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Regional Archaeological Pattern Recognition: Examining Effects of Site Definition

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GRSLE, Inc
GREYBULL RIVER SUSTAINABLE LANDSCAPE ECOLOGY

● A prehistoric site is 15 or more spatially associated artifacts within a **30 meter** diameter area (site may be much larger than 30 meters in diameter).

● At least 10 artifacts of a single class (e.g. debitage, ceramics, glass, cans) within **10-meter** diameter area, except when all are from a single source (e.g. single pot, bottle).
● At least 15 artifacts of at least two classes within a **10-meter** diameter area.

When developing large, essential archaeological datasets, such as SHPO site records, one key attribute is defining what constitutes a basic archaeological unit—the site. To explore potential unforeseen consequences of these definitions, we partition a single large artifact-based dataset from the Greybull River Sustainable Landscape Ecology (GRSLE) project into sites using several different SHPO criteria. Because the underlying artifact distributions remain constant, differences in resulting site numbers, areas, densities, contents, and spatial patterning can be attributed to the definitions applied rather than differences in the archaeological record itself. One of the more surprising results is that, even with the same surface artifact data, different site definitions can suggest very different past behavioral interpretations. The results provide a basis for considering how state-specific recording standards may influence apparent archaeological patterns and whether interstate and regional comparisons based on site inventories reflect recent administrative classification decisions rather than past human behavior.

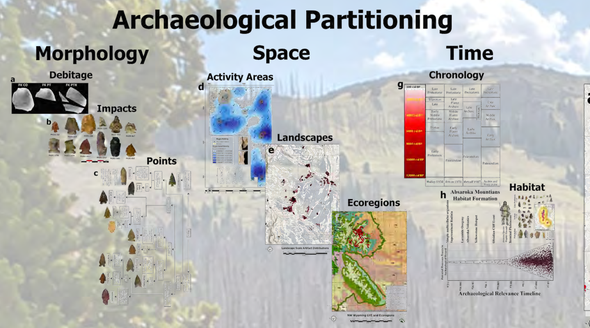


Figure 1. Archaeological partitioning: examples of dividing continuous archaeological variation into analytical units for description and interpretation. Archaeologists routinely partition continuous archaeological variability into discrete analytical categories that facilitate comparison, interpretation, and hypothesis testing. Examples shown here illustrate partitioning across three fundamental dimensions of archaeological research. **Morphology** includes classifications such as lithic debitage (a), impact fractures (b), and projectile point forms © (Reckin and Todd 2019: Fig. 2) into typological categories. **Space** includes the partitioning of artifact distributions into (d) activity areas, archaeological sites, and landscapes, and broader environmental or ecological regions. **Time** includes subdividing continuous archaeological records into chronological periods, environmental histories, and habitat reconstructions. Although these analytical partitions provide essential organizational frameworks for archaeological research, they are methodological constructs rather than intrinsic properties of the archaeological record. The present study examines one form of archaeological partitioning—the definition of archaeological sites—to evaluate how alternative methods for partitioning identical artifact distributions influence archaeological interpretation. The present study focuses on one of archaeology's most fundamental analytical partitions—the archaeological site—to evaluate how alternative methods for partitioning identical artifact distributions influence archaeological interpretation.

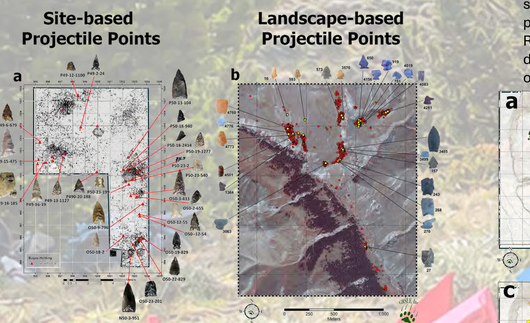
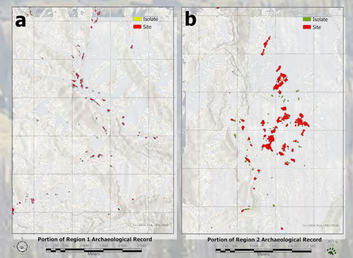


Figure 2. Individual artifact recording at excavation and landscape scales. (a) Individually mapped projectile points from the Bugas-Holding excavation illustrating the standard archaeological practice of preserving precise spatial provenience for subsequent behavioral and spatial analyses within an excavation. (b) Individually mapped projectile points from a GRSLE landscape inventory illustrating application of the same recording philosophy at the regional scale. Although differing by several orders of magnitude in spatial extent, both examples preserve individual artifact provenience prior to analytical partitioning, allowing multiple alternative interpretations of spatial organization rather than committing observations to a single recording framework during field documentation.

