A Preliminary Fabric Analysis on the Spatial Distribution of Artifacts from the Ryan-Harley Site (8JE1004)

Jordan Pierce
Department of Geography
College of Geoscience
Texas A&M University

Abstract

Entering the Holocene shortly after the Last Glacial Maximum (~15,000 BP), it is believed people began migrating into North and South America from the eastern hemisphere using a land bridge formed over what is now known as the Bering Strait (Kunz and Richard, 1994). As the migration continued southwards in search for wild game and warmer climates, people began to break into distinctive groups and settled into regional environments. This regionalization can be observed by the objects and materials left behind which take the form of stone projectile points, beads, pottery and other tools (Hightower-Langston, 2003). These artifacts are used to represent the cultural group and discern them from others. Within the United States, the point style connected to the group known as Suwannee has only been found across the Southeast region, however, only twice have they been found intact within geological context. This report will present the spatial analysis of the distribution of artifacts found at one of these sites: the Ryan-Harley site (8JE1004). The site itself is believed to have been a temporary occupation for these nomadic hunters based on the large collection of stone and bone artifacts which appears to have been a prehistoric midden, the large assemblage of specialized stone tools, and artwork in the form of stone beads. Due to the proximity of the river, the site is now inundated by the anabranching fluvial environment and warrants further research on the stratigraphy of the site

(figure 3). This report's purpose is to analyze the spatial distribution, orientation, and relative proximity of artifacts and to provide graphical representations of the site in order to confirm or reject the standing hypothesis surrounding the site.

Introduction

The Ryan-Harley site (8EJ1004) is located in Jefferson County, Florida, within the Wacissa River (figure 1). The general area was located in previous studies when artifacts were found by local fisherman and archaeologist hobbyist (Balsillie et al., 2006). The area contained what appeared to be a prehistoric midden, a collection of various bones and artifacts resembling a trash pile. The most recent study conducted by Mr. Smith and Dr. Waters started by examining the general area using sediment cores to create a history of stratigraphy to determine the depth at which artifacts relating to the assumed period of time would have be deposited. Using a GPR system installed in an amphibious craft, field researchers were able to scan the terrestrial and marine environment to observe potential locations to excavate. This was done by creating a line-transect across the width of the river and onto land and using radar frequencies of 200 kHz every 10 cm, and 100 mHz every 1 m. With the use of proprietary subsurface modeling software, cross-sectional views of the site were created (figure 7) which successfully lead to a specific location to be excavated. The site itself is located on the northwest perimeter of an island located in the anabranching river (figure 3). The site is a mere 20 m long and is completely submerged underwater. Using SCUBA equipment, researchers with the Center for the Study of the First Americans were able to excavate the site, extracting 1326 artifacts, the vast majority of which were classified as either lithic flake fragments or bone.

Methodology

The overall objective of this research project was to provide evidence for, or against the null hypothesis, which stated:

- **The Ryan-Harley archaeological material is culturally deposited.**

The alternative hypothesis being:

- **The Ryan-Harley material is an accumulation resultant of geologic or geomorphologic processes.**

Although fabric analysis of artifacts is rarely used in underwater archaeology, or terrain archaeology for that matter, it was believed that this investigation would benefit in providing evidence for the hypotheses. GIS fabric analyses were conducted on the location, strike, and dip of the artifacts. For this analysis, dip was the angle the artifact was found in relative to a horizontal position (0-90^{o}) and strike was the direction of the dip (0-360^{o}) while following the assumptions that, "*If the artifacts are resultant of natural processes, they would bear evidence of deposition in the form of consistent strike and dip among artifact and material classes"* (Johnson, et al., 1981, Bertran and Texier 1995, Briggs 1977, Dibble and Lenoir 1995), and, *"If the material is all cultural in origin, the strike and dip would be more randomly distributed between artifacts and material classes*" (Dibble, et al. 1997).

During excavation, all artifact's positions relative to a local site datum were recorded; the z-coordinate representing the depth below water level. The artifact's descriptions, general comments, strike and dip angles were also recorded in paper format which were later archived

and saved to a digital format, and finally transcribed onto digital spreadsheets. Using ArcCatalog, each spreadsheet was converted into a point shape-file representing each individual artifact in its correct spatial position relative to the local site datum. To translate the point's locations from the local datum to the WGS-84 geographic coordinate system, each record's latitude and longitude were corrected arithmetically using the ArcMap field calculator. Artifacts were classified first based on their description which was recorded during the excavation, then further sub-classified depending on if they had dip and strike values. The research project also required multiple reference maps of the site, the spatial distribution of artifacts, digital elevation models, and other representations of the field data to help enhance the overall awareness of the spatial attributes involving the site and artifacts.

Results

Looking at the classification map (figure 2), the top half of the map show shows the major classes of artifact types, with each type being represented by a different color. It can be seen that there appears to be no significant pattern amongst the artifacts based solely on the classification type. Note that the vast majority of the artifacts are either lithic flake fragment or bones; because of this, the rest of the study only focused on these classification types. The bottom half of the map represents the same information as the prior map, however excluding all types other than lithic and bone. Viewing just the lithic and bone artifacts, again, there appears to be no significant pattern based on the types. However there does appear to be a density of artifacts to the north and a sparsity of artifacts to the south of the site. We hypothesize that this

density is occurring due to post-depositional movement caused by the downward sloping of the site itself. Figure 7 shows the ground penetrating radar data that was obtained in-situ using a GPS system installed in a river kayak. It can be seen that the northern portion of the site is higher in elevation, and slopes downward, southward. We concluded that the classification of artifacts alone cannot provide enough information on the depositional process to support or reject the null hypothesis.

