Chapter 8

Conclusions

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The goal of this study has been to identify the regional sources of raw materials used to manufacture Woodland-era ceramic vessels found on archaeological sites in and around the North Carolina Sandhills. To this end, pottery and clay samples from the Sandhills and adjacent regions of the Coastal Plain and Piedmont were collected and compared. The preceding chapters describe the results of analyses that reveal regional variation in the physical, geochemical, and mineralogical characteristics of the samples. This concluding chapter reviews the results of these various studies and brings in an additional line of evidence, the National Geochemical Survey database (United States Geological Survey 2004). The collective data are then evaluated in order to assign artifacts to geographic sources and address the archaeological implications of the study.

Clay Performance Trials

McReynolds and Herbert's performance trials in Chapter 4 assessed the suitability of 84 clay samples for making low-fired earthenware. The goal was to determine if serviceable clays would have been locally available to prehistoric potters in the Sandhills, and if not, to identify the nearest suitable resource area. On a more fundamental level, the research endeavored to clarify why Woodland potters selected particular resources and production techniques rather than others. A primary objective was thus to gain some understanding of the performance characteristics of the samples in order to recognize the technical and economic factors that may have influenced whether or not specific resources were selected for pottery making.

Workability tests designed to assess plasticity, stiffness, and strength allowed samples to be qualitatively described as lean, moderately lean, good, or fat. Replication experiments involved building and, in a few cases, drying and firing coil-built ceramic vessels. The results revealed that even clays exhibiting good workability and no excessive cracking, warping, or shrinkage during laboratory drying and firing still might not have the right combination of strength and plasticity for making pots.

In general, Sandhills samples performed worst while Coastal Plain samples from the Waccamaw and Pee Dee drainages performed best (Figure 8.1). The very best samples, however, came from the lower Haw drainage of the Piedmont. It is therefore unlikely that Sandhills materials were used to fashion the pottery found on Fort Bragg. More suitable resources are available to the north in the lower Haw drainage, to the east in the middle Cape Fear drainage, and to the south in the Waccamaw and Pee Dee drainages.

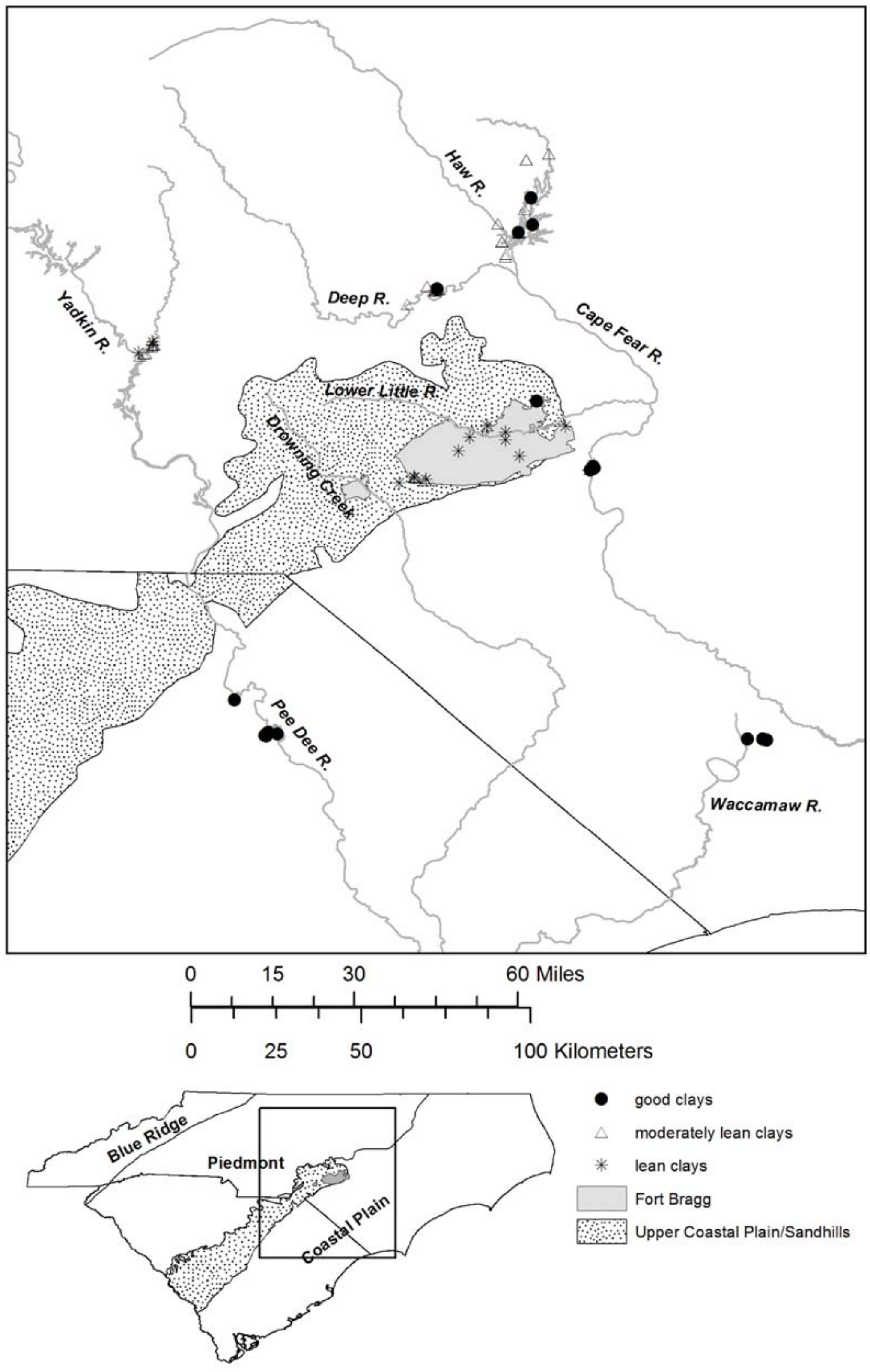

Figure 8.1. Clay sample locations and workability classes (United States Geological Survey 2002).

Neutron Activation Analysis

In Chapter 5, Speakman, Glascock, and Steponaitis described the elemental compositions of the ceramic and clay samples. Neutron activation analysis (NAA) provided elemental concentration values for 30 detectable elements in 70 ceramic samples and 42 clay samples, and these data were explored through standard statistical procedures to assess the similarities and differences among regions. Principal components analysis of the data set generated five chemical groups. Calcium (Ca), sodium (Na), and manganese (Mn) play an important role in discriminating the groups. Indeed, the groups are clearly visible in a simple scatter plot of Ca versus Na (Figure 8.2). Sixty-one of the 70 pottery specimens were assigned to a specific group, and the remaining nine were left unassigned (Table 8.1). A clear pattern emerged from the data indicating that the chemical signatures of Piedmont pottery samples are distinct from those of Coastal Plain samples. The NAA results can be summarized as follows:

- Piedmont pottery samples are assigned to Groups 1 and 2. Most fall into the latter, which is characterized by relatively high Ca, Na, and Mn concentrations. Petrographic analyses (Chapter 6) suggest that the Ca in these pottery samples comes from plagioclase mineral and rock fragments, some of which may have been added as temper.

- Coastal Plain pottery samples are assigned to Groups 3, 4, and 5. All of the assigned Breece site sherds from the middle Cape Fear drainage belong to Group 3 and have intermediate Ca and Na concentrations and low Mn concentrations. Most samples from the Kolb and Waccamaw sites in the Coastal Plain are assigned to Groups 4 and 5. Group 4 is characterized by high Ca concentrations and intermediate Na and Mn concentrations, while Group 5 exhibits low Ca and Mn concentrations and intermediate Na concentrations.

- Significantly, the Sandhills pottery samples exhibit the greatest chemical heterogeneity. Sandhills sherds are assigned to Groups 1, 2, 3, and 5.

If the chemical differences between Piedmont and Coastal Plain pottery samples reflect differences in local resources, then two possibilities exist for explaining the chemical heterogeneity exhibited in Sandhills pottery: (1) either local clay materials in the Sandhills are highly variable, with some similar to Piedmont resources and others similar to Coastal Plain resources, or (2) some or all of the pottery found in the Sandhills was made with resources procured from the Piedmont and Coastal Plain.

