12-2014

Constructing Community in the Central Arkansas River Valley: Ceramic Compositional Analysis and Collaborative Archaeology

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Anthropology

by

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December 2014
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ABSTRACT

In the Central Arkansas River Valley, archaeological investigations of the protohistoric occupation in the Carden Bottoms locality of Yell County, Arkansas suggest the interaction of groups from three adjoining regions at the site (the Central Mississippi Valley, the Lower Arkansas River Valley, and the Middle Ouachita region). Until now, the analysis of whole ceramic vessels associated with the site (derived from looted contexts) constituted the strongest evidence of this process, but this analysis was based on stylistic cues and macroscopic examination of pastes to discriminate between local and nonlocal wares. This project employed instrumental neutron activation analysis (INAA) as an important crosscheck of these assumptions and found that some wares previously identified as evidence of trade with Caddo communities from the Middle Ouachita region of southwest Arkansas may have been produced locally by Caddo potters residing at the site. Other results from INAA support some exchange relationships with communities farther downstream on the Arkansas River. In combination with findings obtained from large-scale excavations and other research undertaken during the larger Central Arkansas River Valley project, I suggest that the Carden Bottoms community may be an early example of societal coalescence in which several formerly distinct groups came together during times of regional instability precipitated by the De Soto entrada, the dissolution of nucleated chiefdoms in northeast Arkansas, and severe drought associated with the Little Ice Age. Most other examples of coalescence in southeastern North America are known from colonial contexts. These combined results shed new light on the process of social interaction, integration, and the projection of social identity in the Central Arkansas River Valley and have broader implications for research throughout the protohistoric Southeast.

ACKNOWLEDGMENTS

As with any endeavor in academia, or life for that matter, this dissertation would not have come to fruition without the support and assistance of numerous individuals and institutions. Foremost acknowledgment goes to the members of my committee: Drs. George Sabo III, Ann Early, and Fred Limp. All have provided useful commentary and suggestions. I thoroughly appreciate the grounding I received in archaeological theory from taking Dr. Limp's seminar class, which reintroduced me to several theoretical perspectives in a new light. Dr. Early generously shared her knowledge and expertise of Caddo ceramics throughout my research, which greatly aided the process of data collection. Dr. Sabo has been a wonderfully supportive advisor who first introduced me to the archaeology of the Central Arkansas River Valley and to the problems at the center of this dissertation. His encouragement to forge ahead with this research project despite some setbacks is much appreciated. I also owe both Drs. Sabo and Early a resounding thank you for helping me find gainful employment after graduation!

Several individuals provided access to collections to obtain comparative samples for compositional analysis or furnished samples for my research. Thanks go to Mary Suter of the University of Arkansas Museum and Drs. Bob Mainfort, Mary Beth Trubitt, and John House of the Arkansas Archeological Survey. Other Survey personnel provided additional access to site records, help with the Carden Bottoms collection, and other practical assistance, including Jerry Hilliard, Dr. Jami Lockhart, Leslie Walker, Jared Pebworth, Mike Evans, Aden Jenkins, and Lela Donat.

I received a National Science Foundation subsidy award from the University of Missouri Research Reactor, which discounted the cost of instrumental neutron activation analysis (National Science Foundation grant #1110793). Additional funds to cover the cost of analysis were provided by a National Endowment for the Humanities *We the People* grant awarded to the Arkansas Archeological Survey (Project ID# RZ-51028-09). Dr. Jeffrey Ferguson, a research scientist at the University of Missouri Research Reactor, provided his much needed expertise with the analysis and interpretation of the results of the chemical compositional study. I appreciate his always prompt responses to my questions.

I would also like to thank the American Indian project participants from the Caddo, Osage, and Quapaw nations who shared their views with me about archaeology and destructive analysis techniques. While all the project participants contributed to my understanding of a collaborative project between Indians and academics, I would like to especially acknowledge Robert Cast, Bobby Gonzalez, Doyle Edge, Jean Ann Lambert, Ardina Moore, and Dr. Andrea Hunter.

Finally, I would like to extend my gratitude and love to my friends and family for putting up with me throughout yet another stint in graduate school. Many thanks go to my wonderful parents, William and Brenda Fritsche, and to Adam Wiewel, my partner in life and archaeology.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Several recent studies of the native history of the southeastern United States have recognized the period known as the protohistoric (A.D. 1500-1700) as a time of social upheaval and transformation in which new group identities were forged (DuVal 2006; Ethridge 2009, 2010; Galloway 2002). It is during this time that we see the appearance of many of the more familiar historic American Indian societies which arose out of groups who formerly participated in a larger Mississippian cultural tradition. For decades, archaeologists have attempted to trace these cultural relationships through time in order to establish connections between archaeological traditions and later historic contexts, utilizing a combination of ethnohistoric, linguistic, and archaeological data (most frequently in the form of decorated ceramics). Within the Central Arkansas River Valley, this strategy has produced a number of thought-provoking studies containing a multitude of hypotheses regarding possible ethnic identifications of protohistoric native groups (Hoffman 1977, 1986, 1994; Jeter 2002, 2009). Yet, based on existing data, these works remain largely conjectural. Ethnohistoric research has been plagued by what researchers in the area refer to as the protohistoric “dark ages”—a period of 130 years between Hernando de Soto’s entrada of 1539-1543 through the Southeast and later French contact in the region.