The strike map shows two different maps (figure 4), each representing the same location and information, however the top representing the bone artifacts, and the bottom representing the lithic flake fragments. The maps both display the artifacts as arrows which represent the strike angle they were found at during excavation. Each arrow is colored based on a sequential color scheme which represents the depth in the water column the artifacts were found at during excavation. Observing the pattern based on color, the map clearly demonstrates what was hypothesized before, with the high density of artifacts being located in the deeper portion of the water column, while the scarcity of artifacts being located in the shallow portion of the water column. Pertaining to the arrow directions representing strike angle, it can be seen by looking at just the bone, or just the lithic flake fragments, or both, there does not appear to be a clear, definitive pattern amongst the angles. If a natural process were to have deposited these artifacts, it would be expected to have deposited them in a somewhat uniform pattern, however they appear to be oriented rather sporadically.

The dip angle map (figure 5) shows the same location as the former map, however artifacts are symbolized by dots which are colored using a sequential color scheme representing the severity of dip angle. As before, looking at just the bone, or just the lithic flake fragments, or

both, there does not appear to be a pattern exhibiting deposition by a naturally occurring process. Instead the artifacts show dip angles that are completely random with no significant pattern based on location of proximity. The Compass-Rose diagram (figure 6) also illustrates the dip (top) and strike (bottom) angles of artifacts. Each corner of the polygon represents a value of of either dip or strike, with the line showing the frequency of that value. The dip angle values appear to be almost completely random, while there appears to be a majority of artifacts whose strike angle is 0 degrees. We believe this can be explained by the post-deposition of artifacts that slowly move down the site's slope due to gravity.

Conclusion

Based on the data obtained by from the excavation, this preliminary fabric analysis indicates that artifacts obtained during the summer excavation of 2015 exhibit a fairly random distribution with no significant patterns in the classification, strike, or dip angle representing a natural origin. As stated before, post-depositional processes can be noted, suggesting that not all of the artifact's locations were in their primary context. We believe that this preliminary analysis of artifacts provided evidence for the null hypothesis, that the artifacts at the Ryan-Harley site were culturally deposited, falsifying the alternative hypothesis of a natural process origin. By providing strong evidence for the null hypothesis, Smith and Waters are continuing with their research to radiometrically date samples of the bone artifacts to provide a timestamp for the deposition of the lithic artifacts. The time estimate for these artifacts will be the very first time estimate for the Swuannee Paleo-Indian group, officially marking the group's location on the pre-historic timeline.

Future

Future analyses will expand upon these preliminary results, including an examination of the distribution of artifacts by size, weight, and clast size. Spatial statistics will also be utilized to study the distribution of materials based on various attributes to see if any trends exists that could not be discerned with only graphical representation of the site. If the assumption is correct in that the density of artifacts located on the northern portion of the site is due to post-depositional processes, it is expected to see the a trend based on the weight of the artifacts. The artifacts will also be examined for evidence of wear indicating fluvial transport during cataloging which would help improve the understanding of depositional method.

References

Kunz, Michael L., and Richard E. Reanier 1994. "Paleoindians in Beringia: evidence from arctic Alaska." *Science* 263.5147:660-662.

Hightower-Langston, D., 2003. "The Native American World." John Wiley & Sons.

Balsillie, J.H., Means, G.H. and Dunbar, J.S., 2006. "The Ryan/Harley site: Sedimentology of an inundated Paleoindian site in north Florida." *Geoarchaeology*, *21*(4), pp.363-391.

Johnson, T.C., 1981. "Origin of sedimentary rocks (Second edn.)." H. Blatt, G. Middleton, and R. Murray, Prentice-Hall, Inc., 1980. *Earth Surface Processes and Landforms*, *6*(1), pp.97-97.

Bertran, P. and Texier, J.P., 1995. "Fabric analysis: application to paleolithic sites." *Journal of Archaeological Science*, *22*(4), pp.521-535.

Briggs, D.J., 1977. "Sediments". London: Butterworths.

Lenoir, M., 1995. "The Middle Paleolithic Site of Combe-Capelle Bas (France)." (Vol. 91). UPenn Museum of Archaeology.

Dibble, H.L., Chase, P.G., McPherron, S.P. and Tuffreau, A., 1997. "Testing the reality of a" living floor" with archaeological data." *American Antiquity*, pp.629-651.

Cassidy, N.J., 2009. "Ground penetrating radar data processing, modelling and analysis." *Ground Penetrating Radar Theory and Applications*, pp.141-176.