The chemical analysis of clay samples supports the latter possibility. Twenty of the 42 samples exhibited moderate to high probabilities of membership in the pottery groups (Table 8.2). Piedmont clays tend to be similar to the pottery in Group 2, as do Coastal Plain clays collected from alluvial deposits along the Pee Dee and Cape Fear Rivers, which originate in the Piedmont. In contrast, clay samples collected elsewhere in the Coastal Plain and in the Sandhills show low probabilities of membership in any of the pottery groups. Sandhills clays seem to be less chemically diverse than Sandhills pottery and quite distinct from Piedmont materials, suggesting a cultural interpretation for the diversity of chemical groups represented in the pottery from Fort Bragg.

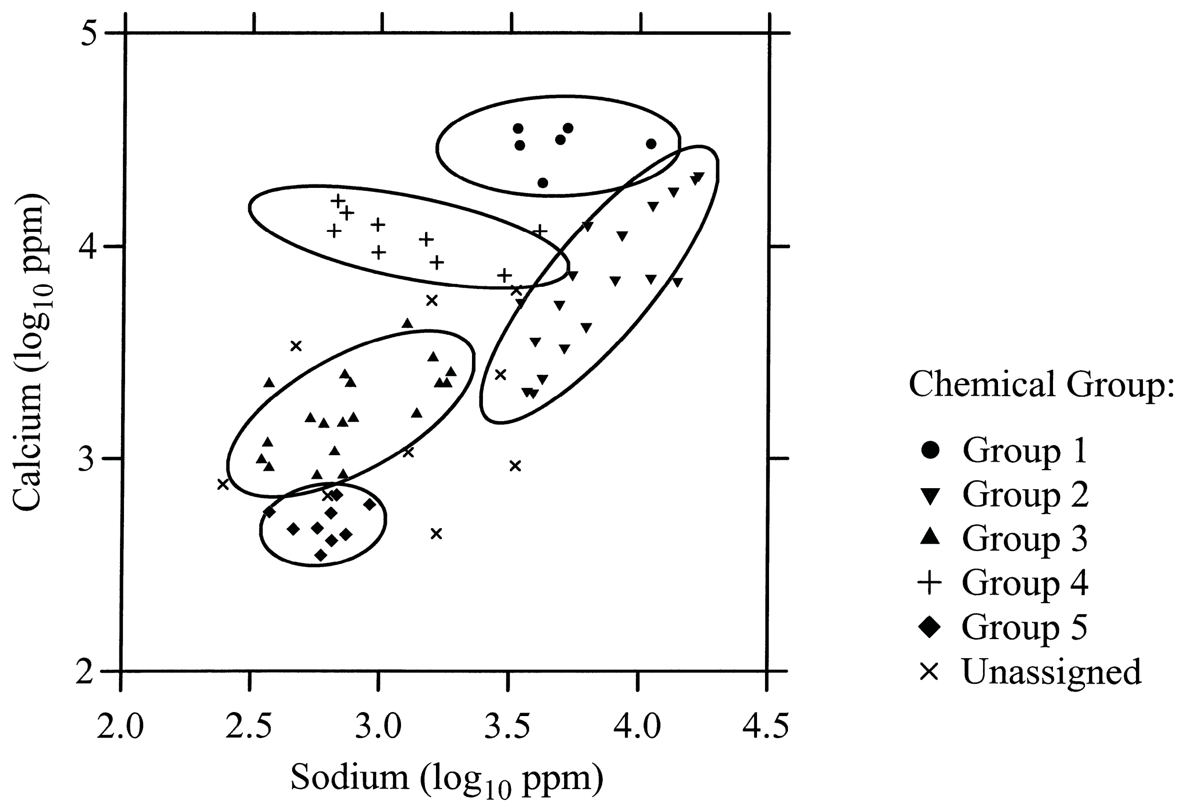

Figure 8.2. Scatter plot of Na and Ca concentrations for pottery samples, showing chemical groups. Confidence ellipses are drawn at the 80% level.

The chemical data for the clays make sense from a geological standpoint: the clays similar to Group 2 represent Piedmont sources and alluvium from Coastal Plain rivers that originate in the Piedmont. Nonetheless, comparing the clay data with the pottery data yields some surprising results. In particular, the discrepancies between Coastal Plain pottery samples (mostly in Groups 3–5) and clays (mostly similar to Group 2) raise the possibility that many of the sherds from the Breece, Kolb, and Waccamaw sites were not made from local resources. We defer a full discussion of the complex chemical relationship between pottery and clays until later in this chapter when we can consider it in combination with other lines of evidence.

Petrography

In Chapter 6, Smith reported the results of petrographic analysis of 70 archaeological pottery sherds and 53 clay test tiles. On the basis of these mineralogical data, the pottery and clay samples were assigned to three distinct petrographic groups. Group I samples have diabase (pyroxene + plagioclase) rock fragments. Group II samples contain quartz + feldspar rock fragments, quartz mineral fragments, and mafic mineral fragments. Group III samples include muscovite mica and quartz and generally lack mafic minerals. Groups II and III are divided into

Table 8.1. Assignment of Pottery Samples to Chemical Groups.[a]

Region: Drainage	Chemical Group 1	2	3	4	5	Unassigned	Total
Sandhills:							
Lower Little	1	2	5		2	2	12
Drowning Creek		1	2		3	2	8
Coastal Plain:							
Cape Fear			9			1	10
Pee Dee			1	6	2	1	10
Waccamaw			2	3	2	3	10
Piedmont:							
Haw	2	8					10
Yadkin	3	7					10
	6	18	19	9	9	9	70

[a] Based on NAA. Group assignments taken from Table 5.4.

subgroups based on variation in mafic mineral components and the presence of argillaceous clay clots, respectively.

Sixty-seven of the 70 pottery specimens could be assigned to a specific petrographic group (Table 8.3). As with the chemical data, a clear pattern emerges indicating that the mineralogical characteristics of Piedmont pottery samples are different from those of Coastal Plain samples. The petrographic data can be summarized as follows:

- Piedmont pottery samples contain Ca-rich plagioclase, pyroxene, and amphibole and are assigned to petrographic Groups I or II. Most fall into Group IIB, characterized by quartz + feldspar rock fragments without mafic mineral components.
- With one exception, Coastal Plain pottery samples are assigned to quartz-rich Group III. Most contain argillaceous clay clots and are classified in Group IIIA.
- Interestingly, most Sandhills pottery samples also fall into petrographic Group III.

These petrographic data may reflect differences in local Piedmont and Coastal Plain resources. Indeed, the petrographic analysis of clay samples bolsters this hypothesis (Table 8.4). Thirty-eight of the 42 clay samples could be tentatively assigned to a petrographic group, and with few exceptions the clay data mirror the pottery data: most Piedmont clay samples fall into Group II, while Coastal Plain and Sandhills clay samples fall into Group III.

In contrast to the chemical data, then, the petrographic data indicate that Sandhills sherds are mineralogically similar to Coastal Plain samples but generally distinct from Piedmont samples. We will explore this apparent contradiction below in light of additional mineralogical and chemical data.

Table 8.2. Affinities of Clay Samples to Chemical Groups.[a]

Region: Drainage	Most Similar Chemical Group[b] 1	2	3	4	5	No Similar Group[c]	Total
Sandhills:							
Lower Little	-	-	-	-	-	12	12
Coastal Plain:							
Cape Fear	-	5	-	-	-	-	5
Pee Dee	-	4	-	-	-	1	5
Waccamaw	-	-	-	-	-	5	5
Piedmont:							
Haw	-	2	-	-	-	3	5
Yadkin	-	5	-	-	-	-	5
Deep	-	4	-	-	-	1	5
	0	20	0	0	0	22	42

[a] Based on NAA, full data set (Table 5.5).
[b] Mahalanobis probability of membership is moderate to high (greater than 20%).
[c] Mahalanobis probability of membership is low for all groups (less than 20%).

X-Ray Diffraction

In Chapter 7, McReynolds, Skaggs, and Schroeder described the mineralogy of clay samples as determined by X-ray diffraction (XRD). They used the Mineral Intensity Factor 100% approach (MIF) to obtain semi-quantitative measurements of quartz, lepidocrocite, gibbsite, plagioclase, K-feldspar, amphibole, and clay minerals in 39 samples.