Similarly, interpretations of archaeological evidence during this time have been frustrated by a lack of large scale, professional excavations. While much scholarly attention has been directed toward understanding large Mississippian centers such as Cahokia and Spiro, much less is known about Carden Bottoms phase communities living in the Central Arkansas River Valley during the later protohistoric period. These communities appear to have been the focus of social and ceremonial activities in the region (Clancy 1985; Hoffman 1986, 1990) following the ceremonial construction and closure of the mound feature known as the "Great Mortuary" at Spiro Mounds (Brown 1996). Until recently, our understanding of Carden Bottoms phase communities was limited to examinations of whole vessels derived from looted contexts in the 1920s and limited archaeological survey and test excavations of varying quality (e.g., Greengo 1957; Harrington 1924; Moorehead 1931). In an effort to fill this void, the Arkansas Archeological Survey; together with the Caddo, Osage, and Quapaw nations of Oklahoma; organized an investigation of protohistoric Carden Bottoms phase communities. The joint investigation has analyzed artifacts from existing museum collections and conducted geophysical surveys and large scale excavations at the Carden Bottoms locality (3YE25/347) located in the floodplain south of the Arkansas River in Arkansas's Yell County (Figure 1.1).

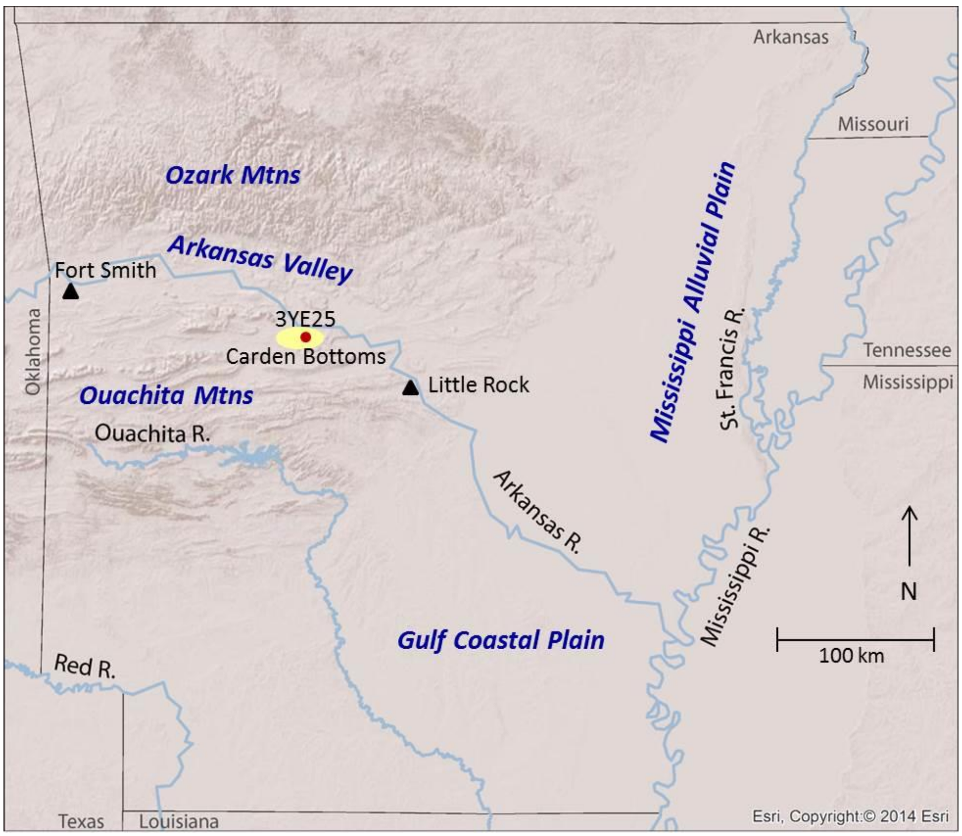

Figure 1.1. Map showing the location of the Carden Bottoms locality and 3YE25, the site of CARV project investigations. Surrounding physiographic regions are also identified. Portions of this figure include intellectual property of Esri and its licensors and are used herein under license. Copyright © 2014 Esri and its licensors. All rights reserved.

To date, this Central Arkansas River Valley (CARV) project has produced a wealth of high quality data. Examination of hundreds of ceramic vessels from museum collections suggests that ceramics from Carden Bottoms phase sites can be placed into three broad categories: local wares reflecting local styles (Figure 1.2a), imported wares likely from both the Mississippi Valley to the east (Mississippian) and Ouachita Mountain/Gulf Coastal Plain region to the south (Caddo) (Figures 1.2b and 1.2c), and "hybrid" wares produced locally using design elements from other ceramic traditions (Figure 1.2d) (Early et al. 2008). Geophysical surveys of the

Figure 1.2. Examples of representative ceramic traditions found in the Carden Bottoms locality: a) Vessel exhibiting local design features likely produced at Carden Bottoms, b) possible nonlocal frog effigy vessel from the Central Mississippi Valley, c) engraved bottle thought to represent nonlocal Caddo ceramic traditions from the Middle Ouachita region, and d) carinated bowl from Carden Bottoms exhibiting a "hybrid" design executed on what appears to be a local ceramic paste. Photos courtesy of Arkansas Archeological Survey, used with permission.