Appendix: Figures:

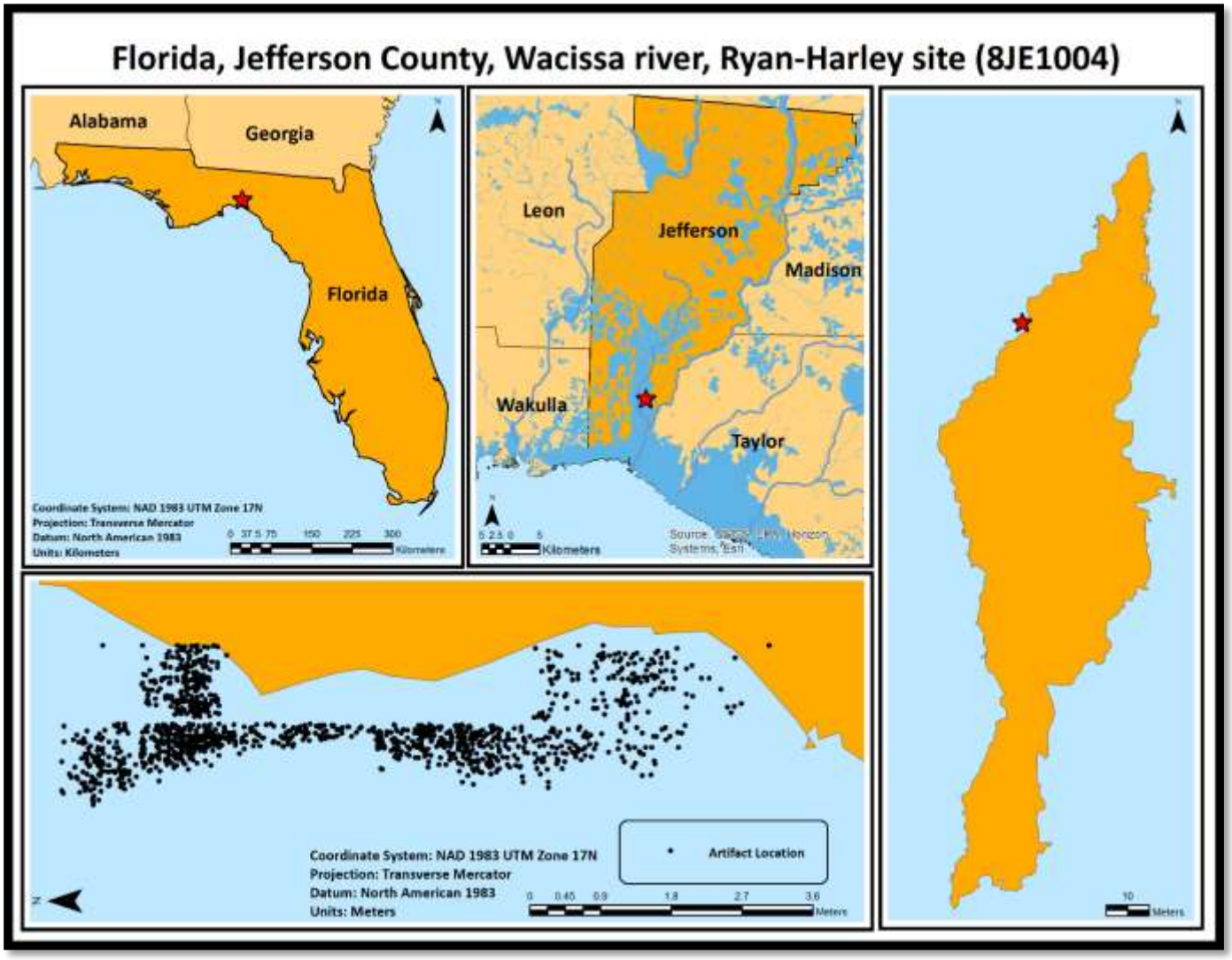

Figure 1 – Multiple views of the site location relative to the state, county, and local scale. State and county polygons, as well as the US Rivers and Streams data were obtained from the U.S. Census Bureau and USGS, respectively. Artifact data points and Island polygon were obtained by using handheld GPS receivers during field excavation of 2015. The box on the far right represents the island located in the Wacissa River, with the Ryan-Harley site on the north-west perimeter. The lower box contains the site location, orientated 270 degrees with the artifact's locations represented by dots.

