A Study of Late Woodland Piedmont Village Tradition Lithic Economies Through Experimental Replication of Triangular Projectile Points

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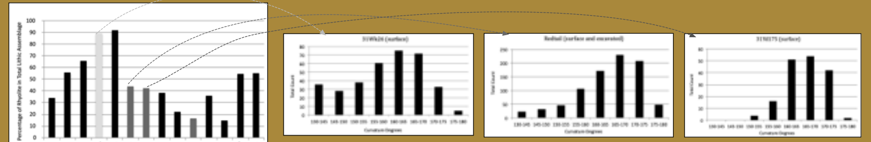
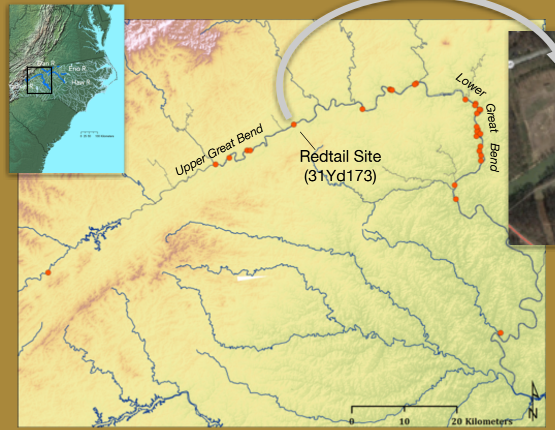
Introduction

This study explores the lithic economy of Late Woodland Piedmont Village Tradition communities in the upper Yadkin River Valley through two related studies: 1) an examination of rhyolite flake attributes from projectile point production at the Redtail (31YD173) site; and 2) a replication study of what types of flakes are produced during the production of these points. We are examining a new area of the site and comparing flake characteristics there to an existing model of gateway rhyolite acquisition and distribution involving the main portion of Redtail and 12 other sites in the valley (Jones et al. 2020). Our analyses and those by Jones and colleagues focus on flake curvature as a measure of reduction stage and reduction stage as an indicator of how worked the rhyolite is when it arrives in a community. The previous research found that flakes at Redtail are generally from later stages of reduction. A comparison to 12 other sites--*see figures below*--showed a regular pattern of sites with evidence of earlier reduction being surrounded by sites with an indirect relationship between distance and curvature (i.e. the farther a site is from these “gateways” the more "flat" flakes in their flake assemblages).

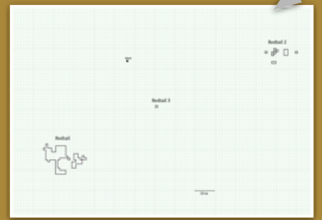


The use of curvature is based on Andrefsky’s (1986) replication study of generalized triangular points. Here, we replicate Andrefsky’s work for three specific PVT types. We then compared our findings to Andrefsky’s and our above findings from Redtail 2 to assess our use of curvature as a measure of reduction stage.



Map of the upper Yadkin River Valley, showing the location of the Redtail site and other Late Woodland sites.

Google maps image, showing excavations at Redtail 1, the locations of Redtail 2 and 3, and the entire floodplain in which they are located.



Map of excavation units at Redtail 1, 2, and 3, showing distances between loci

Background

Andrefsky’s (1986) experimental study showed flake curvature could be used as an indicator of lithic reduction stage. However, Andrefsky’s study was never meant to be definitive; it was supposed to start a conversation that would explore variability through successive studies. Factors such as material, starting core size, reduction technique, and collection bias are addressed here but should be further explored in future work. Finally, we wanted to see if curvature could be used for specific point types, and if indeed it is a valid indicator of reduction stage, to determine what level of access the inhabitants at Redtail 2 had to the rhyolite they needed to produce projectile points.

During the Woodland Periods, Piedmont Village Tradition (PVT) communities settled along the major river valleys of the North Carolina and Virginia Piedmont. Redtail is a PVT settlement site located along the Yadkin River, dating to 1285-1415 CE (Jones 2018). The exact nature of the lithic economy of this region and time period has been explored by previous research, which found evidence to suggest a gateway model of rhyolite acquisition and distribution existed during the Late Woodland Period (Jones et al. 2020). In this system, particular communities acquired rhyolite from sources over 60km to the east, bringing it back in slightly worked forms. They then distributed the material to nearby communities through down-the-line mechanisms. This study hopes to determine the role of Redtail 2 in this system and help clarify the nature of this system by examining the efficacy of curvature as a measure of reduction spectrum/stage.

Methods

Redtail 2 assemblage: Excavations of the Redtail 2 site from 2017-19 produced over 1200 rhyolite flakes, 1100 in a single unit. Of the 1100, over 300 were above 0.5cm in diameter and thus were able to be measured and analyzed more fully. From those 300, 87 complete flakes were large enough to have curvature measurements recorded.