Carden Bottoms locality have revealed the presence of numerous houses with spatially associated pit features. Interestingly, houses at the site seem to be arranged in at least three distinct spatial clusters—one cluster on the west portion of the site contains houses arranged neatly according to the cardinal directions while a second cluster nearby contains houses that are askew from the first group and seem to surround an open area or plaza. Houses found in a third neighborhood on the east side of the site are oriented to the cardinal directions, but patterning is not readily identifiable in their arrangement. Excavation of select house features identified in the geophysical data is ongoing. Currently, three houses have been completely excavated, and excavations of one to two additional houses may take place. Postmold and hearth features have been clearly preserved, and ceramic artifacts recovered from the house floors are consistent with the types of wares housed in museum collections. These ceramic types—including Barton Incised, Keno Trailed, and Hodges Engraved—are the same wares archaeologists use to monitor the appearance of historic tribes across the region. Moreover, the houses have been radiocarbon dated to between A.D. 1620 and 1640 (Sabo et al. 2012:3).

These dates place the Carden Bottoms site firmly in the protohistoric "dark ages" during which historic accounts are nonexistent. According to historically and archaeologically informed reconstructions of De Soto's route through Arkansas, the "province of Cayas" may be located in the Central Arkansas River Valley, and the Carden Bottoms vicinity itself may be the location of "Tanico" (Hudson 1985) (Figure 1.3). Residents of the Carden Bottoms site must have had to contend with the aftermath of De Soto's rampage across the Southeast along with the effects of extreme drought associated with the climatic event known as the "Little Ice Age" (Stahle et al. 2000). The dual effects of these cultural and climatic forces have been implicated in the dissolution of the large and highly organized chiefdoms located in northeast Arkansas and

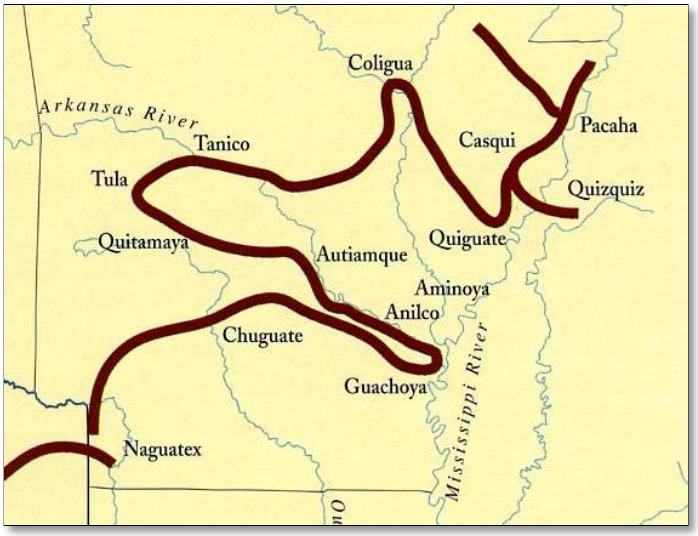

Figure 1.3. De Soto's proposed route through Arkansas (Sabo 1992:12). Tanico may correspond to the location of Carden Bottoms. Used with the permission of the Arkansas Archeological Survey.

described in the accounts of the De Soto entrada (Galloway 2002; Smith 2002). Kowalewski (2006:120) notes that following the demise of chiefdoms, corporate descent groups may have increased in significance and would have been the units responsible for facilitating long distance exchange, recruiting new group members, and integrating members into new community arrangements. All of these changing circumstances have implications for the construction of the Carden Bottoms community in the seventeenth century.

The new wealth of data from the CARV project at the Carden Bottoms site provides a unique opportunity to examine issues of social interaction and integration during this tumultuous time. The distinct neighborhoods found at the site combined with the interesting mix of ceramic traditions and the presence of apparent hybrid wares in the artifact assemblage suggest the possibility that the Carden Bottoms locality is a multiethnic coalescent community in the process of developing its own community identity. This dissertation examines the process of community formation at Carden Bottoms using a combination of intra-site comparisons of ceramic variability employing instrumental neutron activation analysis (INAA) and through a consideration of multiple lines of archaeological evidence—the spatial layout and architecture of the site and stylistic analysis of ceramics and other artifacts recovered from excavated contexts.

In this way, I hope to provide a more nuanced understanding of social identity and the composition of the Carden Bottoms community than has been attempted to date.

Beyond this more traditional archaeological focus, collaboration with American Indian communities is of interest. Specifically, this dissertation research seeks to identify the perceptions of the Caddo, Osage, and Quapaw participants regarding technical analyses like INAA and ascertain areas of potential interest to them in which INAA is of use. While such collaborative efforts are becoming more common, the relationship between archaeologists and indigenous groups has never been straightforward; both positive and negative interactions exist.

For example, a particularly tense period of strained relations between indigenous communities and archaeologists arose with the beginning of the American Indian Movement in the 1960s. Protestors associated with the movement attacked archaeologists' control over indigenous cultural resources by disrupting excavations and damaging field equipment (Zimmerman 1997:92). Archaeologists were faced with addressing difficult questions regarding the stewardship of the indigenous past, and both archaeologists and legislators alike began to take notice of indigenous rights. In the United States, legislation such as the Native American Graves Protection and Repatriation Act of 1990 and the National Historic Preservation Act of 1966, as amended, has highlighted the need for collaboration between archaeologists and indigenous communities.