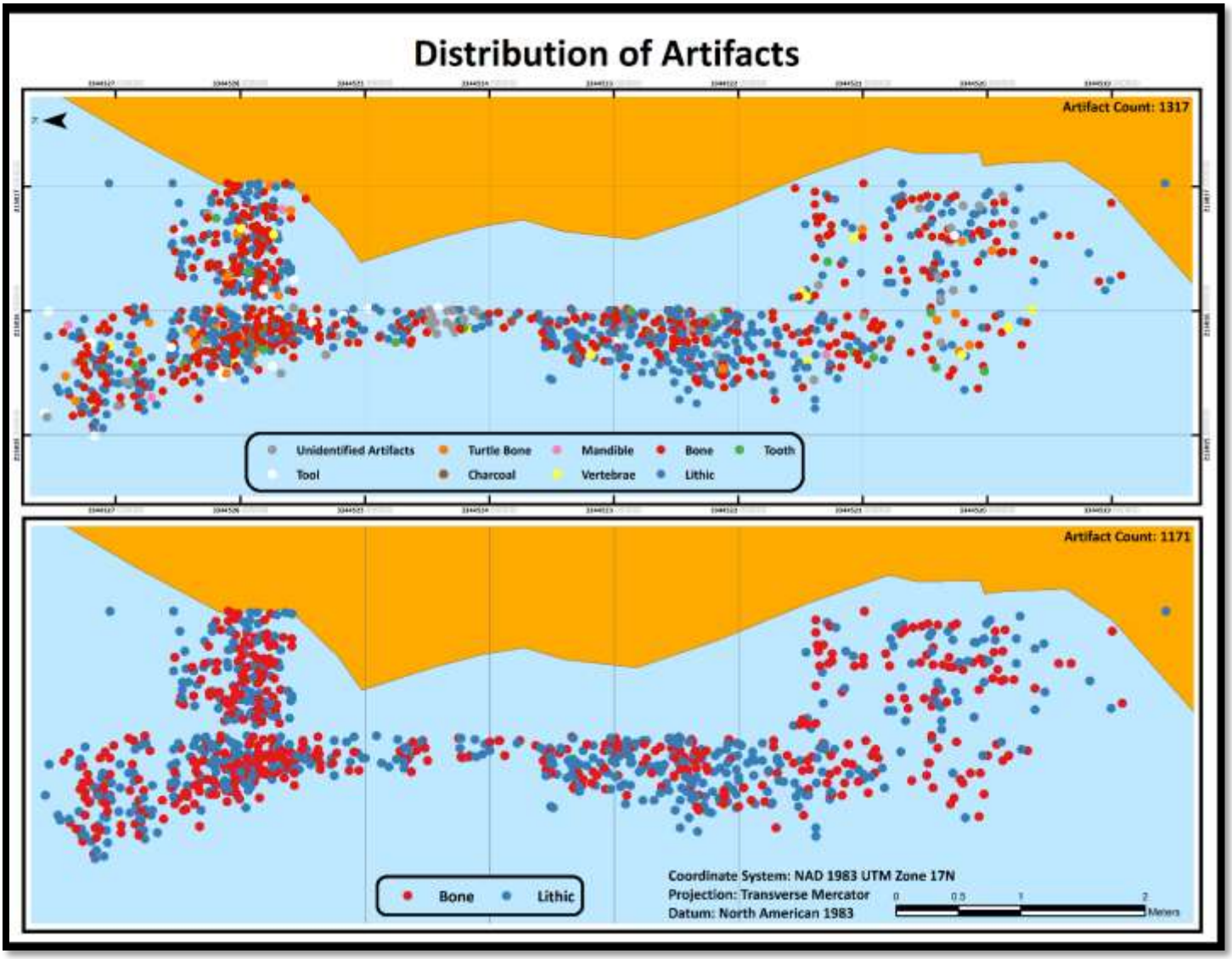

Figure 2 – The top map of the site shows the most common classifications of artifacts with each dot representing a single artifact, and is colored based on the classification. The color scheme was generated by ColorBewer2 to help differentiate the qualitative data points on top of the light-blue background. The lower map is exactly the same as the top, however only includes artifacts that are of bone or lithic classifications.

