arbitrary samples, but rather throughout the site, the Statistical Precision Model presents the best representation of data and estimation of variance and content. Group sampling and survey results tend to minimize effects of aggregation, but the sample size at 060-07 of 1,698 artifacts overcomes this obstacle and gives appropriate expected variance of estimates (p=1-p)=1-

While changing recorder perceptions of a site are immeasurable, it is necessary to consider taphonomic processes that shape understanding. Without subsequent exposure by fire, data from the previous site recording would have been unable to utilize the SPM (<n). Had soil deflation not occurred, non-artifactual objects, mud, root trenches and landscape features, and diagnostic lithics would not be part of site 060-07.

Biotic agents of change: Castor canadensis

• Beaver dam shapes depend on the strength of a stream's current: dams in stronger currents are curved, with the convexity pointing upstream (towards the spring in this case).
• Beaver dams influence the distribution, stock, and availability of ecological elements by shifting pathways and element storage from vegetation to sediments and soils (Naiman, 1994).
• Large-scale beaver pond and stream relationships influence the permeability of geomorphically boundaries and are critical in controlling immediate resource distribution (Schlosser, 1995).
• Dams may function as creators of wetlands, grazing meadows, forests, bottom land, and to promote dentrification.

Fire as a geomorphologic mechanism

• Previous GRISLE studies have focused on direct effects of the 2006 Little Venus Fire in northwestern Wyoming (Knapp 2006). Fire, profoundly influencing geomorphic processes, also functions as a chemical process by removing moisture and organic content from the soil.
• Fire-induced changes in sediment size and absent vegetative cover dramatically increase microtopographic variation, specifically through soil deflation at 060-07.
• The illustrated levels of deflation highlight areas of the landscape more prone to deflation, and higher surface visibility. It is expected that more intensely deflated areas exhibit higher artifact counts.
• Soil deflation data were taken at site 060-07 on each archaeological feature, recording measurements at the cardinal directions as well as minimum and maximum deflation for those directions.

Discussion:

As sites have different structural features in terms of stratigraphic and depositional history, their material patterns vary in density. Site sampling limits observed elements and densities, influencing perception of site structure and function. High artifact densities and substantial features indicate intensity of past occupation (Bamforth, 1988). Artifacts can be measured, counted, and densities computed, but since measurable significance of landscape features is not often clear, they must be roughly gauged on a relative scale to assemble. Various explanations and models are expected, but archaeologists can still use relatively simple statistics to address important issues in archaeology.

Based on parameters of Statistical Precision Model (Nance, 1981), current analyses of site-specific features fail to show a relationship between homogeneity in clusters and the selected taphonomic processes in surface visibility. Surface visibility, as a paramount value, was achieved through a discrete event, and did alter the total representation of material culture. However, the inherent variability between features is indicative of further taphonomic processes at work and the possible influence of culture and organization on site structure.

Site sampling is a primary component of assemblage representation. The ability to represent assemblages ought to be actively incorporated into survey design and methods. Using site features in lieu of grid lines and the assemblage documented in 2008, clustered sampling is appropriate to obtain precise estimates of item populations on a site. The redundancy exhibited between features is paralleled by item class aggregation and helps to point to correlations in feature assemblages with very large sample sizes. These patterns exhibited by statistical procedure point more clearly to the processes that control site visibility.

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