# How Many Late Woodland Projectile Point Types Were There in the North Carolina Piedmont?

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## Introduction

The goal of our research is to quantitatively test the validity of the existing Late Woodland projectile point typology for the North Carolina Piedmont. In other regions, similar work has been conducted to assess the respective splitting and lumping of Late Woodland triangular projectile points into types (e.g. Fox 2015). Our ultimate goal is to evaluate the current typology and how much it tells us about past behavior (e.g. Bettinger and Eerkins 1999; Odell 1988). The utility of and problematic nature of etic typologies has been theorized at length (e.g. Adams 1988; Hayden 1984; Read 1974) and will factor in our conclusions and plans for future work.

To accomplish our goal, we use measurement of 8 attributes on 75 projectile points from the Redtail site, a Late Woodland settlement site in the upper Yadkin River Valley of North Carolina. This site is a good case study because it was occupied for no more than 130 years—radiocarbon dates range from 1285 to 1415 CE (Jones 2018)—and it has all three Late Woodland projectile point types. We each independently typed the points and tested our grouping using discriminant function analysis. We compared our results to assess the existing typology and best practices for using typologies to understand past behavior.

*Before you read further...*
Create your own typology using points from the Redtail we have set out. Think about the following questions:
1. How many groups do you see?
2. How did you classify them (i.e. on what attributes did you focus)?

Once you have completed your classification, look at the guide sheet to see the types as they are currently defined:

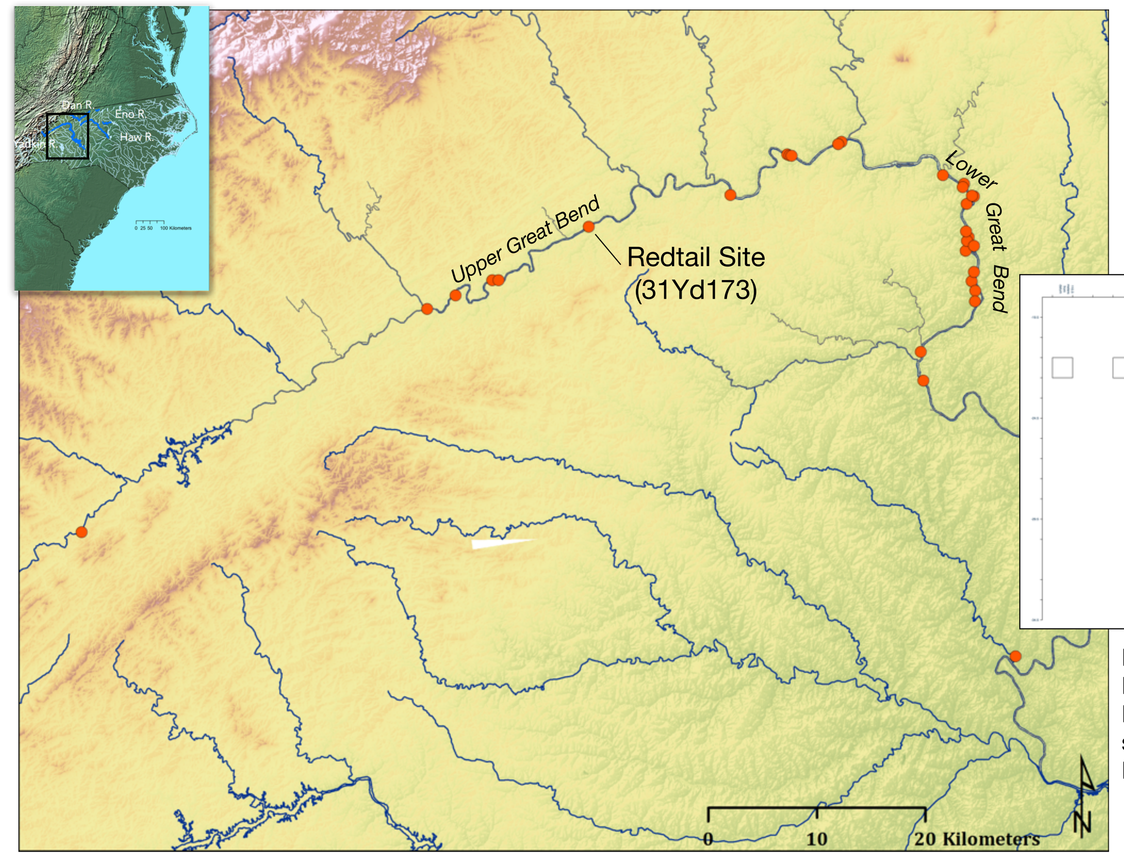


Figure 1: map (left) of the upper Yadkin River Valley, showing the location of the Redtail site and other Late Woodland sites, and map (above) of features at the Redtail site.