Recently, archaeologists have become more aware of the perspectives of indigenous peoples concerning their pasts and have begun to incorporate some of these perspectives into archaeological investigations. To date, most collaborative efforts emphasize an ethical responsibility toward the descendants of the populations that we as archaeologists study. Moreover, literature regarding community archaeology (e.g., Ardren 2002; Fredericksen 2002;

Friesen 2002; Marshall 2002; Moser et al. 2002) and the archaeology of colonialism and culture contact (e.g., Gilchrist 2005; Ross 2005; Wylie 1992) maintain that ethical responsibilities have led to new partnerships with indigenous communities that involve truly collaborative efforts to interpret the past that have fundamentally changed and enriched the discipline of archaeology. While this optimistic view is encouraging, such effects have yet to be fully realized.

Perhaps this situation is due to the nature of most interactions between indigenous communities and archaeologists which consist of legally mandated consultations. While these interactions can be beneficial, they remain limited in scope. The CARV project includes a more substantial collaborative relationship with the Caddo, Osage, and Quapaw nations (three American Indian groups known to be indigenous to Arkansas; the Tunica were also involved in project discussions, but they declined a role as collaborators due to other obligations). Notably, the CARV project was begun as a collaborative venture following the completion of a rock art survey in the Central Arkansas River Valley (Sabo 2008) in which these American Indian groups participated as consultants. Encouraged by the results of the rock art project, the American Indian consultants asked to play a larger role in future research in the region. This project thus benefits from the perspectives of both professional archaeologists and descendant communities.

Research Questions

The nature of the CARV Project provides multiple opportunities for investigating social organization, identity, and community development in the past as well as introspectively examining the conduct of archaeological research in the present. The main questions this dissertation seeks to answer are as follows:

1. Are the different ceramic traditions present at Carden Bottoms the result of exchange indicative of regional interaction? If so, which regions are involved in the interaction sphere of the protohistoric Carden Bottoms community?
2. Do macroscopic examinations of ceramics (including a consideration of design, paste, and temper) correspond with chemical compositional data?
3. Is the protohistoric Carden Bottoms community an example of a coalescent society? What can we infer about social dynamics within the site during its occupation?
4. What concerns or interest do American Indian descendant communities have regarding destructive analysis techniques, such as instrumental neutron activation analysis (INAA)?
5. More broadly, how effective are collaborative research endeavors, such as the CARV project at addressing the different concerns and interests of academic archaeologists and descendant communities?

Addressing these questions requires multiple lines of evidence and a theoretical framework that considers both broad regional dynamics and dynamics on a smaller scale (i.e., community, household, and individual) described in the following sections.

Theoretical Framework

In order to investigate the various social identities and interrelationships that may be present at Carden Bottoms, a series of complementary theoretical frameworks are employed. First, in light of the complex and changing macro-regional dynamic present throughout the protohistoric Southeast, my approach is influenced by the concept that Ethridge (2009) terms the "Mississippian shatter zone." In her introduction to an edited volume (Ethridge and Shuck-Hall 2009) dedicated to the concept, Ethridge defines this approach as a way of understanding the transformation of societies in eastern North America from a Mississippian world through historic times. During this time period regional instability reigned, wrought by the combined effects of internal discord within and among Mississippian polities and the cessation of mound-building and maintenance of this particular form of ceremonial activity in most of the Southeast along with a series of external factors, including the effects of European colonization.

This shatter zone approach is based on a modified world-systems theory framework that conceives of eastern North America during the protohistoric and colonial periods as a series of cores and peripheries in which changes originating in one sector flow outward and lead to various transformations in other areas. In every case causes and effects are intertwined complexly and should be viewed in an integrated way rather than in piecemeal fashion. Unlike some world-systems approaches applied to colonial North America, Ethridge and Shuck-Hall's (2009) shatter zone framework does not view the core(s) as being exclusively European and peripheral areas as native, but rather sees differences on regional levels and recognizes the fact that European traders and others living on the North American continent were as much a part of the periphery as some of their native counterparts. Additionally, the "shatter zone" framework considers the effects of economic change once native groups became involved in trade activities with various Europeans. The devastating effects of the Indian slave trade, in which native groups carried out slave raids on rival or other native groups to satisfy the English demand for slaves in the Caribbean, among other areas, is considered in significant detail. The effects of these raids and others, including the "Mourning Wars" carried out by the Iroquois to replace their dwindling populations, had far reaching effects and may account for the migration of the Quapaw out of their proposed homeland in the Ohio Valley (Jeter 2009). These economic changes and the violence and disruption of slave raids and slavery are considered alongside other factors such as introduced disease to show the amplifying effects of one on the others.