Copy of Poster available:

http://grsle.org/Conferences/2026_GRSLE/Todd_PAC_2026.pdf



c

INVENTORY	ISOLATE	SITE	Total
Region 1	3376	968	4344
Region 2	973	568	1541
Total	4349	1536	5885

d

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	125.290	1	<.001		
Continuity Correction	124.533	1	<.001		
Likelihood Ratio	119.854	1	<.001		
Fisher's Exact Test				<.001	<.001
N of Valid Cases	5885				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 402.20.
* Computed only for a 2x2 table

Figure 3. A methodological thought experiment. (a) Portion of the archaeological record from Region 1 showing archaeological sites and isolated occurrences. (b) Portion of the archaeological record from Region 2. (c) Summary of site and isolate frequencies for the two regions. (d) Statistical comparison of site and isolate frequencies. The apparent differences between the two regions suggest contrasting patterns of archaeological land use and settlement organization. Region 1 GRSLE dataset partitioned using the Utah SHPO site definition, and Region 2 partitioned using the Wyoming SHPO site definition. Same data, different interpretations based on how it is partitioned.

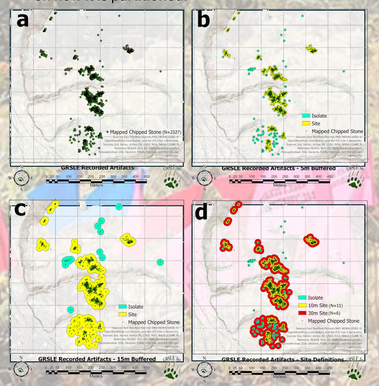


Figure 4. Illustration of the effects of Utah and Wyoming administrative site definitions on the partitioning of a common archaeological record. (a) Distribution of 2,327 individually mapped chipped stone artifacts from GRSLE. (b) Utah classification using 5 m radius buffers around individual artifacts (10 m maximum spacing between connected artifacts). (c) Wyoming classification using 15 m radius buffers (30 m maximum spacing). We merge overlapping buffers and apply minimum artifact-count thresholds to identify sites and isolates. (d) Comparison showing multiple Utah-defined sites nested within larger Wyoming-defined sites. Alternative definitions produce different archaeological units and potentially different interpretations of landscape use.

1. Archaeological partitioning

Archaeology has fundamentally developed as a discipline of partitioning. From field recording to laboratory analysis and regional interpretation, we divide continuous variability in morphology, space, and time into analytical units they can document, compare, and interpret (**Figure 1**). These partitions are essential to archaeological research, but they are analytical constructs rather than intrinsic properties of the archaeological record.

Every partition involves decisions about which observations to group and where to place analytical boundaries. Although these decisions facilitate description and interpretation, they also shape which patterns we can recognize and what information remains available for subsequent research. The central challenge is distinguishing **observations from analytical classifications and interpretations**.

GRSLE addresses this challenge by deliberately separating **observation from interpretation**. Archaeological evidence is initially documented at the finest practicable resolution, including individual artifact locations and attributes. Researchers can then apply alternative partitioning procedures to the same observations, allowing them to evaluate the effects of partitioning on archaeological pattern recognition independently. Previous GRSLE research has examined partitioning of morphological, spatial, and temporal variability (Todd and Dalmas 2026).

This distinction also separates **methods from methodology**. Methods are the procedures used to classify and partition archaeological observations; methodology involves systematically evaluating those procedures and their consequences.

This study is methodological rather than an attempt to define another site. It examines how alternative administrative definitions partition identical artifact distributions into different archaeological sites, potentially producing different site frequencies, densities, spatial patterns, and interpretations. **The fundamental question in this poster is whether observed regional archaeological differences reflect variation in the archaeological record or variation in how that record has been partitioned.**

2. From off-site archaeology to artifact-based landscapes

The recognition that archaeological landscapes contain continuous artifact distributions rather than naturally bounded sites is not new. Foley (1981), in *Off-Site Archaeology*, challenged the assumption that sites constitute archaeology's fundamental observational units. Instead, he advocated investigating artifact distributions across entire landscapes. However, the technological limitations of the time made systematic, regional-scale recording of individual artifacts difficult and labor-intensive.

Excavation archaeology has long recognized the importance of preserving individual artifact provenience for subsequent spatial and behavioral analyses. Yet this same observational principle has rarely been extended to regional landscapes, where artifacts are commonly aggregated into administratively defined sites during initial recording (**Figure 2**).

Advances in satellite positioning, GIS, and spatial analysis now make artifact-level landscape documentation practical. The GRSLE project applies these technologies to extensive archaeological landscapes of the Greater Yellowstone Ecosystem, preserving individual artifact observations independently of subsequent site definitions.