The resulting data help explain the geochemical patterns seen in the NAA data (Chapter 5). They confirm that the high Ca content of chemical Group 2 samples comes from plagioclase derived from Piedmont rocks. They also suggest that clay samples exhibiting good workability and superior hardness contain proportionally more K-feldspar than less suitable samples.

National Geochemical Survey

The National Geochemical Survey (NGS) database contains concentration values for 40 elements detected in stream-sediment samples from across the United States. These data were reported by a variety of agencies employing standardized sampling techniques and analytical methods, including NAA and inductively coupled plasma-atomic emission spectrometry (ICP-AES; United States Geological Survey 2004). Although the NGS data are not comparable to the geochemical data reported here in absolute terms, as the methods and standards of data collection were different, the data can be compared in a general way by looking at patterns of relative abundance. The NGS samples for North Carolina (n = 646) and South Carolina (n = 1,335) are comprehensive and allowed us to generate element distribution maps demonstrating significant geochemical distinctions among the Piedmont, Coastal Plain, and Sandhills regions (Figures 8.3–

Table 8.3. Assignment of Pottery Samples to Petrographic Groups.[a]

Region: Drainage	Petrographic Group I	IIA	IIB	IIIA	IIIB	Unassigned	Total
Sandhills:							
Lower Little	1	-	-	10	1	-	12
Drowning Creek	-	-	2	5	1	-	8
Coastal Plain:							
Cape Fear	-	-	-	9	1	-	10
Pee Dee	-	-	-	6	2	2	10
Waccamaw	-	-	1	3	5	1	10
Piedmont:							
Haw	2	2	6	-	-	-	10
Yadkin	1	4	5	-	-	-	10
	4	6	14	33	10	3	70

[a] Based on petrography. Group assignments taken from Table 6.2.

Table 8.4. Assignment of Clay Samples to Petrographic Groups.[a]

Region: Drainage	Petrographic Group I	II	III	Unassigned	Total
Sandhills:					
Lower Little	-	1	7	4	12
Coastal Plain:					
Cape Fear	-	-	5	-	5
Pee Dee	-	-	5	-	5
Waccamaw	-	-	5	-	5
Piedmont:					
Haw	-	5	-	-	5
Yadkin	-	3	2	-	5
Deep	-	5	-	-	5
	0	14	24	4	42

[a] Based on petrography. Group assignments taken from Table 6.3.

8.7). Comparing these maps to the data reported in Chapter 5 reveals general agreement between the two data sets, indicating that the NGS data can provide an additional line of evidence to inform the assignment of pottery artifacts to specific source areas.

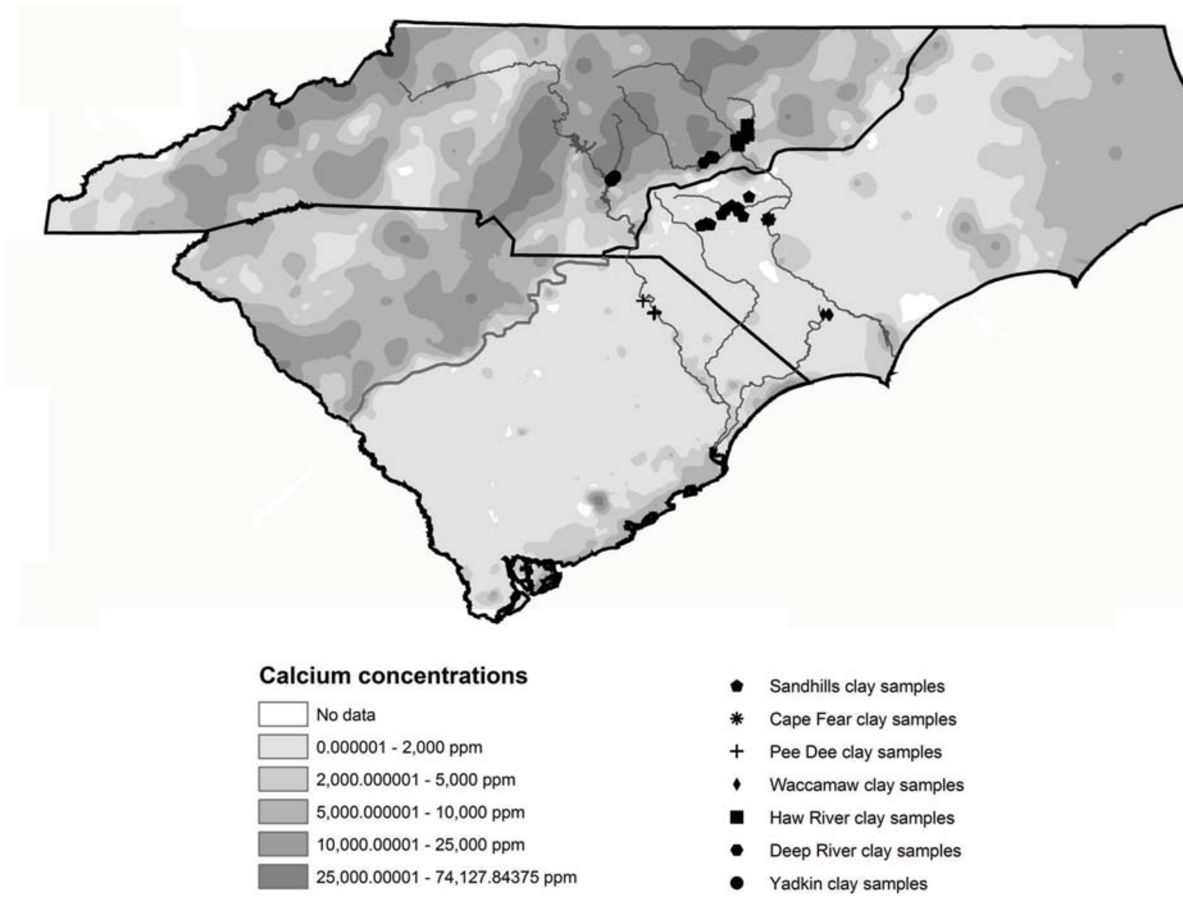

Figure 8.3. Interpolated Ca concentration map prepared by kriging ICP-AES data found in the National Geochemical Survey database (United States Geological Survey 2002, 2004).

The NGS data demonstrate that the Piedmont and Coastal Plain are clearly distinguishable with respect to concentrations of Ca, Na, and Mn, the same three elements that play the largest roles in defining the five chemical groups identified in Chapter 5 (Figures 8.3–8.5). In particular, the Slate Belt region of the Piedmont has very high concentrations of these three elements relative to the Coastal Plain. The Sandhills region is further distinguished by high concentrations of samarium (Sm) and thorium (Th) relative to the lower Coastal Plain and Piedmont regions (Figures 8.6–8.7).

The NAA data on our clay samples reveal similar patterns. In general, the highest average concentrations of Ca, Na, and Mn are found in Piedmont samples from the Yadkin and Deep drainages, while the lowest average concentrations of these three elements are found in samples from the Sandhills (Table 8.5). Sandhills samples also exhibit the highest Sm and Th concentrations. Notably, clays from the Piedmont-originating Cape Fear and Pee Dee drainages exhibit higher relative concentrations of Ca, Na, and Mn than the NGS data predict. However, these discrepancies are easily explained: the NGS database primarily includes samples from low-order streams containing only local sediments, while the clay samples analyzed for this study represent higher-order rivers with sediments transported from far upstream.