## Background

The Redtail site is located in the upper Yadkin River Valley, specifically in the upper Great Bend section of the valley (Figure 1). The site was first recorded in 1990 and has been the subject of archaeological investigation since 2011. Radiocarbon dates place the site between 1285 CE and 1415 CE (Jones 2018). The projectile point assemblage from the site comes from surface, plowzone, and undisturbed contexts. The latter includes a houseflooor, activity areas around the household, shallow pit features (located outside the household), and one small trash pit. Excavations from 2013-17 recovered artifacts from contexts within and around the household. We believe these excavations represent the range of activities that occurred there.

In the current North Carolina projectile point typology by Oliver (Figure 2, right), there are 3 defined triangular Late Woodland styles: Uwharrie, Caraway, and Clarksville. This is a slight change from Coe's typology of 4 types (Figure 2, left). Uwharrie is generally considered to be earlier but overlapping with the later and more contemporaneous Caraway and Clarksville styles.

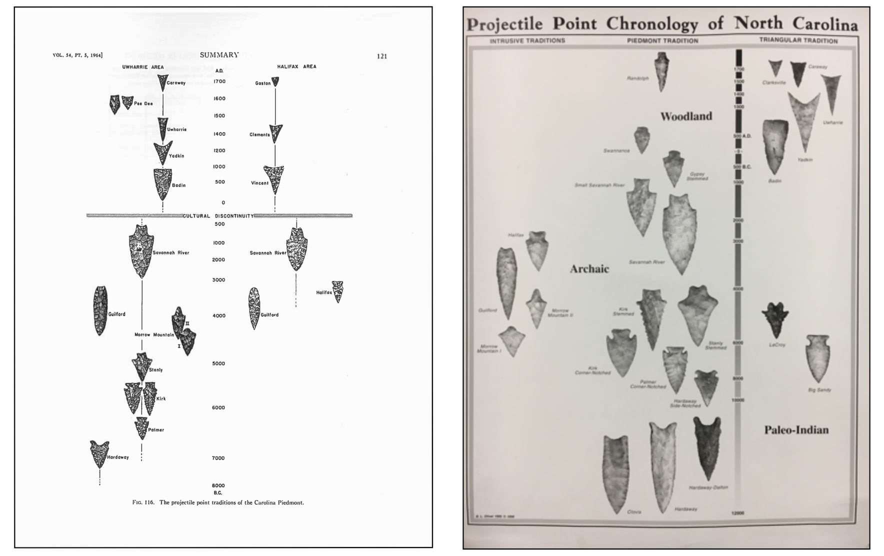


Figure 2: Coe's 1964 typology (left) and Oliver's 1985 refinement (right).

## Methods

*The Assemblage*
Projectile points have been recovered during pedestrian survey, shovel testing, and excavation. To date, we have recovered 109 partial and complete points (Figure 3). Of those, 34 were too fragmented to measure the attributes.