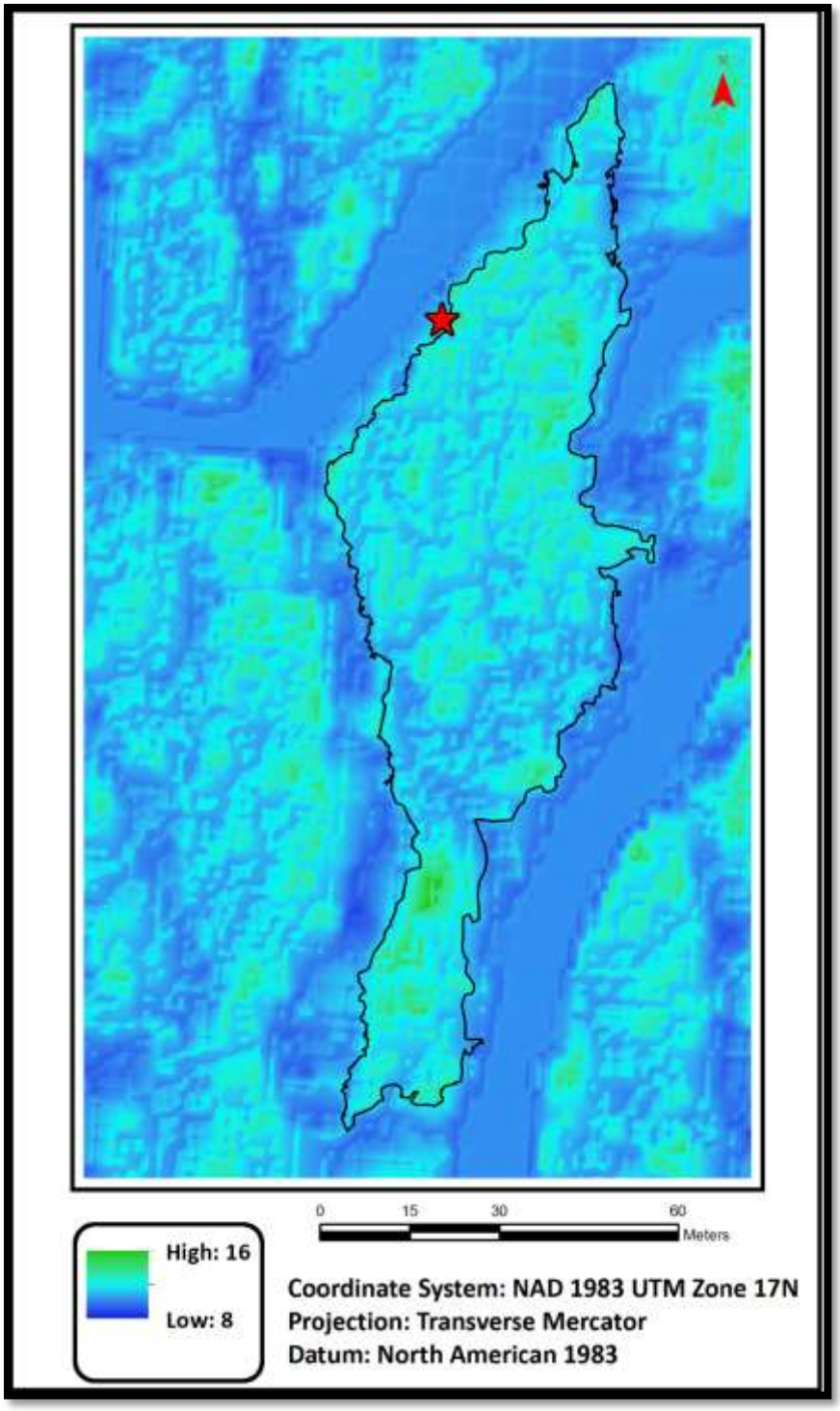

Figure 3 – The 1 m accuracy LiDAR data (2007) was obtained from the Northwest Florida Water Management District's (NWFWMD) Public LiDAR data server. The displayed elevation is relative to the WGS-84 reference ellipsoid model, and is resampled using the Cubic Convolution method. This dataset was initially recorded in 2007; because the river is anabranching, erosion has heavily influenced the boundary of the island.

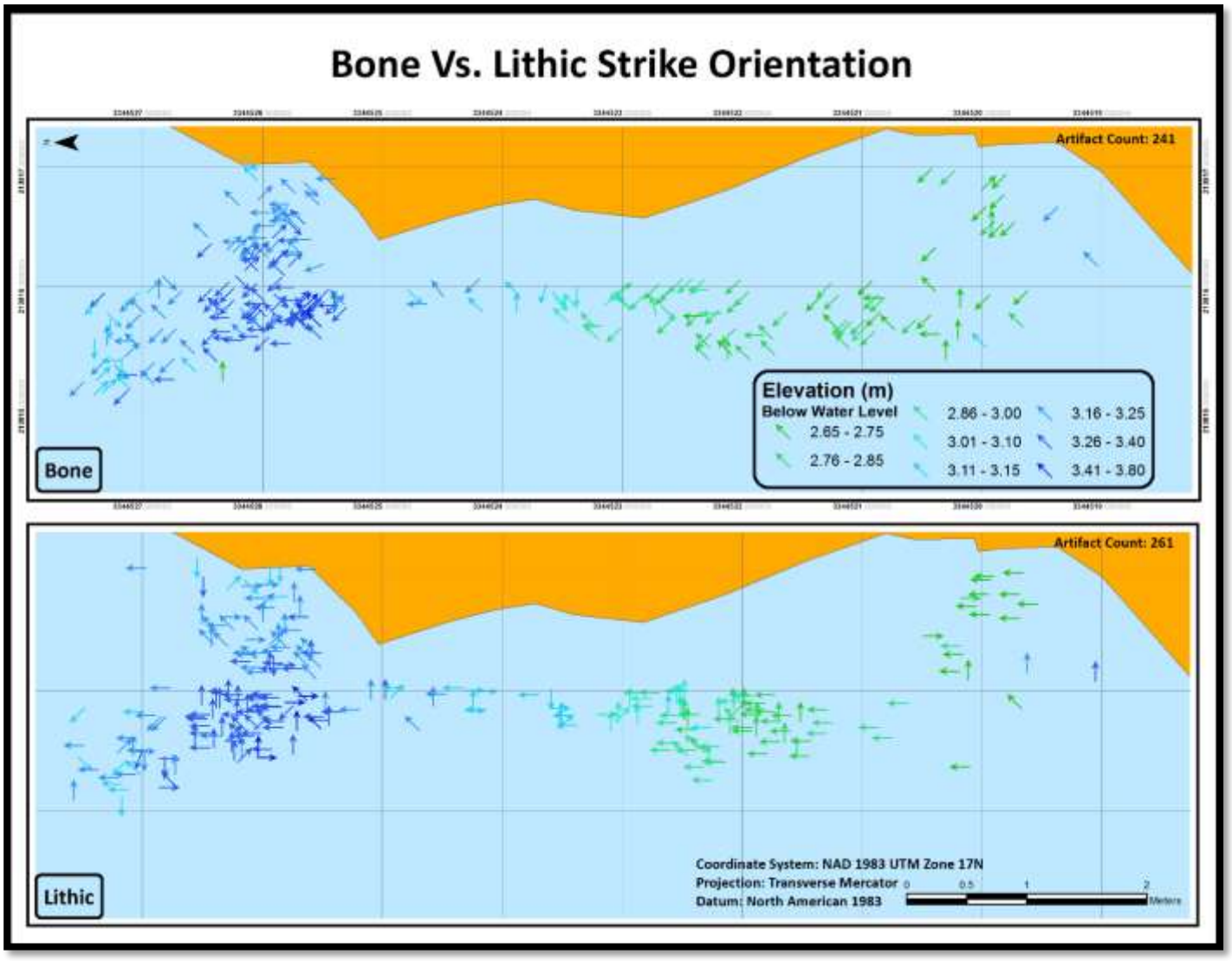

Figure 4 – Both maps show the same critera as each other, however, each represents just bone artifacts (top) or just lithic (bottom). The artifact locations are symbolized as arrows which are orientated in the direction at which they were found at during excavation. Note that map is oriented 270 degrees, with north face the left side of the maps. The arrows are colored based on the elevation at which they were found at excavation; using a sequential color scheme, light green representing shallower water and dark blue being deeper water.