While the Carden Bottoms community may have only experienced shatter zone "ripples" as described by Jeter (2009) since many of the more dramatic transformations that took place in the Mississippian shatter zone occurred after the period of its occupation or in regions farther to its east, this framework still situates the Carden Bottoms community in a wider regional context of which it most certainly was a part. Indeed, as Ethridge (2009:9) states "the fall of the Mississippian world is at the core of the shatter zone." Thus, considering the earlier portion of the Mississippian shatter zone (ca. 1540) beginning with the collapse of many chiefdoms and De Soto's entrada is essential to understanding the various responses and transformations that took place through the colonial period and the inception of the new South (ca. 1730). Residents of the Carden Bottoms community were part of this changing Mississippian world. They were undoubtedly familiar with the violence and disruption of De Soto's entrada and were likely aware of and indirectly affected by the changes occurring to their east as their more distant neighbors became entangled in the English economy.

Likewise, the notion of societal coalescence as espoused by Kowalewski (2006) as one common response to the stresses present in the shatter zone and beyond provides important perspective to my research. First introduced in this context by Ethridge and Hudson (2002), coalescence is now recognized as one of the ways native societies reformed in the face of the shatter zone, pulling together a number of formerly distinct communities who negotiated new group identities and producing such well-known tribes as the Yamasees, Chickasaws, Creeks, and Choctaws to name a few. With these new formations came changes in political institutions which became based on the more diffuse authority of councils over that of hereditary chiefs along with myriad other changes in social organization, ceremonies, and mythmaking designed to integrate disparate groups. As Kowalewski (2006:95) notes, some of these changes resulted in completely new institutions while others simply remade or reemphasized those that were previously established.

Kowalewski (2006) surveys societies throughout the world that exhibit coalescent responses in similar conditions as those identified for the protohistoric and colonial Southeast. He concludes that coalescence is frequently one strategy employed in the face of stresses such as warfare, population decline and movement, and the abandonment of large areas of land and tends to result in several commonly co-occurring responses (see Kowalewski 2006:117 for a complete list of these responses, some of which are described in the preceding paragraph). Although many of the examples of societal coalescence in the southeastern U.S. and beyond occur in colonial settings, Kowalewski describes a few cases from earlier time periods as well and makes the case that coalescence may well have occurred in the pre-contact Southeast. This research considers the possibility that the Carden Bottoms community of the early seventeenth century was a coalescent society in light of the evidence presented herein.

While the concepts of the shatter zone and coalescence provide a broader framework for understanding regional movements and reorganization in the protohistoric Southeast, a framework for understanding the implications of such reorganization at the scale of the community, household, and individual is also useful. As such, my interpretations are informed by the recent scholarship on the archaeology of ethnicity or social identity and ethnogenesis and culture contact studies. The majority of this research focuses on case studies for which a number of historical records are available and is often concerned with culture change and persistence in colonial settings (e.g., Cipolla 2013; Cordell 2002; Deagan and Thomas 2009; Liebmann et al.

2005; Lightfoot et al. 1998; Voss 2008; Weisman 2007). While my research lacks the historical detail (in the form of deeds, land registries, historical documents, and photos) available in much of the scholarship and does not involve the more direct and sustained contact of native societies and Europeans, it can still benefit from the observations and approach of the broader culture contact and ethnogenesis research. The commonality among these approaches is their consideration of the varied ways social identities are forged in the context of pluralism, or the coming together of different social groups, which is a distinct possibility for the Carden Bottoms community.

Early uses of the concept of ethnicity in archaeology have a checkered past. In these early studies, ethnicity is viewed in a static and essentialist manner and is tied problematically to notions of the innate superiority of certain groups over others or is inextricably linked to nationalist ideals (Jones 1997:2-5). Following the abuses of this approach by practitioners of Nazi archaeology, archaeologists refrained from the overt use of concepts tied to ethnicity or the oft-conflated notion of races. Yet, post-World War II interpretations utilizing the concept of archaeological cultures frequently employed the same basic interpretive paradigm with the substitution of the archaeological culture label in place of the ethnic labels of the past (Jones 1997:5). While this approach avoided some of the ethnocentrism of previous work, the result tended to treat archaeological cultures as ethnic units that were bounded and more or less static accumulations of certain material remains and patterns. Today's approaches to ethnicity in archaeology are influenced by the seminal work of Barth (1969) that changed the view of ethnicity in anthropology as a whole. Instead of viewing ethnicity as a given, stable component of identity, Barth asserted that ethnicity is dynamic, situational and dependent on social interaction. As Jones (1997:65-79) summarizes, this recognition of fluidity and social categorization was generally accepted, yet different conceptualizations of ethnicity, which can be broadly classified into primoridalist and instrumentalist camps, persist today. Primoridialist views tend to emphasize the emotional connections of shared histories that create bonds between individuals while instrumentalists see ethnicity in more political terms in which group identities are negotiated in strategic ways. The most productive approaches to ethnicity and identity studies in general appreciate the value of both approaches and see them as being complementary rather than oppositional (see Cipolla 2013:26). In both views, ethnicity is, above all, a social category made real by people interacting with one another on a daily basis.

