

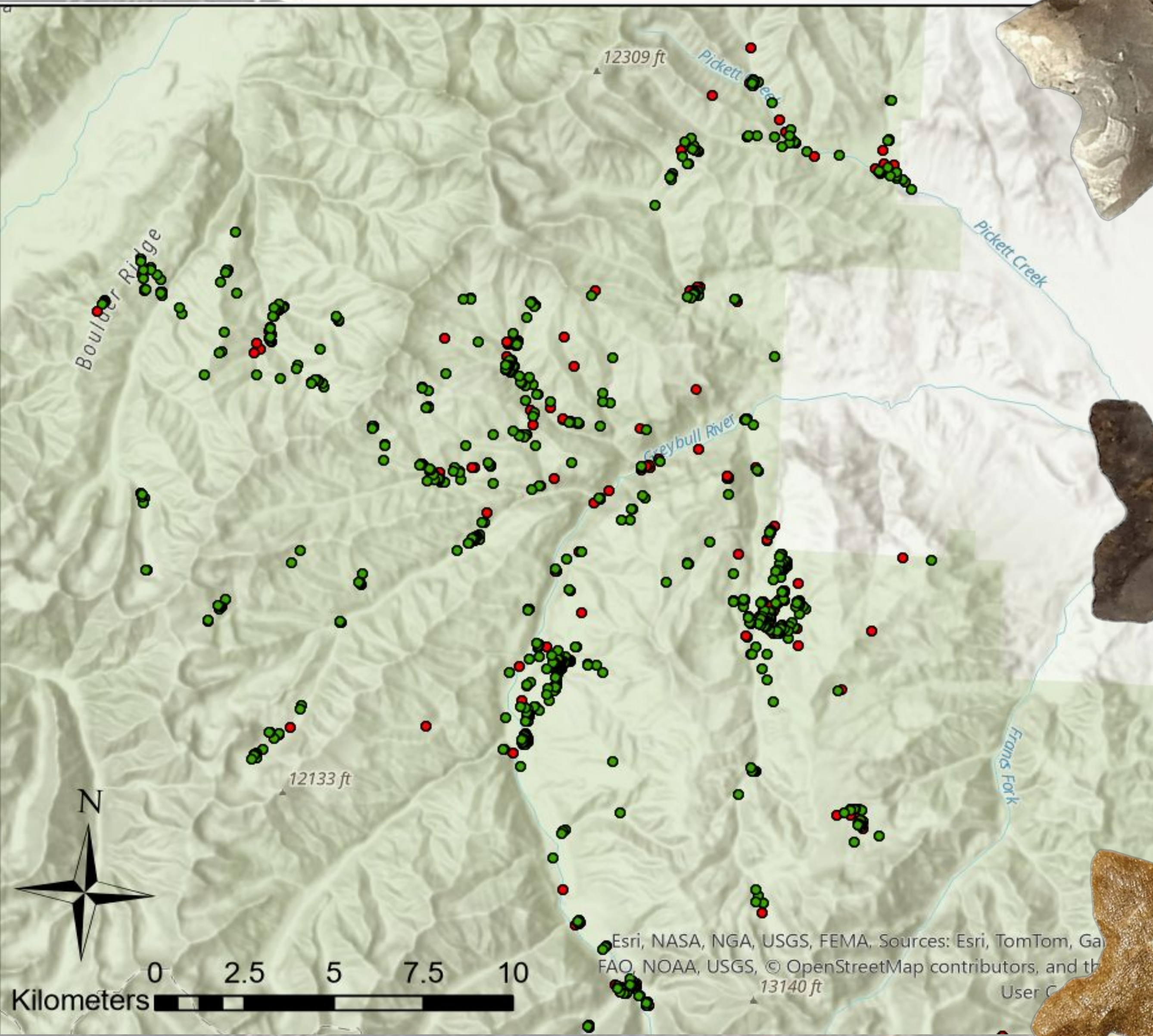
Designing Research with Little Big Data: Lithic Material Studies in Northwestern Wyoming