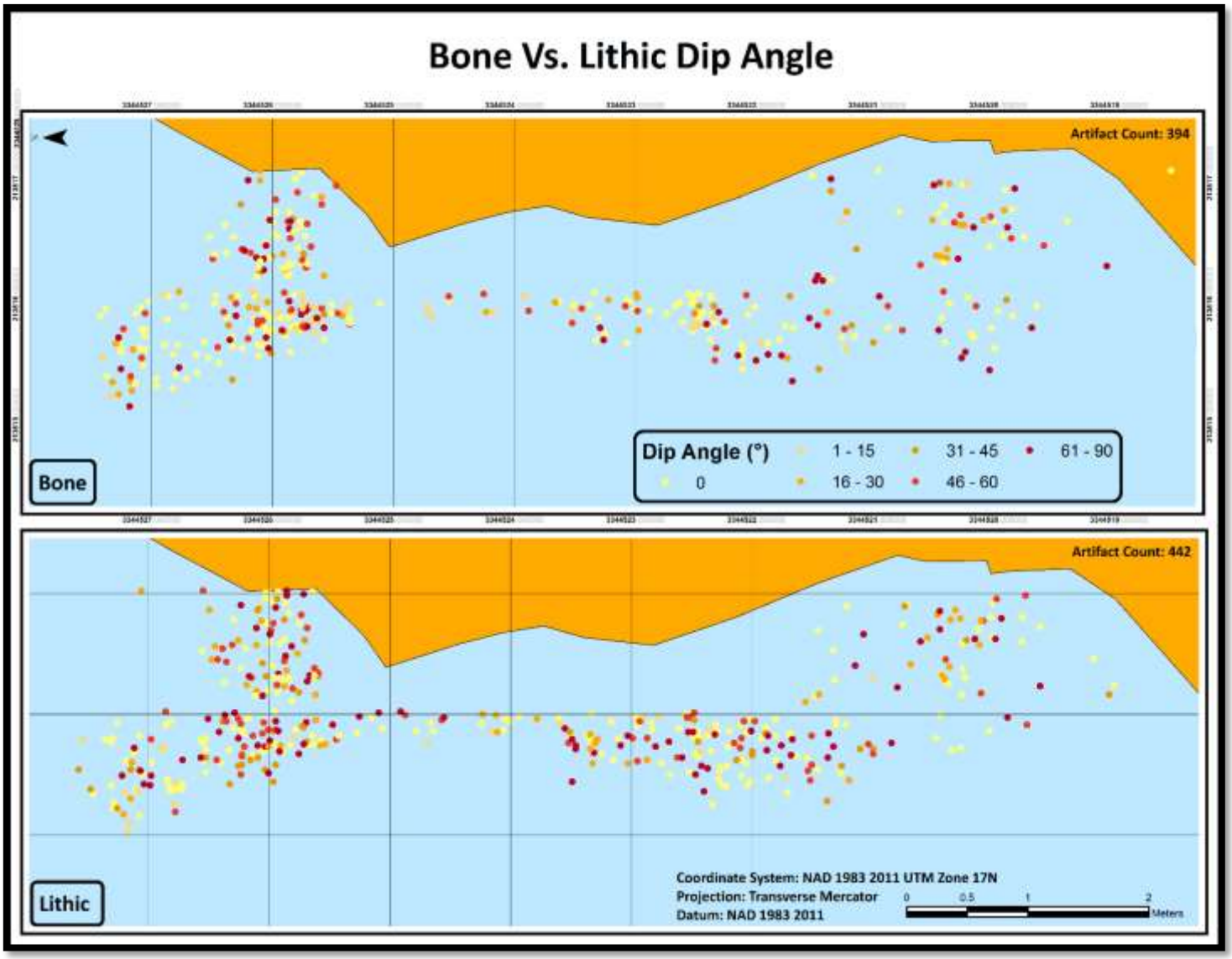

Figure 5 - Both maps show the same critera as each other, however, each represents just bone artifacts (top) or just lithic (bottom). The artifacts locations are represented by points which are colored based on their dip angle using a sequential color scheme designed by ColorBrewer2. Points that are lighter in color represent shallow angles (closer to being horizontal relative to the river bottom), while points that are darker in color represent high angles (closer to being perpendicular relative to the riverbottom).