Such a view accords with another common theme of this strain of research today—the use of practice theory as espoused by Bourdieu (1977, 1990) and Giddens (1979). Incorporating a practice-based approach to the archaeology of ethnicity and culture contact studies allows for material culture remains to be interpreted in new and dynamic ways and provide insight on issues such as social identity and the making of cultural meaning. As Lightfoot et al. (1998:201) succinctly state: "the basic premise of practice theory is that the ordering of daily life serves as a microcosm of the broader organizational principles and cultural categories of individuals, as exemplified in Bourdieu's (1977) concept of *habitus*." Thus, daily activities such as cooking, cleaning, and craft production are all means of reproducing overarching social organizational principles and the fundamental structure of belief systems. Since there are material correlates for many daily activities, practice theory holds particular appeal to archaeologists interested in ways of identifying such broader organizational principles. Moreover, as Jones (1997:120) states: "Material culture is frequently implicated in both the recognition and expression of ethnicity; it both contributes to the formulation of ethnicity and is structured by it." Furthermore, new meanings can be accorded to cultural practices in the context of culture contact or ethnic pluralism. In his studies of culture contact, Sahlins (1981:33-37) emphasizes this fact and demonstrates ways in which people creatively adapt and reinterpret cultural practices through encounters with others. Material culture can play a large role in this process and provide insight on the formation of new social identities. In this way, practice theory recognizes the fluid nature of social identity in the context of everyday interactions in which the dispositions that make up Bourdieu's *habitus* can undergo transformation as well as form the histories of routinized practice that allow individuals to develop shared notions of group identity.

Research Design

Currently, the vast majority of Carden Bottoms phase ceramic vessels exists in museum collections and is derived from looted contexts (see Harrington 1924 for a description of the looting activity that took place in the Carden Bottoms locality during the 1920s). As such, the specific provenience of most vessels is unknown. Additionally, as is the case with most museum quality specimens, these existing collections consist of vessels derived from mortuary contexts. Excavations of the Carden Bottoms locality (3YE25/3YE347) as part of the ongoing CARV project provide much needed contextual information for subsequent ceramic analysis and offer insight into a wider range of activities that took place at these sites. The research discussed here benefits from these current investigations by analyzing ceramics obtained from professionally excavated contexts to test some of the assumptions made about Carden Bottoms phase communities.

Ceramic Compositional Analysis

Provenance studies are frequently applied to archaeological investigations of regional interaction. In the context of ceramic analysis, provenance studies aim to detect differences in the composition of clays used to manufacture ceramic vessels. These differences can be used to identify groups of ceramic vessels likely produced using the same raw material source. If samples of various raw materials are obtained, we can then begin to associate different compositional groupings with specific geographic areas or sources. While a variety of methods exist for conducting provenance studies of ceramics, instrumental neutron activation analysis (INAA) is particularly well suited for such tasks.

Glascock (1992) provides a detailed overview of the INAA process summarized here. Essentially, INAA exposes a sample of pottery to a source of neutrons, making the sample radioactive. Following irradiation, the sample emits gamma rays which are counted to determine the presence and abundance of various elements present in the sample. Distinct elements are detectable based on differing decay schemes of the radioactive particles. Overall, the procedure identifies the chemical signature of a sample. As Glascock and Neff (2003) describe, INAA is highly accurate, reliable, and provides an exceptionally sensitive means for identifying the presence of various elements contained within ceramic vessels in varying quantities (some elements are measured in parts per billion; most are measured in parts per million). These qualities along with the low probability of sample contamination, relative ease and less destructive nature of sample preparation, and comparative affordability make INAA an attractive means of sourcing archaeological ceramics (Glascock and Neff 2003).

Compositional data produced during INAA can include information on up to 35 elements. Interpretation of such data to identify compositional sources requires the use of multivariate statistics, including the frequently used cluster analysis, principal components analysis, and discriminant analysis (see Baxter 1994 and Davis 1986 for detailed descriptions of these techniques). Essentially, these statistical methods aid in pattern recognition and enable researchers to identify the key variables (concentrations of trace elements in this case) which best distinguish different groups.

While the identification of distinct compositional groups using INAA is straightforward for a uniform and geologically distinctive substance such as obsidian, evaluation of compositional ceramics data is more difficult. Clay sources vary in uniqueness based on the composition of their parent materials and individual weathering histories. Thus, some clay sources are readily distinguishable while others are part of a broad source zone containing highly similar clays. The chemical composition of a ceramic artifact may also change during its use life and/or following deposition, introducing a potential source of concern for INAA research (Glascock and Neff 2003). Additionally, potters influence the chemical composition of ceramics based on the choices they make to prepare specific paste recipes or add temper from a variety of sources. These factors complicate the nature of resulting compositional groupings, but INAA has consistently produced useful data for investigating regional interaction in archaeological contexts.

The current project examines the ceramics recovered from three completely excavated houses and trash pits spatially associated with these particular households from the Carden Bottoms locality (3YE25) to better understand the cultural processes that produced such an interesting mix of ceramic traditions. Central to this task is the identification and characterization of archaeologically visible traces of social interaction. Thus far, stylistic cues and macroscopic examination of ceramic vessels has been essential to this process. For example, Early's (2012) assessment of the stylistic attributes of ceramics identified a series of design rules (a "grammar") which potters employed during ceramic production that enable researchers to recognize vessels produced at Caddo communities in particular river valleys in southwestern Arkansas with a high degree of precision.

