Chapter 1

Introduction

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Archaeological surveys at Fort Bragg, a 65,000-ha Army installation in the North Carolina Sandhills, have identified thousands of prehistoric sites that indicate people utilized the region throughout prehistory. Component size and tool diversity suggests that most sites were occupied by small groups for relatively short periods of time. The presence of metavolcanic projectile points and debitage reveals that Archaic flintknappers in the Sandhills obtained raw materials from Piedmont sources (Steponaitis et al. 2006). The use of Piedmont-derived stone to temper pottery found at sites on Fort Bragg suggests that this pattern of reliance on resources from outside of the Sandhills may have persisted into the Woodland period. One way to positively identify and determine the extent of long-distance resource procurement during the Woodland is to establish the sources of the raw materials used to make the pottery found on Sandhills sites.

This study is designed to explore Woodland-era clay procurement by identifying possible source areas in the Sandhills, Piedmont, and Coastal Plain through the comparison of chemical and mineral constituents of pottery and clays. The identification of regional clay sources and the ability to link them with Sandhills pottery provides a means to address broad economic issues such as the degree of residential mobility and the geographic regions frequented by Woodland hunter-gatherers. There are three specific objectives: (1) to characterize pottery and clays from the Sandhills and neighboring regions, (2) to match pottery found in the Sandhills with specific regions of clay and temper resources, and (3) to use the resulting information to address questions related to the role of ceramic production in residential mobility and social interaction.

Multiple lines of evidence are combined to assess variation in pottery and clays from several sites in the Sandhills and a few key sites in the Coastal Plain and Piedmont. Performance tests and replication experiments identify clays suitable for making low-fired earthenware, and geochemical and mineralogical analyses reveal potentially diagnostic differences between resource regions. Based on the combination of physical, geochemical, and mineralogical evidence, Sandhills pots are tentatively associated with other resource regions.

Recognizing where pottery was made and how widely it was transported is essential to reconstructing the Woodland cultural and economic landscape. If ceramic resources were procured directly, the movement of pots can be used to infer the scale of settlement mobility (Binford 1979:261). If pots were obtained through exchange, their distribution reveals aspects of cultural interaction. Recognizing pottery source locations and subsequent movement of pots improves our understanding of Woodland-period settlement, economy, and social dynamics.

Woodland Occupation of the North Carolina Sandhills

Our perspective on prehistoric human ecology in the Sandhills is strongly influenced by the modern landscape and our understanding of the available natural resources. Located in the upper Coastal Plain, the Sandhills are the remnants of an ancient coastal dune environment (Figure 1.1). Today they consist of sandy terraces dissected by low-gradient streams and narrow wetlands. The dry uplands are dominated by pine-savannah, pine-scrub-oak-Sandhill, and xeric-Sandhill-scrub vegetation communities (Noss 1989:211; Russo et al. 1993; Schafale and Weakley 1990; Sorrie et al. 2006). The moister slopes and bottomlands are characterized by mast-producing hardwoods and the fauna they attract. As a result of the low carrying capacity of the uplands, the region is often viewed as less productive than the adjacent Piedmont and has been called the “Pine Barrens,” “Pine Plains,” and even “Sahara of the Carolinas.”

Nevertheless, a decade of archaeological survey on Fort Bragg has identified at least 4,200 prehistoric sites and isolated finds, demonstrating that the Sandhills attracted hunter-gatherer bands for 10,000 years (Abbott 1994; Benson 2000; Benson and Braley 1998; Braley 1989a, 1989b, 1992; Braley and Schuldenrein 1993; Clement et al. 1997; Culpepper et al. 2000; Gray and McNutt 2004, 2005; Grunden and Ruggiero 2007; Idol 1999; Idol and Becker 2001; King 1992a, 1992b; Loftfield 1979; Ruggiero 2003, 2004; Ruggiero and Grunden 2004; Trinkley, Adams, and Hacker 1996; Trinkley, Barr, and Hacker 1996a, 1996b, 1997, 1998). On the 38,573 ha surveyed at Fort Bragg thus far, approximately one prehistoric site has been found for every 8 ha, and Woodland (pottery-bearing) components are found at approximately 900 of these sites. The ephemeral nature and small size of most Woodland components suggest that hunter-gatherer groups employed foraging strategies designed to exploit dispersed resource patches through high mobility (Cable and Cantley 2005:391).