General similarities between the NGS sediment data and our clay data indicate that, despite its small size, our clay sample reflects at least some of the regional differences in elemental

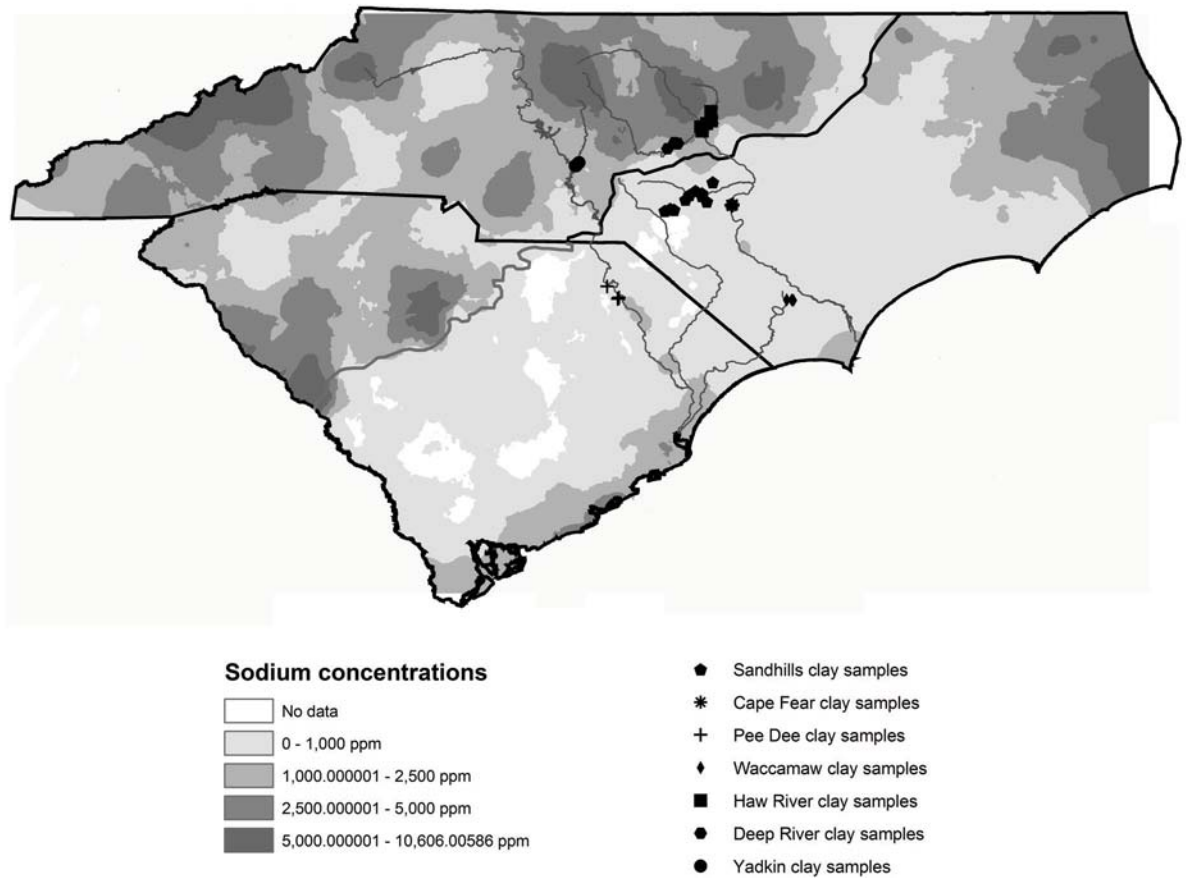

Figure 8.4. Interpolated Na concentration map prepared by kriging NAA data found in the National Geochemical Survey database (United States Geological Survey 2002, 2004).

composition. Concentration values for Ca, Na, Mn, Sm, and Th may be especially useful for discriminating among regions, and we draw upon these results in the following discussion.

Discussion

The various lines of evidence point to broad geographic source areas that correspond to the Piedmont and Coastal Plain physiographic provinces. The following discussion integrates the evidence to help us better understand the relationships between pottery and clay samples from each region. We then propose the most likely geographic area of origin for each of the 70 pottery samples.

Based solely on the pottery samples, there appears to be a relatively unambiguous relationship between chemical and petrographic group assignments (Table 8.6). With the exception of four samples, the data reveal the following general patterns:

- Petrographic Group I is associated with chemical Group 1. Three of the four pottery samples assigned to these groups are from Piedmont sites, while the fourth is from the Lower Little drainage in the Sandhills.

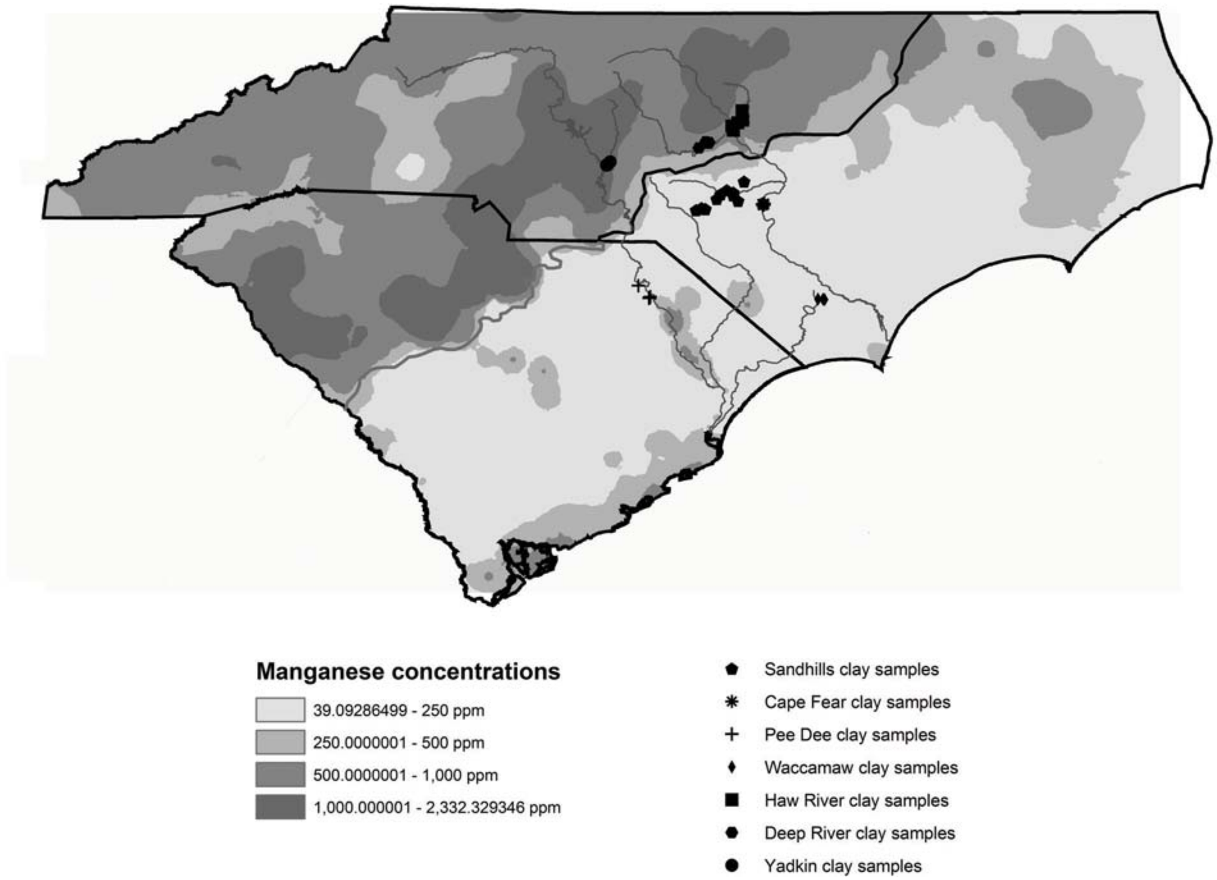

Figure 8.5. Interpolated Mn concentration map prepared by kriging ICP-AES data found in the National Geochemical Survey database (United States Geological Survey 2002, 2004).

- Petrographic Groups IIA and IIB are primarily associated with chemical Groups 1 and 2. Samples assigned to these groups are from Piedmont sites.

- Petrographic Groups IIIA and IIIB are primarily associated with chemical Groups 3, 4, and 5. Samples assigned to these groups represent sites in the Coastal Plain and Sandhills.

If these patterns reflect the use of local resources, the clay data should exhibit similar patterns. Accordingly, Piedmont clay samples should classify as petrographic Group I or II and chemical Group 1 or 2, while Coastal Plain samples should classify as petrographic Group III and chemical Group 3, 4, or 5. In fact, the relationship between petrographic and chemical group assignments for the clay samples is more complicated. As predicted, Piedmont clay samples are assigned to petrographic Group II and chemical Group 2, and Coastal Plain samples are assigned to petrographic Group III (Tables 8.2 and 8.4). Contrary to predictions, however, most Coastal Plain clay samples fall into chemical Group 2 (Table 8.2).