Replication: The first author produced a total of 17 Clarksville, Carraway, and Uwharrie points and collected their debitage for further analysis. Of these, the debitage from 4 Uwharrie points was selected for curvature analysis of flakes in chronological order of removal. The points were produced using Edwards chert; rhyolite was difficult to obtain, so we chose this chert because it is easy to obtain and is also a silica-rich material. It is easier to flake than rhyolite, so future work involving rhyolite will provide more reliable data. Flintknapping started from two unworked flake sizes: “thumb” sized or “palm” sized. Initial reduction and shaping of the flakes was done through direct percussion using a small quartzite hammerstone. Further shaping and bifacing was then continued either with direct percussion using the same hammerstone, or with indirect percussion using deer antler tines and mallets. Final shaping was completed using pressure flaking with the use of an antler tine for all the points. The flakes removed were collected as they were produced, and numbered according to their order of removal. Only complete flakes larger than 1cm were numbered, as each point produced between 600 to 1100 pieces of debitage and of these only a small fraction were measurable for curvature.

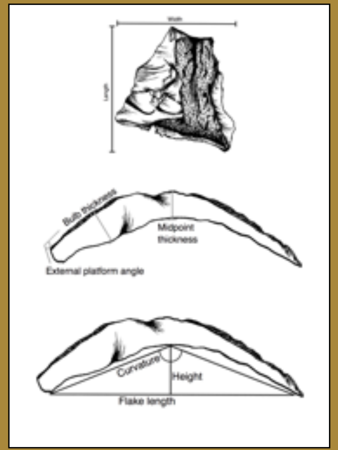
Direct percussion

Indirect percussion

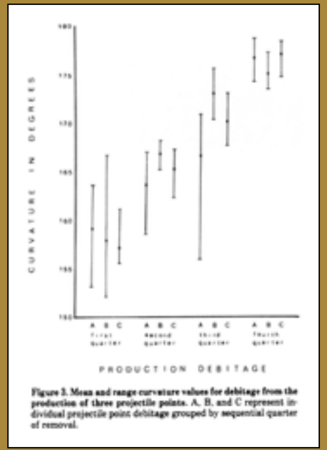
Pressure flaking

Example of total assemblage from replicated point production

The collected flakes were then measured for length, width, and general size and had their curvatures calculated using Andrefksy’s (1986) formula. Of the 4 experimental points produced, 108 measurable flakes were collected. They were then plotted in histograms, to show how many flakes fell into each of Andfrefsky’s four quarters of reduction. The additional use of scatter plots was employed to see if there was a correlation of flake area to curvature. Andrefsky’s four quarters had the following averages; first quarter: 150-165, second quarter: 165-170, third quarter: 170-175, and fourth quarter: 175-180. His quarters are not strict categories, as sometimes flakes fall outside of those ranges which were produced in the same stage of reduction. Andrefsky makes such divisions based on the average curvatures as shown above. It is also interesting to note that Andrefsky’s experimental points produced far fewer flakes, 172 in total from 3 points, than our own.



Measurements taken on flakes from Redtail 2 and from the production of replicated points. Drawing by Maya B. Krause.



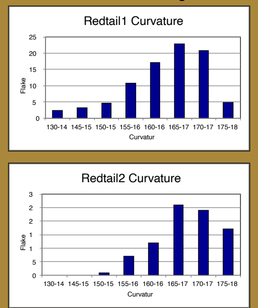
Andrefsky's (1986:51) graph of flake curvatures from 3 replicated triangular points

Results

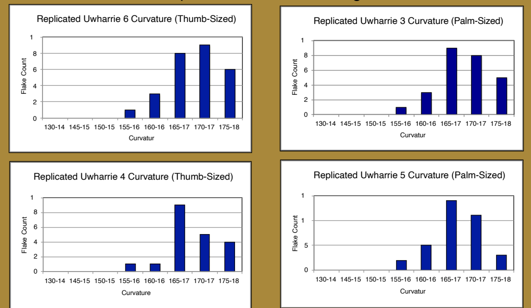
Redtail 2 Assemblage and Comparison to Replicated Point Assemblages

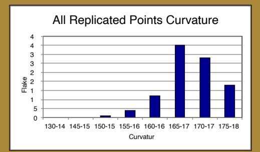
Of the 87 flakes measured from Redtail 2, the average curvature was 168.82 degrees, falling into Andrefsky’s second quarter of reduction. 20 of 87 the flakes from Redtail 2 would fall into Andfresky’s first quarter, 26 into the second, 24 in the third, and 17 in the fourth. Compared to the primary locus at Redtail, Redtail 2 shows fewer flakes with more curvature, suggesting that slightly later stages of reduction occurred there compared to the main area of the site.

Redtail Assemblages



Replicated Flake Assemblages

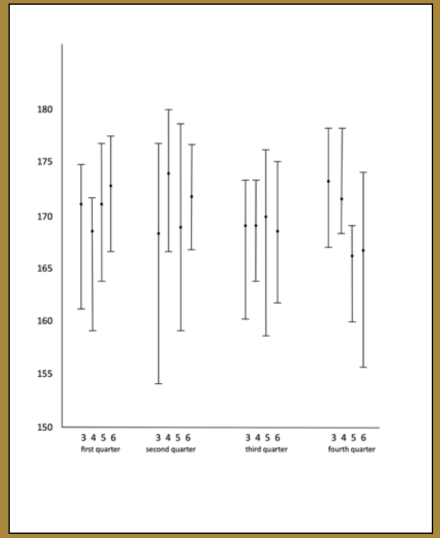




The curvature profile of Redtail 2 looks similar to 3 of the 4 replicated point assemblages and the total replicated flake assemblage. The one exception is the Uwharrie 4 flake assemblage. We interpret this as Redtail 2 was likely a site of point production, starting from relatively well-worked pre-forms.