The geographic area exploited by these hunter-gatherers was presumably very large. The distance from archaeological sites in the North Carolina Sandhills to Piedmont metavolcanic resources is approximately 80 km (Steponaitis et al. 2006). If we assume 80 km as the maximum diameter of an annual foraging-range area, then the squared radius of the range (1,600 km^2) multiplied by π yields an area of 5,026.5 km^2. Although the magnitude of such a foraging area is within the range of ethnographically-documented cases (e.g., foraging areas of the Nunamiut are higher), it would be among the highest documented worldwide (Kelly 1995: Table 4-1). A more likely estimate for the maximum annual foraging area of groups occupying the Sandhills would be 2,000–3,000 km^2, an area comparable to the foraging areas of groups such as the Montagnais, Nez Perce, Ngadadjara, Hadza, Ju/’hoansi (Dobe), Mlabri, Semang, and Washo (Kelly 1995:Table 4-1).

Although foraging models have not been thoroughly developed for the Sandhills, the procurement of resources from the Piedmont could have been undertaken by long-distance logistical procurement parties, down-the-line trade, or family groups mapping onto distant resources through regular long-range residential moves. By whatever means, procuring pottery from distant sources must have been costly, and consequently pots used in Sandhills settings were very likely regarded as valued properties. This is suggested by the commonness of mend holes and repeatedly fired coil-seam failures and the absence of reconstructable vessels, all signs of prehistoric efforts to extend the use-life of pottery (Herbert 2001). This apparent economy of vessel conservation may reflect a dependence on nonlocal pottery resources resembling the Archaic-period “tethering effect” of high-quality Piedmont stone resources for Sandhills groups. Accordingly, it is suggested that Woodland groups would have been able to extend their foraging