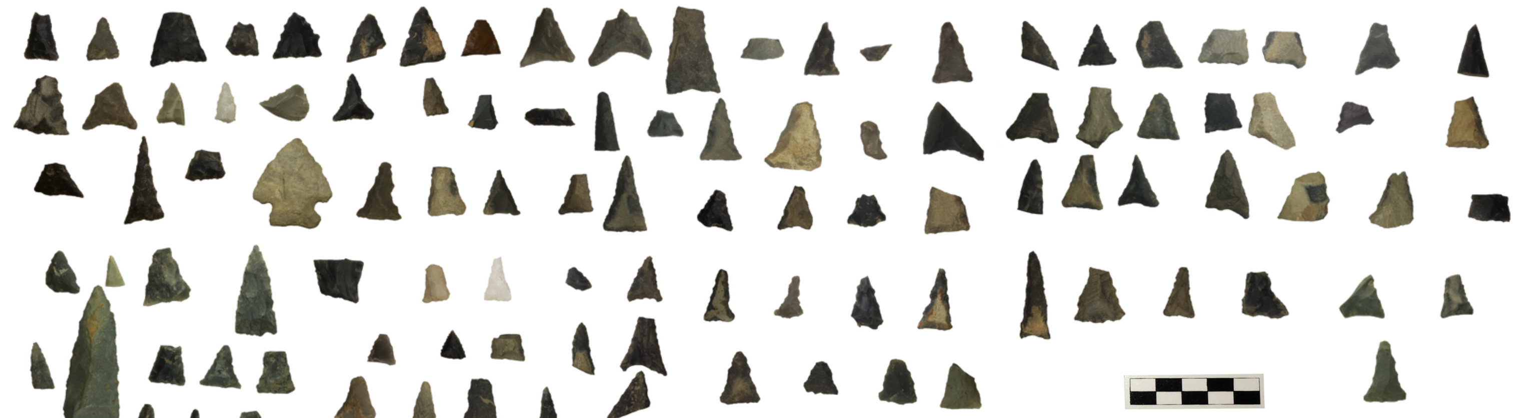

Figure 3: all of the projectile points, whole and broken, used in this study.

*Attributes*
Using digital calipers, we independently measured the following attributes on each of the points, listed and displayed in Figure 4.

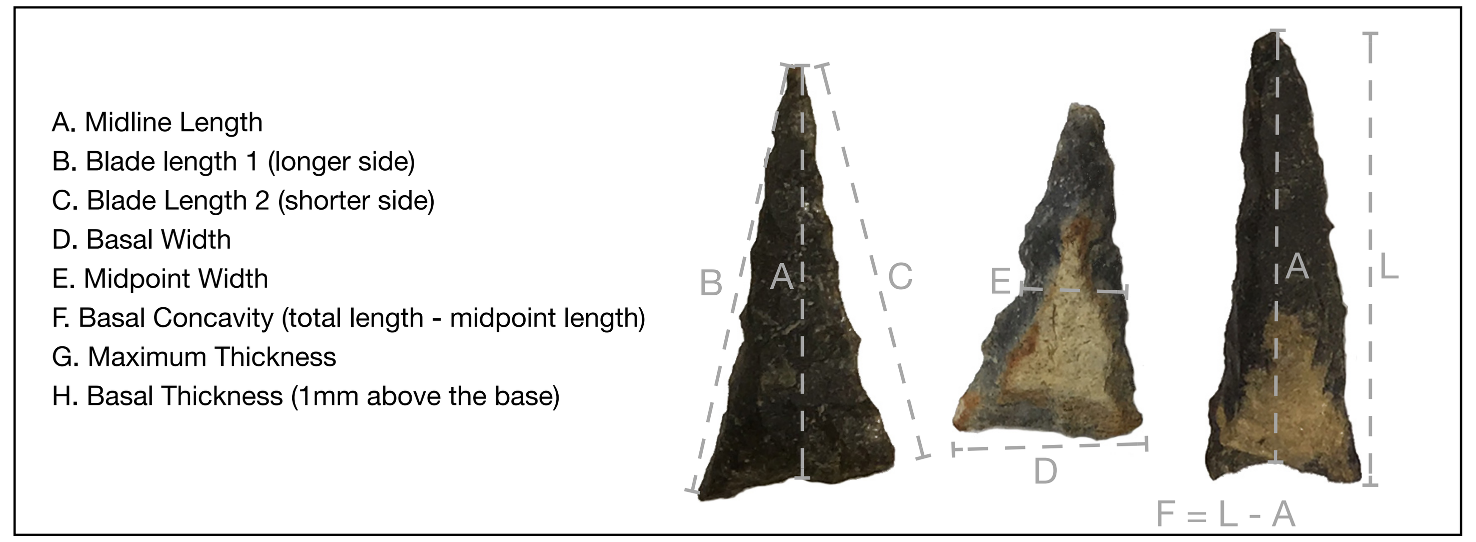


Figure 4: diagram showing how attributes were measured.