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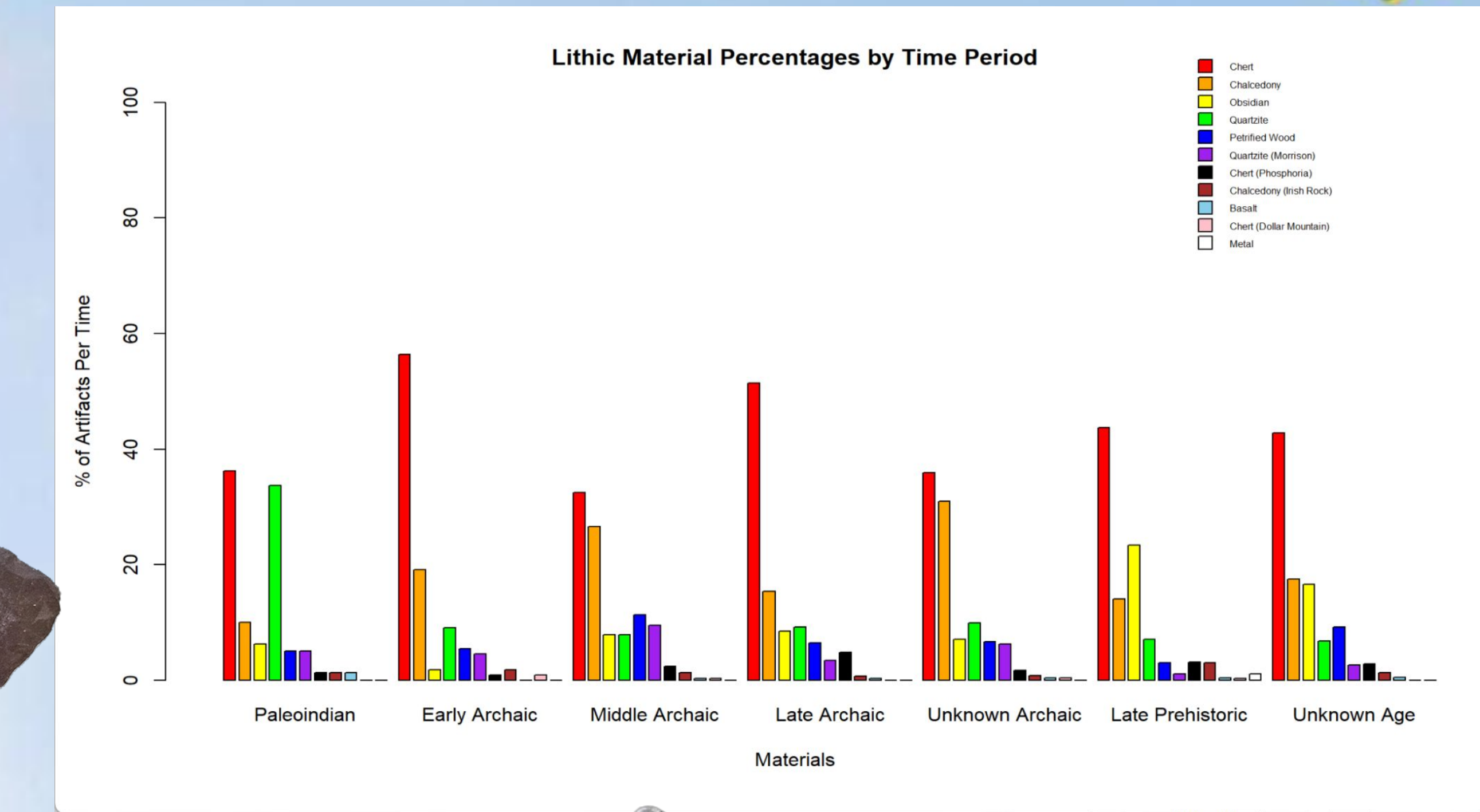
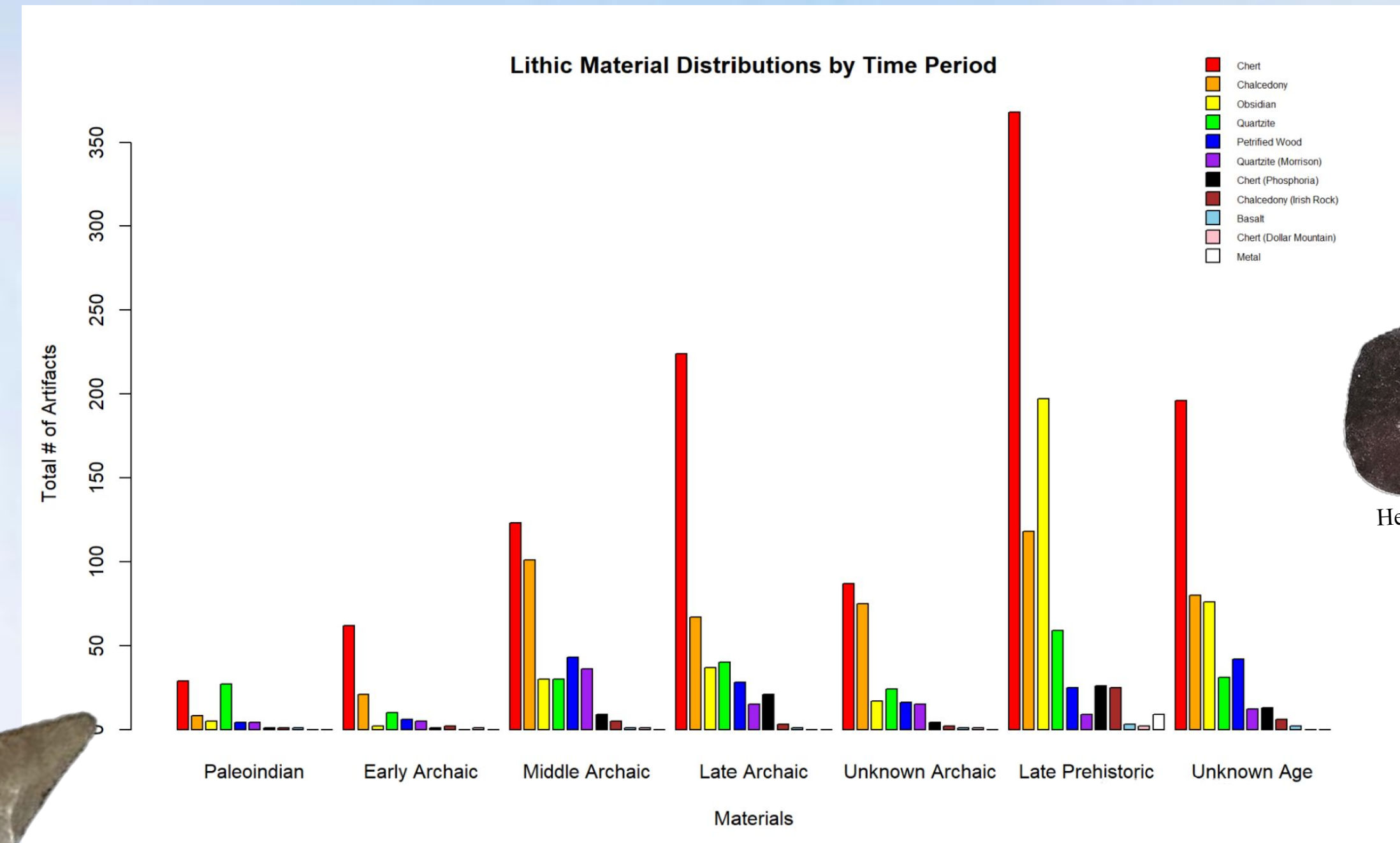
Abstract