Although the assignment of Coastal Plain clay samples to chemical Group 2 is unexpected, it makes sense when the XRD data are considered. The seemingly problematic clay samples generally represent Coastal Plain drainages with Piedmont origins, and the XRD data suggest

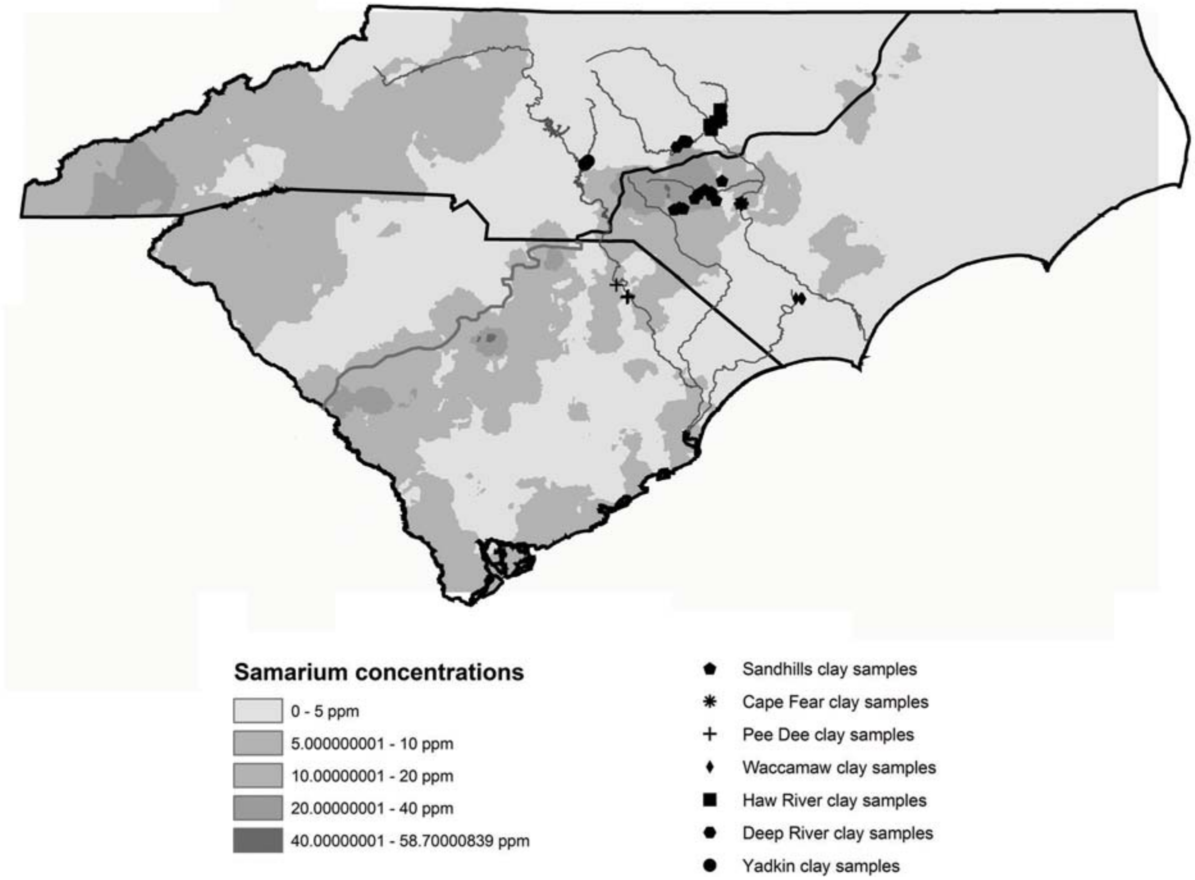

Figure 8.6. Interpolated Sm concentration map prepared by kriging NAA data found in the National Geochemical Survey database (United States Geological Survey 2002, 2004).

Piedmont-derived, Ca-rich plagioclase is responsible for the chemical Group 2 classification. Clay samples from drainages restricted to the Coastal Plain lack plagioclase and show little chemical similarity to any of the pottery groups.

These results indicate that the petrographic data let us broadly distinguish between Piedmont (Group II) and Coastal Plain (Group III) samples. The chemical data, on the other hand, allow discrimination between resources from the Piedmont and drainages originating in the Piedmont (Groups 1–2) and those from drainages restricted to the Coastal Plain (Groups 3–5). With this in mind, we now consider the pottery samples from each region and attempt to attribute them to specific geographic areas of origin.

Piedmont Pottery Samples

Most Piedmont pottery samples are assigned to chemical Group 2 and petrographic Group II. As discussed previously, our Piedmont clay samples are chemically most similar to Group 2 and typically assigned to petrographic Group II. The most straightforward reading of this evidence is that pottery found at the Doerschuk and Haw River sites was generally made from local resources (Table 8.7).

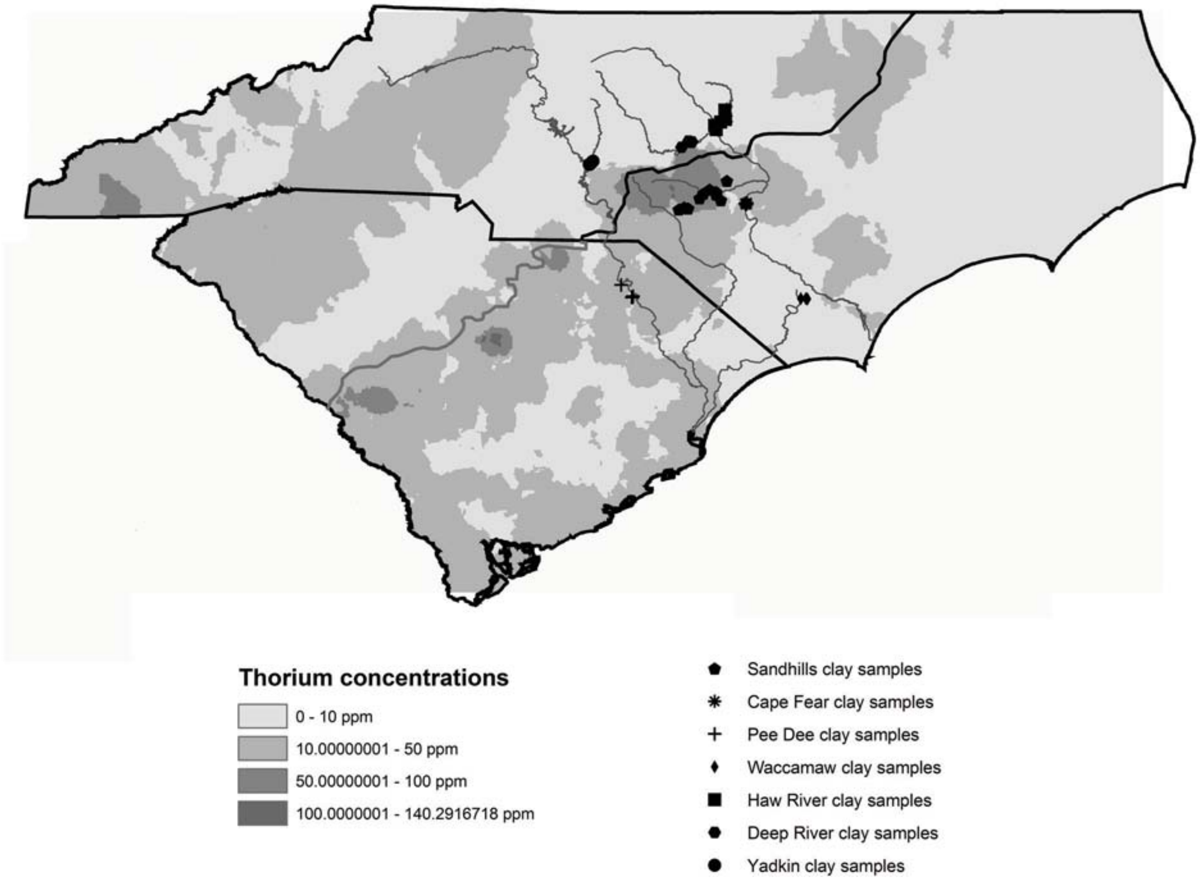

Figure 8.7. Interpolated Th concentration map prepared by kriging NAA data found in the National Geochemical Survey database (United States Geological Survey 2002, 2004).

