STONE QUARRIES AND SOURCING IN THE CAROLINA SLATE BELT

edited by
Vincas P. Steponaitis
Jeffrey D. Irwin
Theresa E. McReynolds
Christopher R. Moore

with contributions by
Drew S. Coleman
James M. Guthrie
Theresa E. McReynolds
Christopher R. Moore
Robert J. Speakman
Edward F. Stoddard
Michael D. Glascock
Jeffrey D. Irwin
Brent V. Miller
John J. W. Rogers
Vincas P. Steponaitis

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In memory of J. Robert Butler

Abstract

Decades of archaeological work on Fort Bragg have revealed thousands of prehistoric sites that were inhabited by Indian peoples before the arrival of the Europeans. It is believed that many of these sites were temporary camps occupied by hunters and gatherers whose territories extended far beyond the boundaries of the modern fort. Thus, understanding the archaeology of Fort Bragg requires that these sites be placed in a larger geographical framework.

One way that modern archaeologists can trace the movements of ancient hunter-gatherers is through geological and geochemical studies that identify the sources of the raw materials used to make the artifacts found at archaeological sites. Such “sourcing” or “provenance” studies have the potential to delineate the territories over which hunter-gatherers traveled in the course of their yearly round of activities.

With these considerations in mind, the present study was designed to achieve two main objectives: (*a*) to evaluate the effectiveness of a range of mineralogical and chemical techniques for “fingerprinting” potential sources of raw materials, and (*b*) to apply these techniques in determining the sources of ancient stone tools found at Fort Bragg.

As a first step, 71 rock samples were collected from 12 different *quarry zones*, which were believed to be likely sources from which the prehistoric inhabitants of Fort Bragg obtained their stone; 11 of these quarry zones were located in the Piedmont (specifically in the Carolina Slate Belt), and one was located in the Coastal Plain. In addition, nine artifacts were selected from archaeological sites on Fort Bragg; all were Savannah River Stemmed points dating to the Late Archaic period (ca. 3000–1000 BC). The mineralogical and chemical composition of these 80 samples was then determined using five different techniques: petrography, neutron activation analysis (NAA), neodymium-isotope analysis, x-ray fluorescence (XRF), and inductively coupled plasma mass spectrometry (ICP-MS).

Petrographic analysis, supplemented by XRF, revealed that each quarry zone was marked by a distinctive suite of metavolcanic and/or metasedimentary rocks. A more general distinction was also seen between the northern and southern portions of the study area. The northern zones contained a mixture of metavolcanic and metasedimentary rocks and showed lower degrees of metamorphism. The southern zones were dominated by metavolcanic rocks and showed higher degrees of metamorphism. Of the nine artifacts examined, only two could be confidently matched with particular quarry zones. The rest could only be tentatively assigned to quarry zones or not assigned at all.

The study of elemental composition based on NAA revealed eight chemical groups among the quarry samples. When the elemental composition of the nine artifacts was compared to these groups, the results suggested that seven came from quarry zones in the southern Uwharrie Mountains. The assignment of the other two artifacts was unclear.

The analysis of neodymium (Nd) isotopes, supplemented by rare-earth elements as measured by ICP-MS, also revealed some interesting patterns. Different quarry zones were marked by distinctive, yet sometimes overlapping, ranges of Nd-isotope ratios. Even more interesting was a general trend of increase in the value of this ratio as one moves from south to north along the Carolina Slate Belt. This trend appears to be very consistent for the metavolcanic rocks and less so for the metasedimentary rocks. Based on these isotope ratios and the rare-earth data, one artifact was confidently assigned to the Orange County zone in the northern portion of the study

area, four were assigned to the Uwharrie Mountains in the southern portion of the study area, and four were left unassigned.

When the results of these studies were compared, we found that each provided useful information, but that there were significant discrepancies among the assignments of artifacts to geological sources made by different researchers using different lines of evidence. Indeed, there was not a single case in which all three lines of evidence produced exactly the same assignment. This illustrates the need to look at *all* the lines of evidence together in making such assignments. The most reliable interpretations came from a synthetic approach that considered and weighed the different lines of evidence together. Based on this approach, we were able to conclude with some confidence that two artifacts came from the northern portion of the study area (including one from the Orange County zone), three came from the Uwharrie Mountains in the southern portion of the study area, and two may have come from the Uwharrie Mountains or even farther south. Two artifacts remained unassigned.