These developments make it possible to empirically investigate a fundamental question implicit in Foley's work: **How much of archaeological pattern recognition reflects past human behavior, and how much reflects the methods used to partition the archaeological record?**

Three principles guide this investigation:

- **Record observations at the highest practical spatial resolution.** Preserve individual artifact locations and attributes as primary archaeological observations.
- **Separate observation from interpretation.** Document archaeological evidence before aggregating observations into interpretive units such as sites.
- **Treat analytical partitions as hypotheses.** Site boundaries, typologies, and other classifications should be open to comparison, testing, and revision rather than accepted as intrinsic properties of the archaeological record.

Together, these principles provide the foundation for evaluating how alternative SHPO site definitions transform identical artifact distributions into different archaeological inventories.

3. A methodological thought experiment

Consider two archaeological inventories from adjacent mountain regions of western North America. Region 1 contains substantially more sites and isolated occurrences than Region 2, with statistically significant differences in their relative frequencies ($\chi^2 = 125.29$, df = 1, $p < 0.001$; **Figure 3**).

Based on these results, archaeologists might reasonably infer different prehistoric settlement and land-use systems. Region 1 could suggest dispersed, short-term occupations, while Region 2 might indicate fewer, larger, and more concentrated activities. Such interpretations would appear consistent with the recorded archaeological patterns.

But the apparent differences do not necessarily reflect differences in past human behavior.

Both inventories draw on the same GRSLE artifact-based recording system but used different SHPO site definitions: Utah for Region 1 and Wyoming for Region 2. These differences show how recording criteria can shape archaeological pattern recognition and potentially confound regional comparisons.

Are we documenting differences in the archaeological record—or differences in how we define it?

4. Administrative Partitioning of Archaeological Landscapes

Throughout western North America, archaeological surveys partition continuous artifact distributions into sites using administrative criteria established by State Historic Preservation Offices. Although intended to standardize recording, these criteria differ in artifact thresholds and spatial relationships, potentially producing different archaeological inventories from identical observations.

Figure 4 compares Utah and Wyoming site definitions applied to the same GRSLE artifact distribution. Utah's smaller spatial criterion produces numerous discrete clusters, whereas Wyoming's larger criterion aggregates many of these into more extensive sites. The underlying archaeological observations remain unchanged; only their administrative partitioning differs.

These differences raise a fundamental methodological concern: **regional comparisons of site frequencies, densities, and spatial organization may reflect administrative classification criteria as much as variation in past human behavior.**

To examine this further, Figure 5 extends the comparison to three alternative site definitions, including an earlier Wyoming criterion that required only three artifacts rather than the current fifteen. This provides an opportunity to evaluate how changes in administrative thresholds influence archaeological pattern recognition, even within a single jurisdiction.

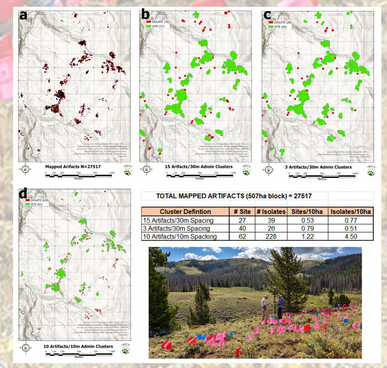
5. Administrative Definitions and Archaeological Interpretation

Applying three alternative site definitions to the same GRSLE landscape produces markedly different archaeological inventories (**Figure 5**). Site counts range from 27 to 62, while isolated occurrences range from 26 to 228. These differences arise entirely from changes in classification criteria, not changes in the underlying archaeological observations. Importantly, differences occur not only between states but also between historical and current definitions within Wyoming. Consequently, regional and temporal comparisons based on site inventories may reflect administrative practices rather than differences in past human behavior.

6. Conclusions

Are we documenting differences in the archaeological record—or differences in how we examine it?

Before interpreting spatial patterns in the archaeological record, we need to understand how our methods produced them. Recording sites rather than individual artifacts can mean **recording interpretations rather than observations**. Preserving artifact-level data lets us test, compare, and revise alternative classifications without losing the underlying archaeological evidence. This separation of observation from interpretation provides a foundation for more rigorous archaeological comparisons across regions, recording systems, and time. The methodological explorations presented here provide one approach to better understanding the implications of our partitioning methods.



Cluster Definition	# Site	# Isolates	Sites/10ha	Isolates/10ha
15 Artifacts/30m Spacing	27	39	0.53	0.77
3 Artifacts/30m Spacing	40	26	0.79	0.51
10 Artifacts/10m Spacing	62	228	1.22	4.50

Figure 5. Effects of alternative administrative site definitions on a common archaeological landscape. (a) Distribution of 27,517 individually mapped GRSLE artifacts across 507 ha. Site classifications using (b) 15 artifacts/30 m (current Wyoming), (c) 3 artifacts/30 m (earlier Wyoming), and (d) 10 artifacts/10 m (Utah-style). The table compares resulting site and isolate frequencies and densities. The photograph illustrates artifact-level field documentation.

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