Table 8.5. Mean Concentrations of Select Elements in Clay Samples by Drainage.[a]

Region: Drainage	Ca (ppm)	Na (ppm)	Mn (ppm)	Sm (ppm)	Th (ppm)
Sandhills:					
Lower Little	106.9	386.4	54.60	9.4510	14.8333
Drowning Creek	0.0	391.2	31.81	8.1630	22.4766
Coastal Plain:					
Cape Fear	2182.3	4293.9	668.20	4.6340	8.5305
Pee Dee	2628.0	3281.3	575.20	7.9030	13.1709
Waccamaw	3160.0	460.2	55.00	3.5350	8.0947
Piedmont:					
Haw	2670.3	3103.5	361.30	2.7830	10.9907
Yadkin	7809.6	3568.0	1431.40	4.9690	5.8311
Deep	4448.7	7230.6	511.60	5.5740	7.9631

[a] Based on NAA. Data from Tables C.1–C.3.

Table 8.6. Cross Tabulation of Chemical and Petrographic Groups for Pottery Samples.[a]

	Chemical Group				
Petrographic Group	1	2	3	4	5
I	4	-	-	-	-
IIA	2	4	-	-	-
IIB	-	11	1	-	-
IIIA	-	3	15	6	5
IIIB	-	-	3	3	2

[a] The dotted lines divide predominantly Piedmont groups from predominantly Coastal Plain groups. Generally, the upper left quadrant contains pottery made in the Piedmont, the lower left quadrant contains pottery made in the Coastal Plain from Piedmont-derived alluvial clays, and the lower right quadrant contains pottery made in the Coastal Plain from other kinds of clays.

Five Piedmont pottery samples are assigned to chemical or petrographic groups that are not similar to any of the clay samples we collected (JMH031, JMH032, JMH034, JMH046, JMH047; see Table 8.7). In three of these cases (JMH031, JMH046, JMH047), diabase inclusions account for the petrographic Group I assignment. Because the crushed diabase in these sherds was probably added as temper, the chemical differences between the pottery and local clays are to be expected. Smith's comparison of the inclusions with diabase from the eastern Piedmont suggests that these three samples were made from locally obtained Piedmont resources (Chapter 6).

In the cases of samples JMH032 and JMH034 from the Doerschuk site, stylistic evidence suggests Piedmont sources. These pottery samples are typologically classified as Dan River Simple Stamped and Jenrette Plain, respectively. Both types are associated with the Piedmont Dan and Eno River basins, about 80–120 km northeast of the Doerschuk site. Because the Group II petrographic assignments for these sherds are also consistent with Piedmont sources, a Piedmont origin is proposed for both samples.

In addition, Ca, Na, Mn, Sm, and Th concentration values for these five samples are consistent with Piedmont origins. As the NGS data for Piedmont sediments predict, the samples exhibit relatively high concentrations of Ca, Na, and Mn and relatively low concentrations of Sm and Th.

Coastal Plain Pottery Samples

The complex relationship between chemical and petrographic group assignments for Coastal Plain clays makes it more difficult to attribute pottery samples to specific source areas. Petrographic Group III assignments for most sherds are consistent with Coastal Plain origins, but the chemical data are problematic. None of the 30 Coastal Plain sherds match local clay samples

Table 8.7. Proposed Source Assignments for Piedmont Pottery Samples.

Sample ID	Site	Drainage	Pottery Type	Period	Chemical Group	Petrographic Group	Proposed Source Area
JMH031	Doerschuk	Yadkin	Yadkin Fabric Impressed	Middle Woodland	1	I	Piedmont
JMH032	Doerschuk	Yadkin	Dan River Simple Stamped	Late Woodland	1	IIA	Piedmont (Dan or Eno drainage?)
JMH033	Doerschuk	Yadkin	Yadkin Fabric Impressed	Middle Woodland	2	IIA	Piedmont
JMH034	Doerschuk	Yadkin	Jenrette Plain (Bruton?)	Contact	1	IIA	Piedmont (Dan or Eno drainage?)
JMH035	Doerschuk	Yadkin	New River Cord Marked	Early Woodland	2	IIB	Piedmont
JMH036	Doerschuk	Yadkin	New River Net Impressed	Early Woodland	2	IIB	Piedmont
JMH037	Doerschuk	Yadkin	Yadkin Check Stamped	Middle Woodland	2	IIB	Piedmont
JMH038	Doerschuk	Yadkin	Yadkin Cord Marked	Middle Woodland	2	IIB	Piedmont
JMH039	Doerschuk	Yadkin	Dan River Net Impressed	Late Woodland	2	IIB	Piedmont
JMH040	Doerschuk	Yadkin	Yadkin Net Impressed	Middle Woodland	2	IIA	Piedmont
JMH041	Haw River	Haw	Yadkin Paddle-edge Stamped	Middle Woodland	2	IIB	Piedmont
JMH042	Haw River	Haw	Yadkin Cord Marked	Middle Woodland	2	IIB	Piedmont
JMH043	Haw River	Haw	Yadkin Plain	Middle Woodland	2	IIB	Piedmont
JMH044	Haw River	Haw	Cape Fear Fabric Impressed	Middle Woodland	2	IIB	Piedmont
JMH045	Haw River	Haw	Yadkin Plain	Middle Woodland	2	IIA	Piedmont
JMH046	Haw River	Haw	Yadkin Plain	Middle Woodland	1	I	Piedmont
JMH047	Haw River	Haw	Yadkin eroded	Middle Woodland	1	I	Piedmont
JMH048	Haw River	Haw	Yadkin Plain	Middle Woodland	2	IIA	Piedmont
JMH049	Haw River	Haw	Yadkin Plain	Middle Woodland	2	IIB	Piedmont
JMH050	Haw River	Haw	Yadkin eroded	Middle Woodland	2	IIB	Piedmont

Table 8.8. Proposed Source Assignments for Coastal Plain Pottery Samples.

Sample ID	Site	Drainage	Pottery Type	Period	Chemical Group	Petrographic Group	Proposed Source Area
JMH021	Breece	Cape Fear	Hanover II Paddle-edge Stamped	Middle Woodland	3	IIIA	Coastal Plain
JMH022	Breece	Cape Fear	New River Fabric Impressed	Early Woodland	3	IIIB	Coastal Plain
JMH023	Breece	Cape Fear	Hanover II Fabric Impressed	Middle-Late Woodland	3	IIIA	Coastal Plain
JMH024	Breece	Cape Fear	Hanover II Fabric Impressed	Middle-Late Woodland	3	IIIA	Coastal Plain
JMH025	Breece	Cape Fear	Cape Fear Cord Marked	Middle Woodland	3	IIIA	Coastal Plain
JMH026	Breece	Cape Fear	Hanover II Fabric Impressed	Middle Woodland	-	IIIA	Coastal Plain
JMH027	Breece	Cape Fear	Hanover I Fabric Impressed	Middle Woodland	3	IIIA	Coastal Plain
JMH028	Breece	Cape Fear	Hanover I Fabric Impressed	Middle Woodland	3	IIIA	Coastal Plain
JMH029	Breece	Cape Fear	Hanover I Fabric Impressed	Middle Woodland	3	IIIA	Coastal Plain
JMH030	Breece	Cape Fear	Hanover II Fabric Impressed	Middle-Late Woodland	3	IIIA	Coastal Plain
JMH051	Kolb	Pee Dee	Yadkin Fabric Impressed	Middle Woodland	5	-	Coastal Plain
JMH052	Kolb	Pee Dee	Yadkin/Hanover Fabric Impressed (with grog)	Middle Woodland	5	-	Coastal Plain
JMH053	Kolb	Pee Dee	Yadkin Cord Marked	Middle Woodland	-	IIIA	Coastal Plain
JMH054	Kolb	Pee Dee	New River Cord Marked	Early Woodland	3	IIIA	Coastal Plain
JMH055	Kolb	Pee Dee	Yadkin Cord Marked	Middle Woodland	4	IIIB	Coastal Plain
JMH056	Kolb	Pee Dee	New River Fabric Impressed	Early Woodland	4	IIIA	Coastal Plain
JMH057	Kolb	Pee Dee	New River Cord Marked	Early Woodland	4	IIIB	Coastal Plain
JMH058	Kolb	Pee Dee	Cape Fear Fabric Impressed	Late Middle Woodland	4	IIIA	Coastal Plain
JMH059	Kolb	Pee Dee	Cape Fear Fabric Impressed	Late Middle Woodland	4	IIIA	Coastal Plain
JMH060	Kolb	Pee Dee	Hanover I Fabric Impressed	Middle Woodland	4	IIIA	Coastal Plain
JMH061	Waccamaw	Waccamaw	Thoms Creek Punctate	Early Woodland	4	IIIA	Coastal Plain
JMH062	Waccamaw	Waccamaw	Cape Fear Fabric Impressed	Late Middle Woodland	4	IIIB	Coastal Plain
JMH063	Waccamaw	Waccamaw	Hanover II Fabric Impressed	Late Woodland	4	IIIA	Coastal Plain
JMH064	Waccamaw	Waccamaw	Hanover II Fabric Impressed	Late Woodland	-	IIIB	Coastal Plain
JMH065	Waccamaw	Waccamaw	Hanover I Fabric Impressed	Middle Woodland	3	IIIA	Coastal Plain
JMH066	Waccamaw	Waccamaw	Cape Fear Fabric Impressed	Late Middle Woodland	-	IIIB	Coastal Plain
JMH067	Waccamaw	Waccamaw	Cape Fear Fabric Impressed	Late Middle Woodland	3	IIB	-
JMH068	Waccamaw	Waccamaw	Hanover eroded	Middle Woodland	-	-	-
JMH069	Waccamaw	Waccamaw	Cape Fear Fabric Impressed	Late Middle Woodland	5	IIIB	Coastal Plain
JMH070	Waccamaw	Waccamaw	Cape Fear Fabric Impressed	Late Middle Woodland	5	IIIB	Coastal Plain