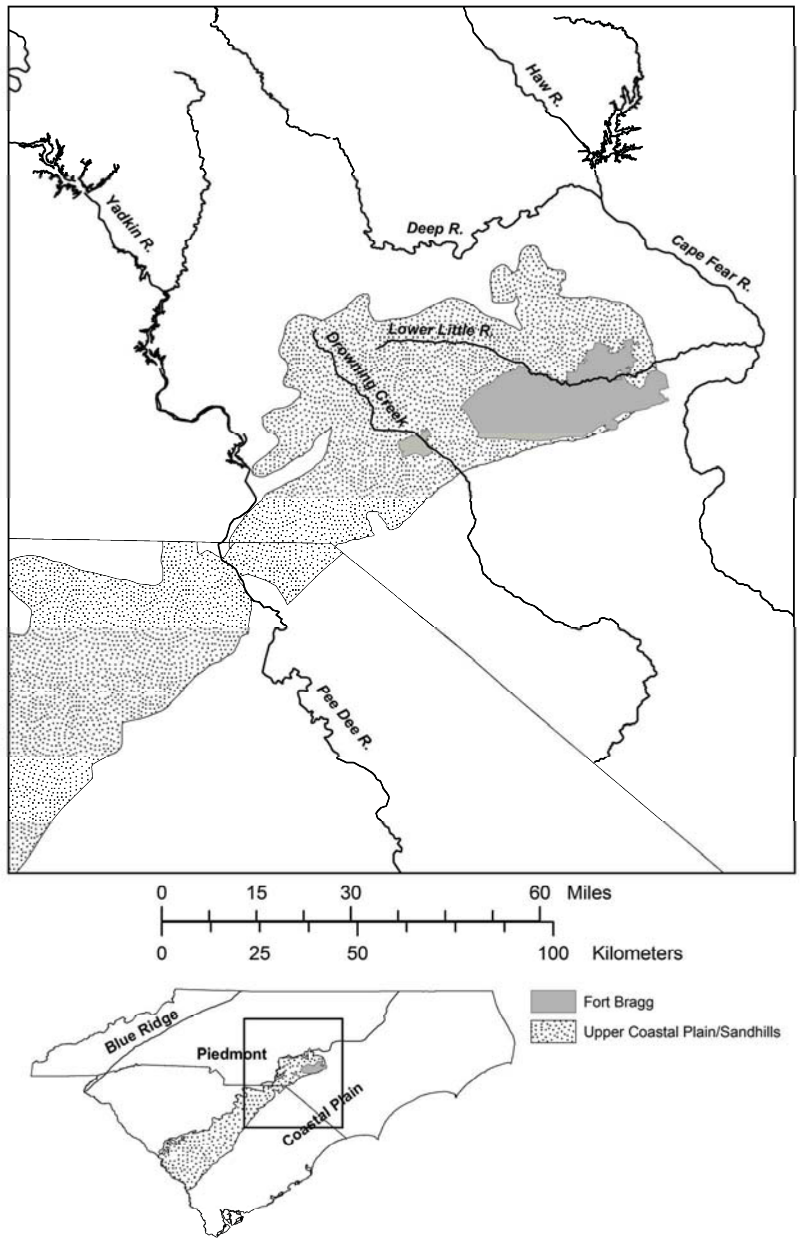

Figure 1.1. The Sandhills region of the Carolinas (United States Geological Survey 2002).

ranges away from clay-source locations by periodically provisioning themselves with vessels and then conserving or possibly caching pots as they moved away from the procurement areas.

Sourcing Ceramics

This study tests the proposal that Woodland-period Sandhills pottery was fashioned from nonlocal resources. It has two components: a characterization phase and a provenance phase. The characterization phase combines multiple analytical techniques to describe and classify physical, chemical, and mineralogical variation in 70 pottery and 84 clay samples from the Sandhills and neighboring regions. The provenance phase compares the ceramic and clay data in an effort to identify the regional sources of the raw materials used to manufacture pottery. Identifying source locations provides a basis from which to explore patterns of prehistoric ceramic production and distribution.

This sort of comprehensive, multi-component sourcing investigation is the first of its kind for the North Carolina Sandhills region, but its validity has been established by archaeologists working in other areas. In the past two decades, ceramic sourcing projects have increasingly utilized a combination of chemical and mineralogical evidence to distinguish pots and/or clays (e.g., Bartlett et al. 2000; Fitzpatrick et al. 2006; Fowles et al. 2007; Klein et al. 2004; Lane 1999; Phillips and Morgenstein 2002; Porat et al. 1991; Stoltman et al. 1992; Stoltman and Mainfort 2002).

A variety of analytical methods can be used to quantify the elemental compositions of ceramic and clay samples, including neutron activation analysis (NAA), inductively-coupled plasma spectrometry (ICP), X-ray fluorescence (XRF), and scanning electron microprobe analysis (SEM). This study employs NAA, which provides precise data on the chemical composition of aplastic components. Statistical procedures are applied to distinguish groupings within the data that may have interpretive significance. Considered in combination with other lines of evidence, groups identified on the basis of elemental composition can narrow the range of possible source locations. In cases where group membership is based on a specific trace element with a restricted geologic distribution, it may even be possible to isolate the exact location of origin.

Common techniques for determining mineralogical components of pottery and clays include petrography and X-ray diffraction (XRD). Petrography is typically used to identify aplastic inclusions. Under favorable circumstances, it may be used to differentiate purposefully added temper from natural inclusions, thereby providing a means of distinguishing among paste recipes. XRD is uniquely capable of identifying plastic minerals in unfired clays, but it cannot detect original clay minerals in pottery because the firing process destroys their characteristic crystalline structures. Both petrography and XRD are also useful for cross-checking and interpreting patterns identified through chemical analyses.

Unlike chemical and mineralogical analyses, field and laboratory techniques for assessing the physical variability of clays are not a regular component of most sourcing studies. Nevertheless, physical properties such as workability and shrinkage may provide keys to understanding why specific sources were exploited or ignored. This study incorporates performance and replication experiments for evaluating the physical properties of clays in order to both reduce the number of samples submitted for chemical and mineralogical analyses and to gain insights into factors that may have influenced the decisions and behaviors of prehistoric potters.