While this stylistic approach is very useful, ceramic compositional analysis using INAA is desirable for a number of reasons. First, INAA provides an independent means to evaluate the validity of using visual forms of assessment to distinguish local and nonlocal wares. Second, Early's (2012) research focuses on only one limited region of interest to this project. The specific origin of Mississippian wares found in the Central Arkansas River Valley is much less certain. Finally, the stylistic approaches used to distinguish among local, imported, and hybrid wares (e.g., Early 2012; Early et al. 2008; Walker 2008) rely on an examination of whole vessels, which are rarely found in archaeological excavations of residential areas. In contrast, INAA can provide reliable provenance data for fragmentary remains. These fragmentary remains constitute an underutilized source of data and are an important complement to our understanding of whole vessels derived from mortuary contexts.

Specifically, the ceramic compositional analysis discussed herein provides a means for establishing the following:

1. The relative prevalence of local and imported ceramics from the households investigated at the Carden Bottoms locality.
2. The probable geographical origin of imported wares.
3. The agreement between visual examinations of ceramic pastes to discriminate between local and imported ceramics and the results obtained using INAA.

Thus, compositional analysis of ceramics yields important data that can be used to determine the degree and type of social interaction present at the Carden Bottoms site and provide a firm basis for both intra- and inter-site comparisons.

The identification of possible spatially distinct “neighborhoods” at the site provides an important focus for intra-site comparisons involving ceramic compositional data. Comparison of the ceramic assemblages between households in these different contemporaneous neighborhoods provides the chance to assess the degree of social integration in the community. If specific households or neighborhoods were occupied by groups from different geographic regions, with each group utilizing its own ceramics (or maintaining social ties with particular communities), then the compositional analyses from different areas of the Carden Bottoms site should produce distinctive results. However, if intra-site comparisons suggest a similar mix of imported and local wares across all areas of the site, we can begin to make inferences regarding the presence of integrative social tactics designed to unify disparate social groups.

Moreover, INAA results are interpreted within the context of geophysical and excavation data that provide information on architecture, house construction techniques, community layout, and relationships among other artifacts. In this way, investigations at the Carden Bottoms site succeed at providing information on social identity (though not necessarily precise identifications of known ethnic group labels) where previous attempts to link archaeological assemblages to historically known groups have been hampered by poor temporal and spatial resolution and lack of contextual information.

American Indian Views on INAA

As mentioned previously, the larger CARV project is a collaborative endeavor between members of the Arkansas Archeological Survey and the Caddo, Osage, and Quapaw nations. As part of this collaboration, this project seeks to identify ways in which archaeologists and American Indian communities can work together in mutually beneficial ways, focusing on the use of technical analyses like INAA as a means of addressing issues of interest to both academic archaeologists and indigenous communities. It is the hope that this process will facilitate productive discourse among the parties involved, broaden academic views of the archaeological record, and enable indigenous communities to become more engaged in archaeological research.

For this project, a number of data sources are utilized, drawing upon the methods used in community archaeology projects (e.g., Ardren 2002; Fredericksen 2002; Friesen 2002; Marshall 2002; Moser et al. 2002). First, relevant literature regarding the philosophical perspectives of indigenous communities and academics and existing examples of collaborative archaeology is evaluated to help guide this portion of the research. Most importantly, a series of semi-structured interviews and informal conversations between the author and Caddo, Osage, and Quapaw participants are used to identify effective ways in which a the questions and concerns of a variety of stakeholders can be addressed in current archaeological research. A structured questionnaire provides an additional evaluation of the collaborative project as a whole and the views of project participants toward various sources of information about the past.

Organization of Chapters

The next chapter provides a foundation for the succeeding research and analysis. It presents the archaeological and historical background of the Carden Bottoms locality and other regions of interest to this study. Recent findings from CARV Project remote sensing investigations, excavation, and stylistic ceramic analysis are also discussed. Chapter 3 then describes the methods used in INAA and the results of this analysis for the examination of ceramic pastes. The identification of different compositional groups within the Carden Bottoms ceramic assemblage and the comparative collections is discussed along with implications for regional interaction. The fourth chapter reports on the results of an attempt to use the INAA data to characterize compositional groupings of shell temper for the same study assemblage to complement the more traditional approach of examining ceramic paste. Chapter 5 explores the implications of the compositional analyses in depth and integrates the INAA results in the context of archaeological findings and previous research to discuss community formation, issues of social identity, and regional dynamics during the protohistoric period in the Central Arkansas River Valley. The collaborative component of this research is the focus of Chapter 6. The views of American Indian project participants toward technical analyses like INAA are summarized, and a broader discussion on collaborative archaeology and the successes and shortcomings of the CARV Project follows. Concluding remarks are presented in Chapter 7 along with how the questions guiding this research can best be addressed currently. Data gaps and future research directions are also discussed.

CHAPTER 2: RESEARCH IN THE CENTRAL ARKANSAS RIVER VALLEY

Before detailing the current findings of the CARV project excavations in the Carden Bottoms locality, this chapter examines the history of research and pot-hunting activity in Carden Bottoms and the wider Central Arkansas River Valley area to provide context for the current study. Additionally, an overview of other regions identified as having a probable or possible relationship to Carden Bottoms phase sites offers insight into the wider regional dynamics at work during the protohistoric period (ca. A.D. 1500-1700).