The GRSLE Project has systematically documented over 250,000 artifacts in northwestern Wyoming since 2002, providing an exceptional foundation for regional-scale research. This poster outlines a new study investigating lithic raw material diversity across Paleoindian, Archaic, and Late Prehistoric periods (1) using temporally diagnostic projectile points from the cumulative, artifact-based database. We introduce the project design, methods, and goals, emphasizing how ArcGIS and RStudio can be used to analyze raw material distributions across time. We aim to evaluate whether increasing population densities in the region (2) led to greater reliance on local stone resources, or alternatively stimulated broader interaction and exchange networks reflected in more diverse lithic assemblages. This poster presents the research framework and early stages of analysis, setting the stage for future results and interpretation.

Initial Analytics: Spatial Mapping



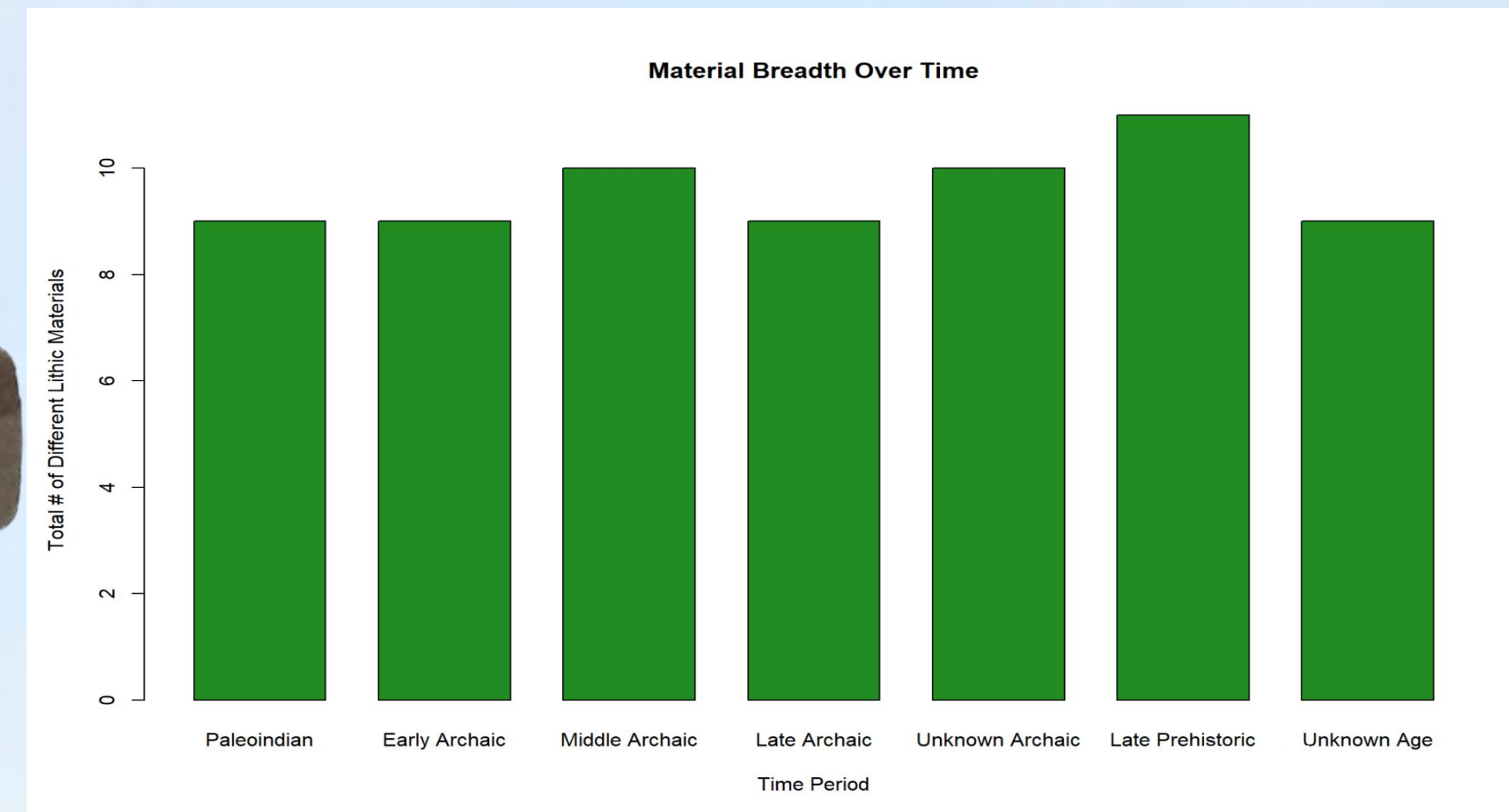
Expanding Relationships in Material Use



Using a percentages based approach is best for cross-comparison data. Here we can see how there is a relatively large amount of nonlocal quartzite use in the Paleoindian period, a large amount of local chalcedony use in the Archaic periods, and a large amount of non-local obsidian use in the Late Prehistoric. This supports ideas that increased migration costs influenced material choices within the region.

Using numeric counts of materials ~ time, comparisons between time periods can be parsed out, but separating relative differences between materials is skewed by preservation bias.

Dead Ends in Data Analysis



Sometimes data analysis leads to dead ends. I initially hypothesized there would be significantly fewer types of materials in the archaic periods (based on locality and access graphs), however, that doesn't seem to be the case.