*Typing*
After measuring, we assigned points to types based on Oliver's typology. We each did this independently 1) to describe inter-observer differences; 2) to evaluate the ability of discreet measurements and discriminant function analysis to test this typology; and 3) to assess the impact of creating etic typologies on our understanding of past behavior in this region. We used the following criteria:

Jones
- Uwharrie: curving concave base with immediate narrowing of the body; at least twice as long as wide
- Caraway: eared as opposed to concave base; straight sides
- Clarksville: curving concave base with straight sides; between 1:1 and 1.5:1 length to width
- Redtail (new fourth type): flat or convex base; immediate narrowing of the body above the base; less than 1.5:1 length to width
- Undefined: points with incomplete or missing bases; non-triangular points, including older types and possibly unfinished points

Capps
- Uwharrie: at least twice as long as wide; immediate narrowing of the body
- Caraway: greater midline length than basal width; straight sides
- Clarksville: straight sides with edge lengths relatively equal to basal width
- Undefined: points with incomplete or missing bases; non-triangular points, including older types and possibly unfinished points

*Discriminant Function Analysis*
We subjected each of our datasets to discriminant function analysis (DFA) using several models. DFA is a multi-functional, multivariate statistical analysis that compares datasets with internal groupings and several characteristic variables (i.e. attributes). We used it to compare each of our types and the attributes of each point within those types. DFA finds the combinations of attributes (i.e. functions) that most distinguish the groups and shows how much it can distinguish them. DFA can also ignore the assigned groups and try to create its own groups using just the attributes of individual cases. Those groups are then compared to the defined groups. Thus, it is capable of showing that groups cannot be distinguished based on their attributes. This is particular is important in this case to evaluate how much our types are simply reaffirming themselves.

We created and analyzed six models: 1) All points with all variables; 2) All points with no length measurements; 3) All points with only basal measurements; 4) Just typed points with all variables; 5) Just typed points with no length measurements; 6) Just typed points with only basal measurements. We examined different models as a separate test of significance and reliability.

## Results

For each model, the first discriminant function is the most important combination as it maximally discriminates among the types. Each function defines a canonical variable, for which the eigenvalue divided by the sum of all the eigenvalues is a ratio that can be interpreted as the proportion of between-group variation explained by that canonical variable. The larger the eigenvalue, the more important the canonical variable is for group separation. The structure matrix values show which attributes are related to the canonical variable and how (Figures 6 and 8 below). Finally, the predicted group membership, or cross-validation, leaves out one case and then predicts group membership (Figures 5 and 7 below). We focus on these last two lines of evidence here because the first shows what attributes most distinguish types and the second assesses whether our types are actually statistically supported.

*Jones' Results*
I ran 18 models: the six listed in the Methods section for 1) all four types I defined; 2) Redtail types combined with Caraway; and 3) Redtail and Caraway combined as a single type and Clarskville and Uwharrie combined as a single type. What I present below are the graphical and tabular results for those models that produced cross-validated results above 66.7% (highlighted in yellow below), showing that my defined types were not simply recapitulated in the analysis. All 18 models had overall significance values < 0.05.

| Model | All points all variables | All points no lengths | All points only basal | No untyped all variables | No untyped no lengths | No untyped only basal |
|---|---|---|---|---|---|---|
| Four types | 22.2% | 57.1% | 42.6% | 40.9% | 75.0% | 51.9% |
| Three types | 33.3% | 65.3% | 60.7% | 63.6% | 77.3% | 81.5% |
| Two types | 48.1% | 77.6% | 68.9% | 86.4% | 93.2% | 90.7% |

Figure 5: cross-validated grouping results for all 18 of Jones' models.

Analyses without untyped points tend to cross-validate more often, which is not surprising. My own classification relied most heavily on basal morphology, so cross-validation of models with other variables is a good sign that there is validity with regard to overall point morphology in my typology. These results show that the most support may be for two projectile point types: Uwharrie/Carraway and Clarksville. There is also very little support for four categories. In the following scatterplots related to three of the cross-validated models above, Function 1 is most strongly influenced by basal concavity. In each, that function strongly separates them and shows that Uwharrie (3) and Clarksville (2) group together in the first two. In the third, Carraway (1), Uwharrie/Clarksville (2), and untyped (3) separate distinctly. The other cross-validated models show similar patterns to these.