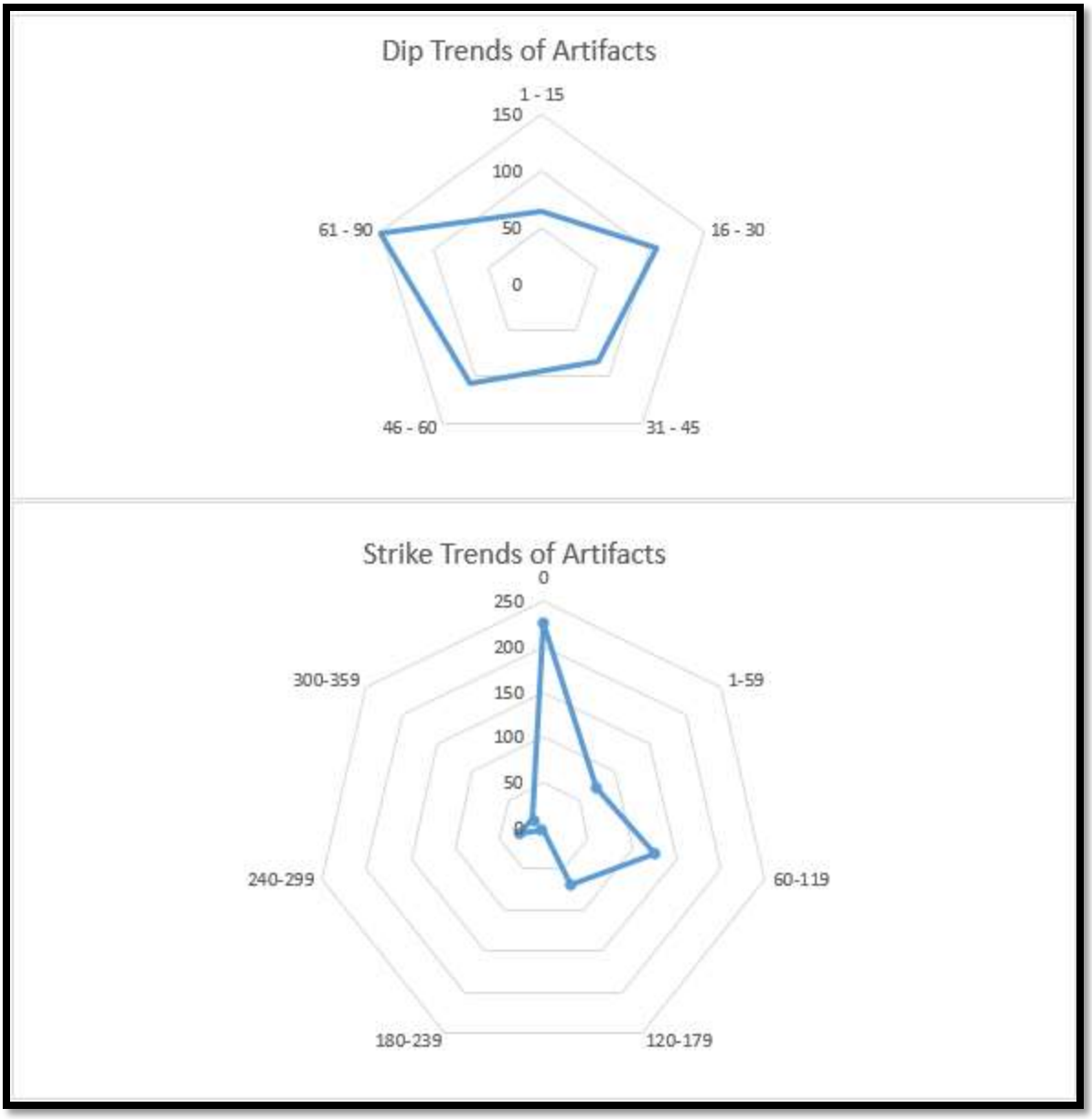

Figure 6 - This image represents a Compass-Rose diagram which was used to show the frequency of dip and strike values. The dip angles appear to be fairly random; the strike angles however seem to have a pattern, with the majority of the artifacts being oriented north. The assumption for this pattern is that it is caused by the downward sloping of the site, which post-deposits the artifacts because of gravity and the density of the artifact. Because the site is located within a river some would quickly speculate that this pattern in orientation is caused by fluvial dynamics, however the river flows in the opposite direction.