Redtail 1 shows recognizably more flakes in the 130-155° categories than Redtail 2 or any of the replicated points. This could indicate that Redtail 1 started with less modified rhyolite.

Comparing our Replicated Flakes to Andrefsky's



Graph of our flake curvatures from the 4 replicated points.

We reconstructed Andrefsky's chart of flake curvature from four quarters of point *production for our replicated points--see the figure to the left*. On the surface, ours looks quite different from his. If we tease apart the four replicated points, numbers 3 and 4 have a similar overall shape to Andrefsky's, where there is a large amount of variation in curvature during the first three stages and the fourth stages shows much less variation and angles around or above 170º. Points 5 and 6, however, show none of those same trends.

This initially threw us for a loop and made us think that perhaps curvature for these specific types does not follow the same patterns as for Andrefsky's generalized points...

However!* **with a very careful re-reading by both authors*

Andrefsky is very clear that curvature is related to the type of tool being made. For example, prismatic blade cores will produce flakes with more curvature over time, whereas thin projectile points will produce those with less.

As we were contemplating our contradictory results, we decided it might be productive to measure the thickness of our replicated points. Sure enough, points 3 and 4, which are the closest to Andrefsky's results are much thinner than points 5 and 6--*see the points on display*--, which continue to produce curvy flakes throughout. Our results may be saying more about our abilities as knappers this summer than anything else at this point.

Discussion

Overall, our attempts at replication are inconclusive (more on this below), but this does not mean Andrefsky’s study does not apply to PVT projectile point assemblages. Using Andrefsky's study, it appears that the Redtail 2 flake assemblage is similar to that at Redtail 1 but skewed slightly later in the reduction process. Other concurrent research (*see Walton and Jones in this same session*) strongly suggests that Redtail 1 and 2 were occupied at the same time, by either related groups or the same group. Thus, it could be that Redtail 2 is either another household in this floodplain getting similar materials as the residents at Redtail 1, and our differences in curvature may simply be random. Alternatively, Redtail 2 might be a type of out-building (e.g. a hunting blind or shelter in a field for keeping pests away) where already worked material from the main residence at Redtail 1 is being taken to construct points. Either way, Redtail 2 does not provide any evidence to disprove the existing gateway model.

With regard to our differences in curvature compared to Andrefsky, there are several possible explanations for our results. Firstly, the skill of the knapper creating the experimental assemblages could have an impact on the produced flakes. Toombs, the knapper, was relatively new to knapping, but was still able to produce the triangular style projectile points of the Late Woodland period with only a few weeks of practice. However, his points are significantly thicker than those recovered at Redtail 1 and 2. We believe this is the main explanation for our descrepancies with Andrefsky’s curvature results, as points U3 and U4, whose assemblages follow Andrefsky’s trendline, are thinner than points U5 and U6 whose assemblages do not. Collection bias may be an issue here as well, Toombs had to simultaneously collect and produce the flakes, meaning some may have been missed during production.

Future studies would ensure that our experimental assemblages would more accurately replicate those recovered at Redtail 1 and 2 with regard to point thickness. Having one person collecting and numbering flakes while another is knapping would ensure than all flakes are collected and numbered properly. Finally, conducting this experiment with rhyolite as was used at Redtail would further ensure that curvature does indeed apply as a measure of reduction stage to Late-Woodland PVT points.

Conclusions

We are still confident that Redtail’s assemblages reflect the trends of the larger gateway model based on other morphological characteristics of the flakes recovered. We also believe that using curvature is still a valid means of studying flake assemblages and determining reduction stage and this study has exposed some potential confounding factors in this analysis. We remain steadfast.

We are currently planning a future experimental study with the adjustments suggested in the discussion. Toombs will undertake this project for his honors thesis and add a comprehensive measurement of projectile point thicknesses from Redtail 1 and 2, as well as from the Porter and 31Wk26 sites in the same area of the upper Yadkin River Valley. He will take several thickness measurements on each point to quantitatively examine patterns for each point type, site-level patterns, intrasite variability, and variability within and between sites. These data will then be used to further refine the parameters for replicating Clarksville, Caraway, and Uwharrie points. Stay tuned!

Acknowledgments

Funding for the first author was provided by the Wake Forest Undergraduate Research and Creative Arts Center. The flake assemblages from Redtail 1 and Redtail 2 are housed at the Anthropological Geographic Analysis Laboratory at Wake Forest University, under the direction of the second author. (Be aware that it is on the move to the University of South Carolina in August 2020 for anyone interested in analyzing them.)

We would like to thank the entire 2018 Wake Forest fieldschool for their work at Redtail 2, and especially Alyssa Walton who continued excavation and research there with us in the summer of 2019. Thank you to Maya Krause for permission to use her flake drawings.

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