with respect to both chemistry and mineralogy. Nevertheless, the available data may be used to propose general source areas for most Coastal Plain sherds (Table 8.8).

The Breece site pottery samples are all assigned to chemical Group 3 and petrographic Group III, suggesting a single, Coastal Plain source (Table 8.8). However, because all five clay samples collected near the Breece site are most similar to chemical Group 2, it is likely that the source used by prehistoric potters lies outside the site's immediate environs.

One possible nearby source for the Breece site pottery samples is suggested by the nineteenth-century manufacture of stoneware from sedimentary clay mined at the "Poe & Bros." yard in Fayetteville (Ries 1897:110–111). Although the Poe clay bed was primarily used for brickmaking, some portion contained very smooth clay without iron stains that was used for pottery making. The Poe clay mine was not discovered during this study, but its general location indicates the presence of good quality clay about 10 km from the Breece site.

Most pottery samples from the Kolb and Waccamaw sites are assigned to petrographic Group III and chemical Groups 3, 4, or 5 (Table 8.8). This suggests pottery found at these two sites was constructed from Coastal Plain resources, and stylistic evidence generally supports this conclusion. Six Kolb sherds and all of the Waccamaw sherds are classified to Coastal Plain pottery types.

Four Kolb sherds were classified to the Yadkin series on the basis of crushed-quartz temper (JMH051–JMH053, JMH055). The Yadkin series is typically found in the Piedmont and occasionally in the Sandhills. Nevertheless, the geochemical and petrographic characteristics of these four specimens are consistent with Coastal Plain resources. Interestingly, samples JMH051 and JMH052 are geochemically and petrographically distinct from the other Kolb sherds, indicating that they were likely made from different resources. It is not difficult to imagine the significance of the Pee Dee River as a prehistoric transportation corridor, and it may be that both pots and pottery making traditions moved along this major waterway.

Clearly, the exact source locations for the resources used to make most of the Kolb and Waccamaw pottery were not identified in this study. Although it is possible that constituents of sand or grog added as temper may have influenced the chemical composition of the pottery samples, a more likely explanation is that the specific clay sources that were used prehistorically are not represented by the clay samples collected for this study.

Sandhills Pottery Samples

Sandhills pottery samples exhibit more mineralogical and chemical variability than Sandhills clays, which are primarily assigned to petrographic Group III. It is tempting to speculate that the seven pottery samples classified as chemical Group 3 and petrographic Group III were made with local Sandhills materials, but it is important to recall that this study did not identify a single suitable clay sample in the Sandhills region despite intensive searching (see Chapter 4). Moreover, Sm and Th concentrations for Sandhills sherds are not as elevated as would be expected if they were made from Sandhills resources.

Petrographic assignments to Group III suggest that most Sandhills pottery samples were made from Coastal Plain resources, and stylistic attributes support this conclusion (Table 8.9). The 12 samples assigned to chemical Groups 3 or 5 almost certainly came from the Coastal Plain. Samples JMH003, JMH008, and JMH016 are classified as chemical Group 2 and may have come from Coastal Plain drainages originating in the Piedmont or from the Piedmont itself, but the former interpretation is favored given that they are classified to series characteristic of the

Table 8.9. Proposed Source Assignments for Sandhills Pottery Samples.

Sample ID	Site	Drainage	Pottery Type	Period	Chemical Group	Petrographic Group	Proposed Source Area
JMH001	31Hk868	Lower Little	Hanover II Fabric Impressed	Middle-Late Woodland	-	IIIA	Coastal Plain
JMH002	31Ht392	Lower Little	Hanover II Fabric Impressed	Middle-Late Woodland	3	IIIA	Coastal Plain
JMH003	31Ht273	Lower Little	Cape Fear III Fabric Impressed	Middle-Late Woodland	2	IIIA	Coastal Plain (Piedmont drainage)
JMH004	31Hk127	Lower Little	Hanover II Fabric Impressed	Middle-Late Woodland	3	IIIA	Coastal Plain
JMH005	31Hk59	Lower Little	Hanover I Cord Marked	Middle Woodland	3	IIIA	Coastal Plain
JMH006	31Hk123	Lower Little	Yadkin Fabric Impressed	Middle Woodland	1	I	Piedmont
JMH007	31Cd750	Lower Little	Hanover I Paddle-edge Stamped	Early Woodland	-	IIIA	Coastal Plain
JMH008	31Ht269	Lower Little	Mount Pleasant Cord Marked	Middle Woodland	2	IIIA	Coastal Plain (Piedmont drainage)
JMH009	31Cd486	Lower Little	Cape Fear Cord Marked	Middle Woodland	5	IIIA	Coastal Plain
JMH010	31Hk715	Lower Little	Hanover Fabric Impressed	Middle Woodland	3	IIIA	Coastal Plain
JMH011	31Mr241	Drowning Creek	Hanover I Cord Marked	Middle Woodland	5	IIIA	Coastal Plain
JMH012	31Mr259	Drowning Creek	Hanover II Fabric Impressed	Middle-Late Woodland	5	IIIA	Coastal Plain
JMH013	31Mr241	Drowning Creek	Deptford Linear Check Stamped	Middle Woodland	5	IIIA	Coastal Plain
JMH014	31Mr253	Drowning Creek	Yadkin Fabric Impressed	Middle Woodland	-	IIB	Piedmont
JMH015	31Mr241	Drowning Creek	Sand-Tempered Plain	Early-Middle Woodland	-	IIB	Piedmont
JMH016	31Sc71	Drowning Creek	New River Paddle-edge Stamped	Early Woodland	2	IIIA	Coastal Plain (Piedmont drainage)
JMH017	31Mr93	Lower Little	New River Cord Marked	Early Woodland	3	IIIB	Coastal Plain
JMH018	31Sc87	Drowning Creek	Deptford Check Stamped	Middle Woodland	3	IIIB	Coastal Plain
JMH019	31Mr93	Lower Little	Hanover II Cord Marked	Middle-Late Woodland	5	IIIA	Coastal Plain
JMH020	31Mr241	Drowning Creek	New River Cord Marked	Early Woodland	3	IIIA	Coastal Plain