Future Research

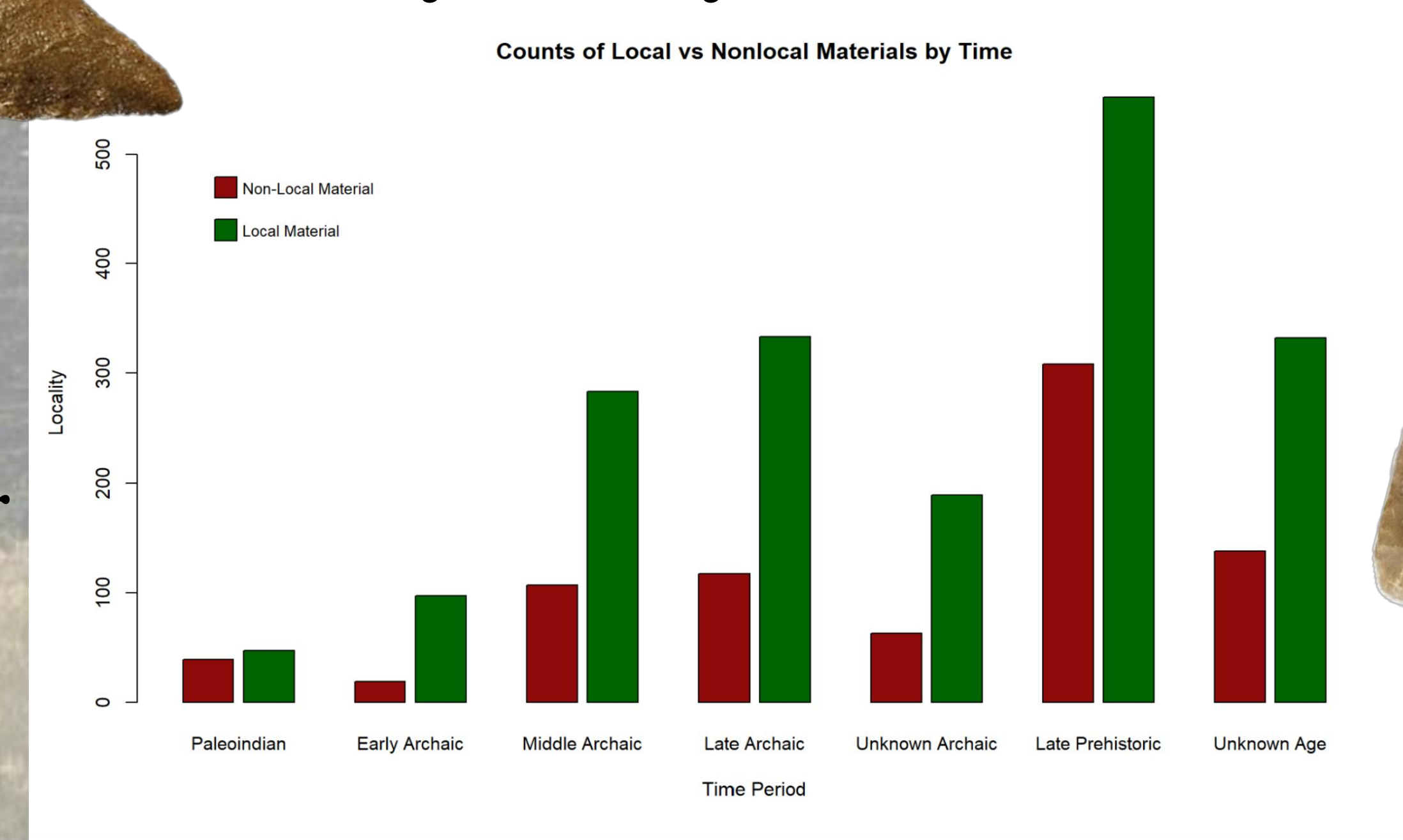
These initial findings all suggest that as populations increased over time, that a distinct drop in non-local material use occurred after the Paleoindian period. Afterwards, non-local materials began to steadily become more frequent until they jumped back up primarily due to obsidian use in the late prehistoric.

Following this preliminary analysis, I want to compare how this relative frequency data can be related to the costs of material procurement. This involves finding the geologic sources for identifiable materials (XRF analysis of collected obsidian + quarry data for non-local materials like chert), along with calculating the energy costs required for indigenous peoples to travel to those sources. This will be done using least cost path analysis using slope and distance to calculate total caloric cost.