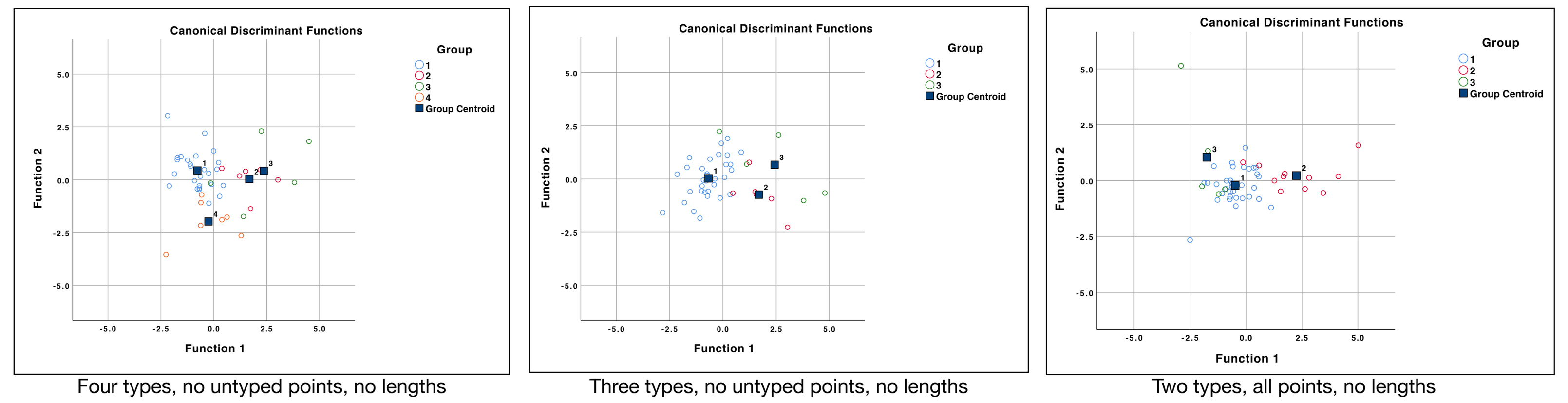


Figure 6: Scatterplots of Jones' functions.

*Capps' Results*
I ran 7 models excluding untyped points: (1) points with no length measurements, (2) points with only basal measurements, (3) points with only length measurements, (4) points with all variables, (5) points with no basal measurements. What I present below are the graphical and tabular results for those models that produced cross-validated results above 66.7% (highlighted in yellow below). In particular, the "whole points no thickness" result shows that the analysis did not simply reflect my typing of the points based primarily on length. Of these 5 models only "whole points no lengths" was found to have a significance value > 0.05.

| Model | All points all variables | Whole points all variables | Whole points no lengths | Whole points no thickness | Complete base only basal | Whole points only length | Whole points no basal |
|---|---|---|---|---|---|---|---|
| Three types | 62.7% | 63.0% | 51.9% | 77.8% | 33.3% | 81.5% | 74.1% |

Figure 7: cross-validated grouping results for all 18 of Capps' models.

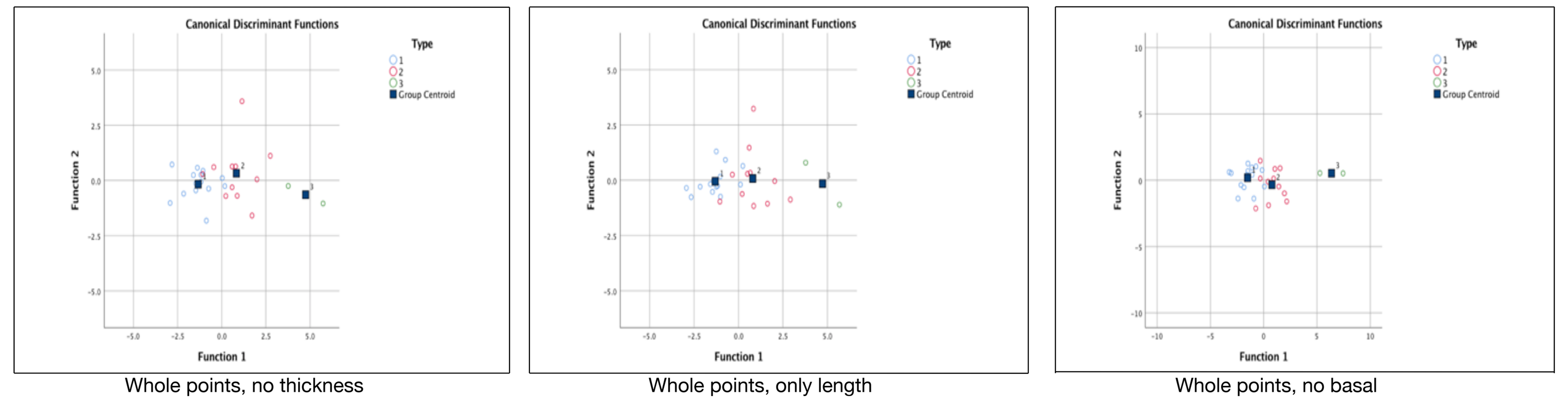


Figure 8: Scatterplots of Capps' functions.