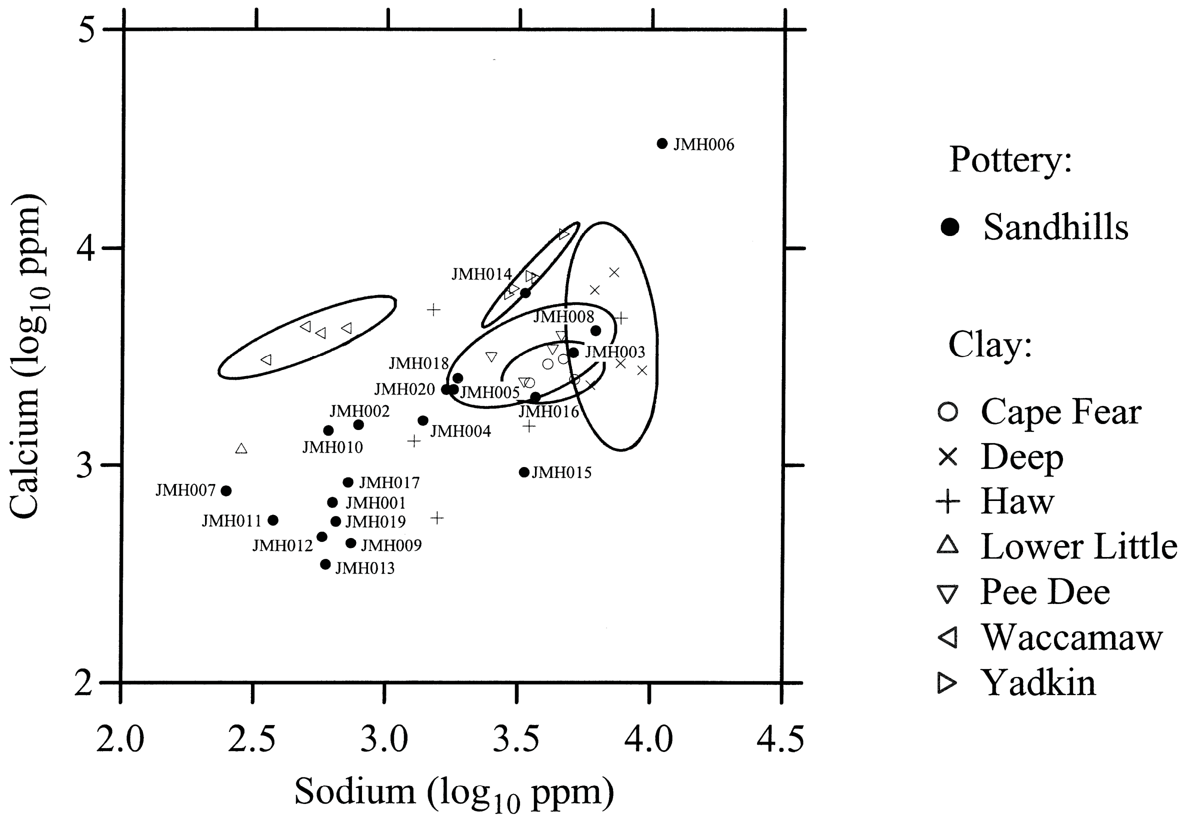

Figure 8.8. Scatter plot of Na and Ca concentrations, comparing Sandhills pottery with clay samples. Sandhills pottery specimens are labeled. Confidence ellipses are shown for clay samples from the Cape Fear, Deep, Pee Dee, Waccamaw, and Yadkin drainages.

Coastal Plain. In addition, when Ca and Na concentrations are considered, these three samples cluster with clay samples from the Cape Fear and Pee Dee drainages (Figure 8.8).

Samples JMH001 and JMH007 are assigned to petrographic Group III but could not be assigned to a chemical group. When Ca and Na concentrations for Sandhills samples are plotted, however, these two samples resemble other Group 5 pottery samples (Figure 8.8). Given that JMH001 and JMH007 also exhibit Hanover stylistic attributes, they may reasonably be attributed to Coastal Plain resources.

Three Sandhills samples are mineralogically similar to Piedmont samples (JMH006, JMH014, and JMH015). It is very likely that Group 1 sherd JMH006 was originally made in the Piedmont. Like the other three Group-I sherds attributed to Piedmont resources, JMH006 is classified as Yadkin series and tempered with crushed-diabase rock, the nearest source of which is approximately 30 km from the Fort Bragg site where this sherd was found. Petrographic Group IIB samples JMH014 and JMH015 were not assigned to a chemical group, but Na and Ca concentrations suggest that they were also made from Piedmont resources. Sample JMH014 clusters with clay samples from the Yadkin drainage and is classified as Yadkin series. The amount of Na in JMH015 suggests it resembles other Group-2 pottery samples (Figure 8.8).

In summary, the data suggest that 3 of the 20 Sandhills pottery samples were probably imported from the Piedmont (JMH006, JMH014, and JMH015). The other Sandhills sherds appear to reflect Coastal Plain resources, most likely obtained outside of the Sandhills region.

Conclusions

The chemical and mineralogical characteristics of pottery found on Piedmont sites generally reflect Piedmont resources, and the characteristics of pottery found on Coastal Plain sites generally reflect Coastal Plain resources. Based on the convergent results of NAA and petrographic analyses of Piedmont pottery and clays, we conclude that potters at the Haw River and Doerschuk sites primarily used locally available resources. Sherds from Coastal Plain sites could not be associated with particular clay resources, but most could be linked to the Coastal Plain region.

Interestingly, the chemical and mineralogical homogeneity of pottery samples from the Breece site suggests a clay source in the immediate vicinity of the site, but the NAA results reveal an unexpected chemical distinction between the sherds (Group 3) and local clays (similar to Group 2). This anomaly suggests that alluvial clays from the Cape Fear drainage were not often being used to make the pottery found at the Breece site, but rather that pottery vessels made from Coastal Plain resources were being transported to the site from other areas. The clay bed accessed by the nineteenth-century Poe mine suggests that good clay resources may be found nearby, but the current study cannot preclude the possibility that the Breece site occupants procured clays from Coastal Plain sources much farther afield.

The presence of several distinct chemical and petrographic groups among the Kolb and Waccamaw sherds suggests that potters in these areas utilized clays from multiple locations. Most of these resources appear to have come from the Coastal Plain, although a few Kolb pottery samples suggest stylistic influence from the Piedmont. Additional study may help determine whether potters at the Kolb and Waccamaw sites used several different clays from the same general region or exploited resources from more than one region.

Finally, the results of clay performance trials, geochemical analyses, and mineralogical analyses all suggest that most of the archaeological pottery found at Fort Bragg sites was fashioned from Piedmont or Coastal Plain sources and subsequently transported into the Sandhills region. We were unable to locate serviceable clay resources in the North Carolina Sandhills, and the results of NAA and petrographic analyses indicate that most Fort Bragg pottery samples more closely resemble Coastal Plain and Piedmont resources than local Sandhills materials. The available evidence indicates that Coastal Plain clays may be better represented among the Sandhills sherds than Piedmont clays, but at least three pottery samples appear to have been fashioned from Piedmont resources.

Overall, these results suggest that pottery circulated over broad regions, implying that the acquisition of clay materials from distant sources was a routine feature of Woodland-period subsistence in the Sandhills. Such materials could have been obtained through high levels of residential mobility, exchange, or both, and future studies should be designed to evaluate the specific strategies Woodland people used to obtain pots. If pottery vessels were routinely transported into the Sandhills by mobile Woodland people, we would expect to primarily find small, light, multipurpose vessels on archaeological sites. Research should be undertaken to determine if this expectation is warranted by ethnographic analogy to mobile pottery making societies and substantiated by archaeological evidence from Fort Bragg.

Additional studies are also needed to expand the number and stylistic range of pottery samples such that temporal variations in acquisition strategies can be assessed. Likewise, unanswered questions regarding the variation and quality of clay resources could be addressed by collecting more clay samples at greater distances from the pottery-sample sites. Results of the XRD data suggest that workable clays might be found where the Lower Little River dissects the

Cape Fear Formation just east of Fort Bragg. Certainly the nineteenth-century commercial Poe pottery at Fayetteville represents a clay source that was not included in this study sample. Collecting a broader spectrum of clay samples, including lean ones from the Piedmont and Coastal Plain, would fill gaps in the database.

Nevertheless, the overarching conclusion reached in this study is well supported by the data. Although it is often assumed that serviceable clay is ubiquitously distributed across the landscape, clay resources with adequate plasticity and strength for fashioning coil-built pots are hard to find. In fact, it appears that they may be largely absent from some regions such as the Sandhills. It therefore seems likely that Woodland potters would have held serviceable clay resources in high regard, passing information about their locations from generation to generation and considering the costs of clay acquisition when deciding where to take up residence. We hope this study will encourage future research that will lead to a better understanding of the importance of clay resources and how the acquisition of those resources may have influenced economic activities and social relations during the Woodland period.

Notes

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