Research Design

This study was inspired by evidence that many prehistoric pottery vessels were brought into the Sandhills from distant sources. Some sherds from Fort Bragg sites contain inclusions such as granitic rock and weathered feldspar that presumably originated in the Piedmont (Herbert et al. 2002). Signs of resource conservation and occasional stylistic clues such as check- or complicated-stamped surface treatments, uncommon in the Sandhills, also suggest that pots may

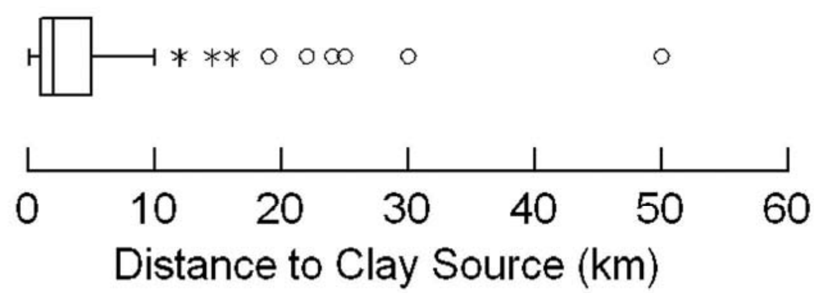

Figure 1.2. Distance from clay source to pottery production locale for 108 ethnographic cases (data from Arnold 1985).

have been imported from other areas. Finally, clay samples collected opportunistically from exposures on Fort Bragg did not seem to have enough plasticity or strength to make useful pots.

We therefore set out to test the notion that pottery found on Sandhills sites originated in surrounding regions. Several related assumptions guided our selection of an appropriate geographic scale of analysis. The first is that pots, rather than raw materials, were transported from source locations to the archaeological sites in which they were found. The construction of an average cooking pot with a capacity of 3.8 liters (1 gallon) would require approximately 2.7 kg (6 pounds) of clay (Zug 1986:145). Data collected during our firing experiments (see Chapter 4 and Appendix B) suggests that same pot would weigh only about 2 kg (4.4 pounds) after firing. We therefore consider it likely that mobile hunter-gatherers would choose to fire pots as close to the raw material source as practically possible, and ethnographic data support this assumption. Data from a sample of 108 cases worldwide reveals that the median distance from clay source to production locale is less than 5 km (Figure 1.2; Arnold 1985).

A second, related assumption is that the effort necessary to transport fragile, finished pots limited the distance over which they were regularly transported. This assumption has played an important role in previous studies of this sort, as it underlies the belief that the constituent materials of archaeological pottery specimens reflect the clay and temper resources of their immediate environs (e.g., Steponaitis et al. 1996).

Based on these two assumptions, we limited our study area to the Sandhills and adjacent regions of the Coastal Plain and Piedmont. For sampling purposes, river drainages are considered to be the relevant geographic units. Pottery and clay samples representing the Sandhills came from the Lower Little and Drowning Creek drainages, and comparative samples were collected from the Cape Fear, Waccamaw, and Pee Dee drainages in the Coastal Plain and the Yadkin, Haw, and Deep drainages in the Piedmont (Figure 1.1). Analyses were designed to characterize materials from these eight drainages in the hopes of understanding patterns of resource procurement and movement of pots.

Organization of this Volume

The next three chapters discuss pertinent background information and the details of sample selection. Chapter 2 describes the general geological, pedological, and hydrological characteristics of the study area. In Chapter 3, the pottery samples (numbered throughout this volume with the prefix JMH) are discussed in the context of the sites from which they were drawn. Chapter 4 describes the clay samples (specified with the prefix FBR) and presents the results of field and laboratory performance tests.

Chapters 5–7 present the results of chemical and mineralogical characterization analyses. In Chapter 5, the geochemical data are summarized. Chapter 6 presents the petrographic analyses, and the XRD data are interpreted in Chapter 7.

Chapter 8 summarizes the most important findings of each of the various lines of evidence, compares these results, and evaluates the implications for the model of Woodland period social and economic behaviors discussed above.