These results show support for three projectile point types: Clarksville (1), Caraway (2), and Uwharrie (3). In all of the scatterplots above, Function 1 is strongly influenced by midline length and clearly separates them into the these 3 types.

## Discussion

*Functional, Temporal, Neither, or Something else?*
Our results support the existing typology... or possibly a typology with two types. Given that all three traditional types are found at a site occupied for ~130 years, we initially interpreted that these different types might be related to functional differences. We then looked for spatial patterns, and found that the different types are evenly distributed across the houseflloor, activity/production area, and features at Redtail. It does not appear that different types were being used in different areas. Fragmented and whole points also appear to be evenly distributed across functional areas. However, this does not rule out functional differences. It could be that all three points are used for hunting different animals, and point production, use, and discard associated with hunting occurred across the site with little regard to the type of animal being hunted and processed.

To assess temporality, we compared the percentages of types at Redtail to those at other sites with reported projectile point types (Figure 9). The differences in our two classifications are Clarksville vs. Caraway; we classified Uwharries consistently across our datasets. When compared to the Donnaha site (Woodall 1984), which likely was occupied for several hundred years before and overlapping with Redtail, the percentages are somewhat different. Looking at Woodall's images of points, we would both place his Pee Dee points in the Clarksville category. If we do that, those numbers look similar across the site, but the Caraway:Uwharrie ratio is different. However, all three types are represented there just like at Redtail. McPherson is very different, almost exclusively having Clarksville points, but this is a reported number and we cannot compare images to our points. Either way, the co-occurrence of these three types at both a shorter term site (Redtail) and a long-term site (Donnaha) suggest these point types are not temporally distinct.

| Site | Clarksville | Caraway | Uwharrie | Pee Dee | Other |
|---|---|---|---|---|---|
| McPherson | 82.8% | 0.0% | 0.0% | 0.0% | 17.2% |
| Donnaha | 0.0% | 31.3% | 45.2% | 21.3% | 2.2% |
| Redtail (Jones) | 15.9% | 76.2% | 7.9% | 0.0% | 0.0% |
| Redtail (Capps) | 30.5% | 58.1% | 11.4% | 0.0% | 0.0% |

Figure 9: Percentages of point types at three Late Woodland sites in the UYRV.

Finally, we must entertain the idea that the types are related to different cultural approaches to a point used for the same purpose. This would be more likely if some point types appear to have been traded into the UYRV. However, Woodall (1990), Rogers (1993), and our own recent research show that rhyolite was likely coming into the valley in unworked or lightly worked forms and then made into points. Thus, all three types were made locally, so it seems that any of these types were imported.

From these results, we believe there were three different and mostly contemporaneous triangular point styles in the North Carolina Piedmont during the Late Woodland period. As such, we believe the best route to explore further is whether they have different functional properties.

## Conclusions

Our work displays some of the inherent difficulties of constructing typologies and using them to interpret past behavior as has been discussed at length in other regions of North America (e.g. Bettinger and Eerkins 1999). Our differences are a result of our own determinations of what parts of the point are most distinguishing. For Jones, it is basal morphology based on the idea that point morphology will change with use and repair. For Capps, it is point length based on the idea that it shows functional differences. In reality, combining both of our approaches is almost certainly better than using one or the other. In fact, a productive next step would be to have more researchers follow the same procedure and compare those results. Alternatively, a more holistic morphological computer-based comparison may be productive and not prone to human bias. However, we are not convinced that removing the human equation completely is the best method. After all, humans made these points. Perhaps a combination of computer-based analyses either heuristically driven by or complemented with researcher variables and input is the best approach.

The discussion of improvements aside, we do believe that these results are showing support for the three type system and support for future research that examines the technological similarities and differences between the three types. Ideally, the next steps are use-wear analysis of both types and experimental archaeology that looks at technological properties as well as repair and retouching of Uwharrie points to see if Clarksville is a common resultant form to assess the results that do support a two-type typology.

## Acknowledgments

Portions of this work were funded by a grant from the National Science Foundation (BCS-1430495). We would like to thank Ellie Logan and Robby Outland for assistance in the planning and data collection for this work. Thanks to the 2013-18 Wake Forest fieldschool crews and 2013-17 Yadkin River Settlement Ecology crews for the recovery of the points analyzed here. As always, thanks to Sharon DeWitte for editing and support.

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