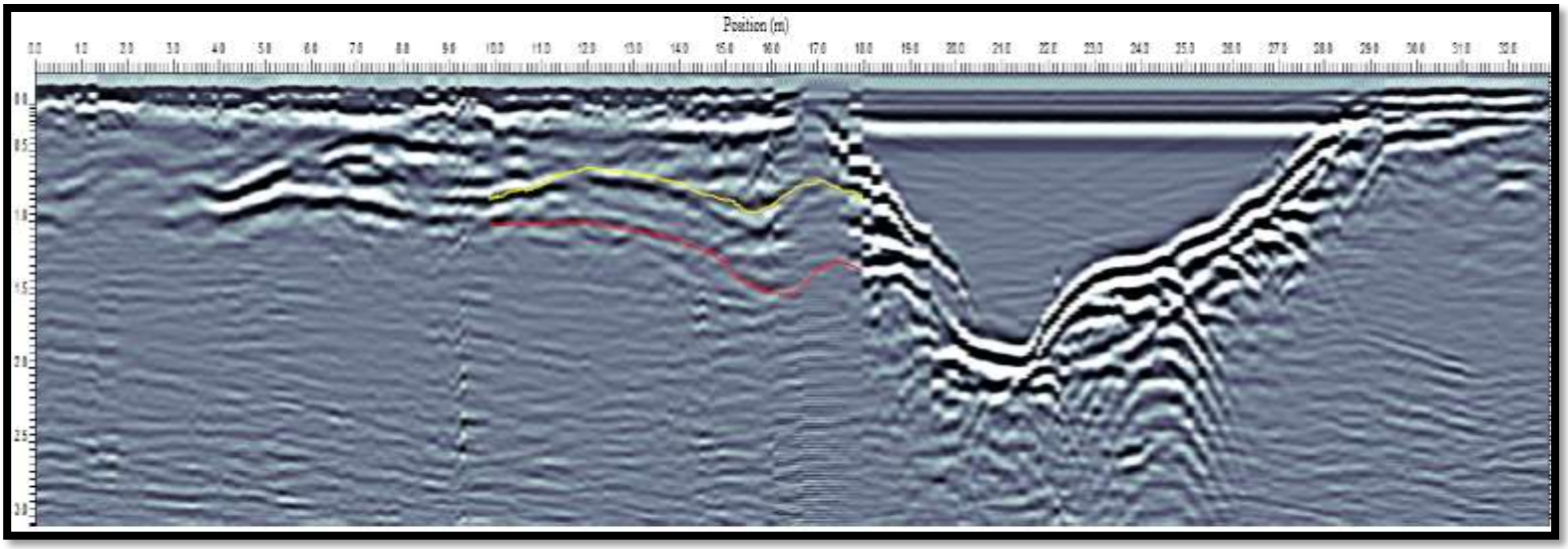

Figure 7 - Ground penetrating radar data obtained using the Sensors & Software PluseEEKO Pro system used here to highlight the subsurface stratigraphy present. Data was collected with 200 and 100 MHz every 10 cm with 8 stacked traces per station. Vertical resolution and penetration depth is determined by pulse duration and dielectric permittivity of the subsurface (Cassidy 2009). The yellow and red lines represent high reflectivity of radar waves.

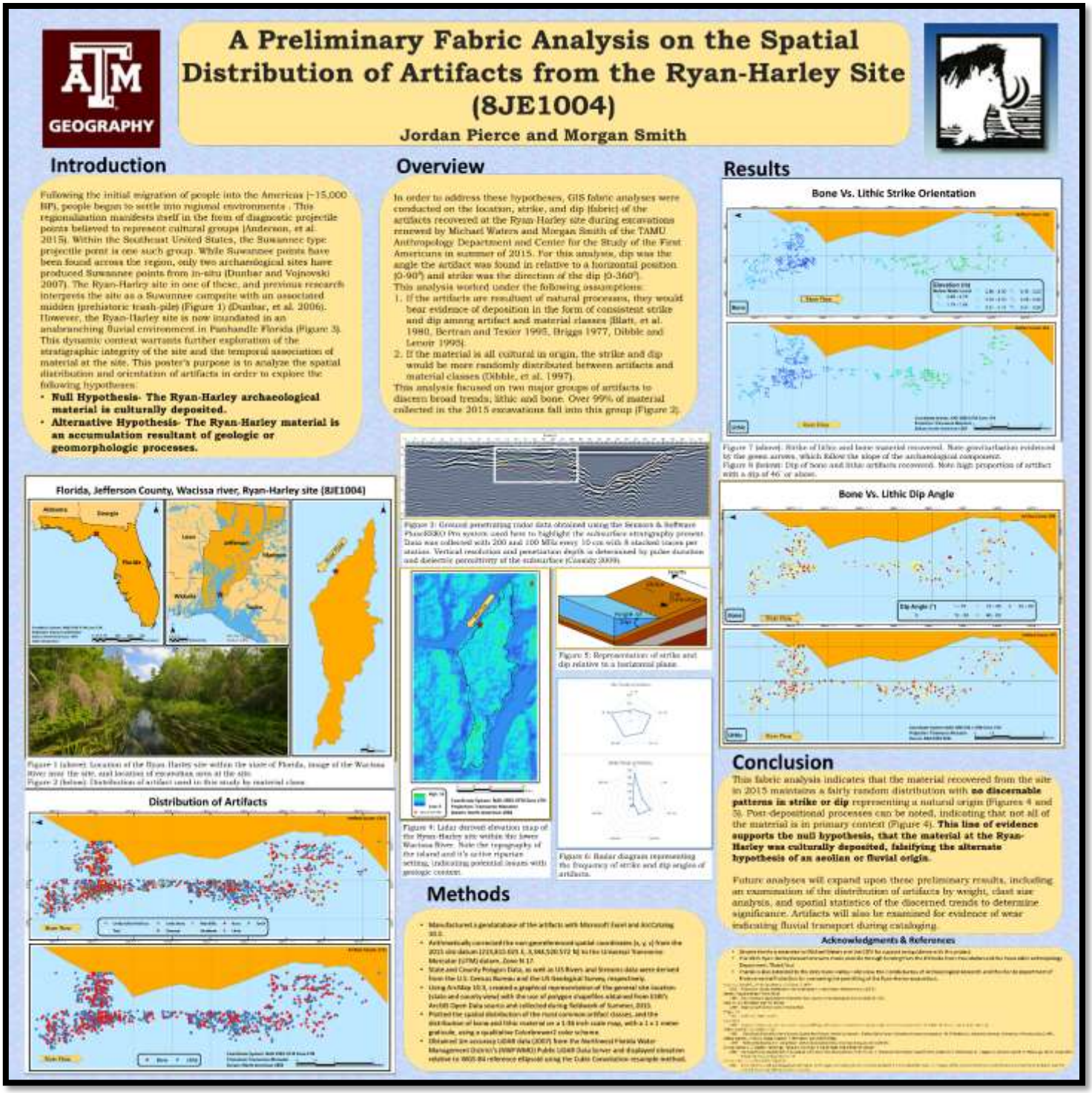

Figure 8 – This poster was the final product of the research project which was presented at three student research conferences during the Spring semester of 2016: Texas A&M Student Research Week 2016, Texas A&M Anthropology Student and GUMP Research Conference, and the TAMU Society for Underwater Technologies Research Conferences: Frontiers in Underwater Science. Co-authored with Ph.D. fellow Morgan Smith under the advisement of Dr. Michael Waters, head of The Center for the Study of the First Americans in the Anthropology Department of Texas A&M.