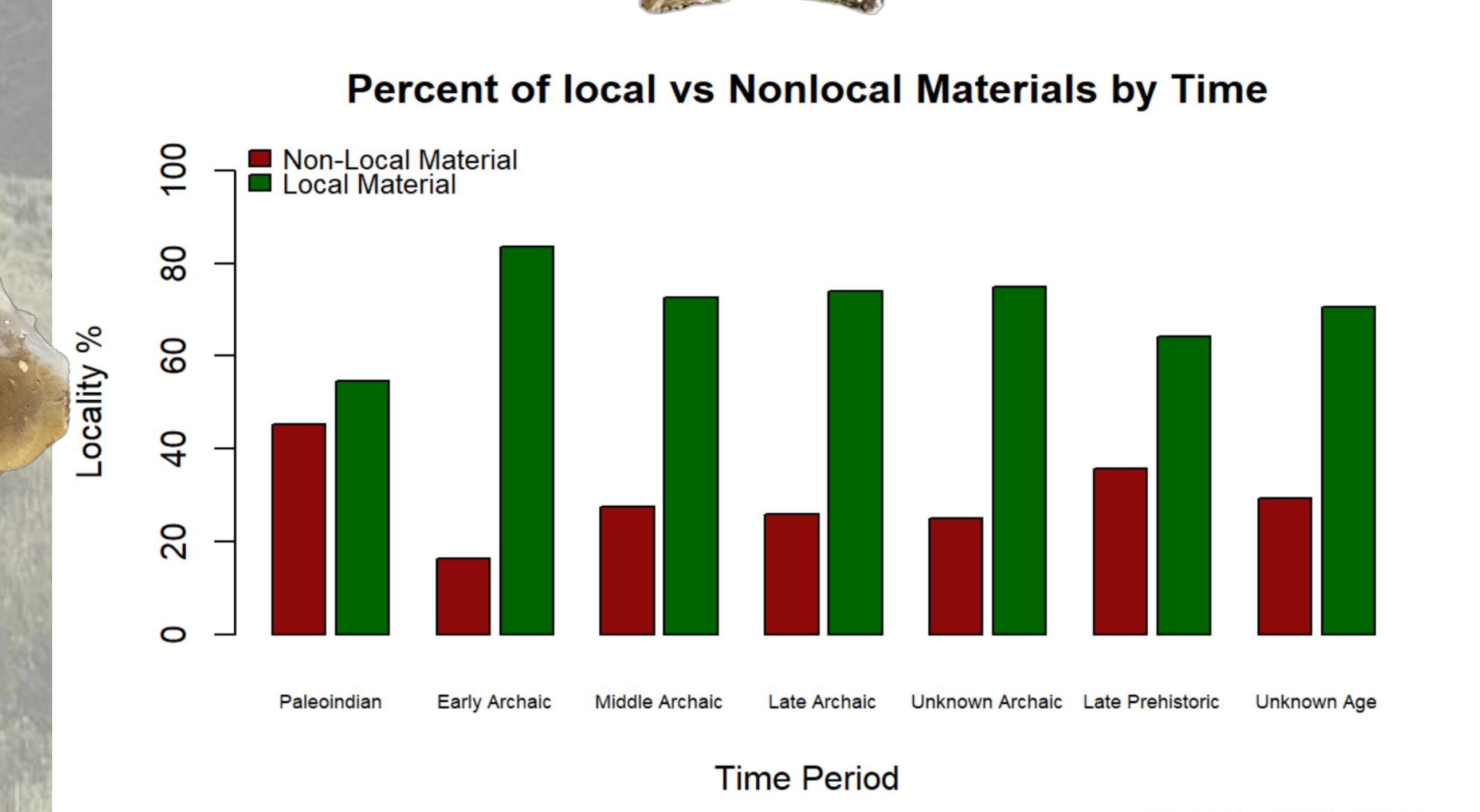
I would like to thank GRSLE inc. for the resources to do this analysis, along with the wonderful support of GRSLE team 2025, I am eager to present the conclusion of this research in future conferences.

We observe that in the Paleoindian time period, more non-local material was being used compared to any future time. Additionally, some factor in the Archaic prevented indigenous peoples from having as much access to non-local materials. The Late Prehistoric has a rise in non-local use, but still not to the extent of the Paleoindian era.

Locality Analysis For Tools



Similar to the material type ~ time period plot. Any observed differences in local vs non-local are skewed by preservation bias. Percentages (see right), are much better for showing increased reliance on local material past the Paleoindian period.



Digital Tools



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References:
(1) Reekin, Rachel & Todd, Lawrence. (2019). Refining chronology for surface collections: A new adaptation of morphological dichotomous keys for the Plains Typology and the Greater Yellowstone Ecosystem. Plains Anthropologist. 65. 1-29. 10.1080/00320447.2019.1611022. (2) R.L. Bettinger, Prehistoric hunter-gatherer population growth rates rival those of agriculturalists. Proc. Natl. Acad. Sci. U.S.A. 113 (4) 812-814. https://doi.org/10.1073/pnas.1523806113 (2016). (3) R Core Team (2025). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/