Based on this pilot study, we now have a much better understanding of the relative utility of the different techniques for sourcing artifacts from Fort Bragg. The two most useful techniques proved to be petrography and Nd-isotope analysis, although the elemental data (NAA, XRF, and ICP-MS) were also very helpful in certain cases. Nd-isotope analysis has the additional advantage of producing reliable results with very small samples of rock, which makes it particularly valuable for sourcing artifacts nondestructively.

We also now have a somewhat better idea of how ancient people moved over the landscape, at least for Late Archaic times, when the artifacts in our study were manufactured and used. The artifact assignments just described suggest that Late Archaic inhabitants of Fort Bragg utilized a number of quarries scattered over a wide area. Before being discarded, the artifacts had been carried over the linear distance between Fort Bragg and the Carolina Slate Belt quarries, minimally some 70–80 km. Given the non-linear patterns of movement often seen among hunter-gatherers, the actual distances involved may well have been over 200 km.

We recommend further studies of quarries in the Carolinas and artifacts from Fort Bragg. Additional quarries in the Piedmont should be sampled in order to refine our understanding of their chemical fingerprints and to answer some of the questions raised by this pilot study. It is especially important, for example, to sample areas south of the Uwharrie Mountains in order to see if the north-south trend in Nd ratios continues in this direction. We also need to learn more about the composition of rocks from the Coastal Plain. The sample of Fort Bragg artifacts should also be expanded to include both a wider variety of materials and periods other than the Late Archaic.

Table of Contents

List of Figures

List of Tables

Preface

The research presented in this volume was prompted by two simple questions: Where did the ancient inhabitants of Fort Bragg come from, and how did they move over the landscape? As our knowledge of prehistoric settlements on Fort Bragg grew, it became increasingly clear that these sites could not be understood in isolation. Rather, many seemed to be temporary camps of people whose territories extended far beyond the bounds of the present-day military base. The only way to reconstruct these ancient territories archaeologically would be to trace the movements of the artifacts that these people carried with them. This objective could best be accomplished by linking the artifacts to their geological sources — that is, by "fingerprinting" the raw materials from which the artifacts were made and matching the fingerprints with particular outcrops of stone. The methods were well established; yet very few such studies had ever been done in the Carolinas.

It was clear from the outset that our questions could only be answered by a collaborative project involving both geologists and archaeologists. The archaeological impetus for this project was provided by Jeff Irwin and Chris Moore. A number of scholars were then recruited for their geological and geochemical skills: Skip Stoddard for his knowledge of petrography and local rocks, Brent Miller and Drew Coleman for their expertise in isotope geochemistry, and Mike Glascock and Jeff Speakman for their expertise in element geochemistry and archaeological sourcing. Vin Steponaitis and John Rogers were brought in to provide additional perspectives and to help design and coordinate the research. Once the work was underway, Theresa McReynolds joined the team in order to help edit and produce the report.

The analysis of archaeological and geological samples took place over a period of two years at three different laboratories, each working independently. The petrography was done by Skip Stoddard at North Carolina State University; neutron activation, x-ray fluorescence, and inductively coupled plasma mass spectrometry were carried out by Mike Glascock, Jeff Speakman, and their colleagues at the University of Missouri in Columbia; and the neodymium-isotope analysis was done by Brent Miller and Drew Coleman at the University of North Carolina at Chapel Hill. The results were then discussed and compared by the research group as a whole, a fruitful process that led to the synthetic conclusions presented in Chapter 7.

Needless to say, many other individuals provided crucial help in bringing this project to a successful conclusion. Wayne Boyko, Tad Britt, and Paul Webb provided leadership, administrative support, and constructive oversight, without which this project would never have gotten off the ground and kept moving. Tim Brown shared his computer expertise at many points along the way. Mary Ayers, Randy Daniel, Steve Davis, Mike Harmon, Brett Riggs, and Ken Robinson provided archaeological advice and assisted greatly in identifying and collecting samples. Dolores Hall and John Mintz helped in working with the North Carolina site files. And many avocational archaeologists — among them Robert Graham, Mark McCravey, and Joe Moylan — shared their knowledge of quarry sites throughout the Carolina Slate Belt. To all these colleagues and friends, we express our sincere gratitude.