The History of Carden Bottoms Phase Research

Carden Bottoms (also referred to as Carden Bottom or Carden's Bottom) is situated in an alluvial floodplain between Holla Bend, a cut-off channel of the Arkansas River, and the Petit Jean River as it flows into the Arkansas. After looting activity in the 1920s made this locality—and its ceramics—famous, it became the namesake for an archaeological phase, defined principally by the frequency of particular ceramic types, dating from ca. A.D. 1400-1700. The phase occurs along the Arkansas River within the physiographic region known as the Arkansas Valley, a topographic trough between the Ozark Plateau and Ouachita Mountains, ranging from just east of modern Fort Smith to the section of the stream just above modern Little Rock. Further downstream, ranging from the area around Little Rock to the mouth of the Arkansas River, lies a series of contemporaneous sites belonging to the Menard complex (formerly known as the Quapaw phase) (Figure 2.1).

Menard complex sites share many characteristics with Carden Bottoms phase sites, including evidence of European trade goods, Nodena points, and such pottery types as Barton

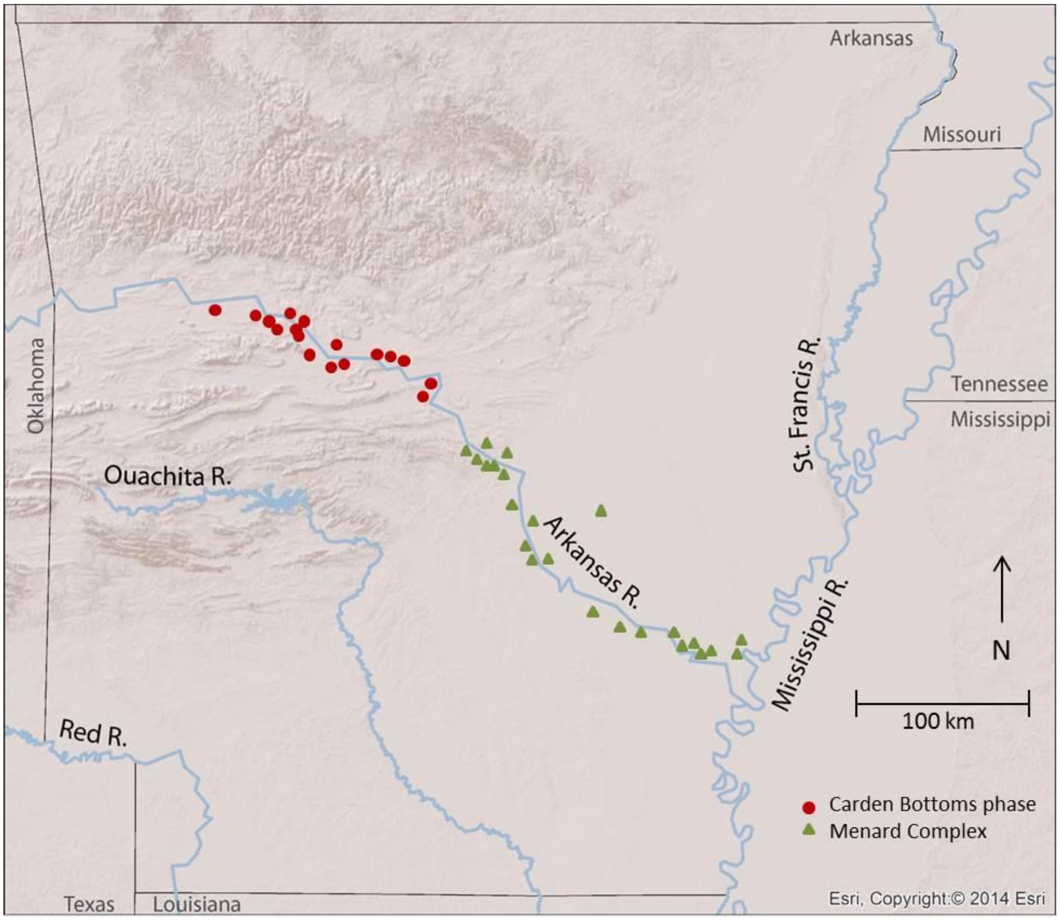

Figure 2.1. Approximate distribution of Carden Bottoms phase and Menard complex sites along the Arkansas River (After Hoffman 1986: Figure 3.1). Portions of this figure include intellectual property of Esri and its licensors and are used herein under license. Copyright © 2014 Esri and its licensors. All rights reserved.

Incised, Wallace Incised, Carson Red on Buff, Old Town Red, and Keno Trailed as well as distinctive vessel forms like flaring-rim ("helmet") bowls, and "teapots" (Figure 2.2). Both phases also contain a variety of Late Caddo pottery types, most appearing to originate in the Ouachita Mountain region. The main difference cited in the literature comparing these two phases is the relative proportion of certain ceramic types. Barton Incised is more common in sites assigned to the Carden Bottoms phase as are Late Caddo ceramic types while Wallace Incised occurs more frequently in Menard complex assemblages as do pottery types found in the Central Mississippi Valley of northeast Arkansas (Hoffman 1986:28). It is also interesting to note that we have very little information regarding the immediate antecedents to both the Carden Bottoms

Figure 2.2. Teapot-shaped vessel attributed to the Carden Bottoms phase housed in the Gilcrease Museum. Photo courtesy of the Arkansas Archeological Survey, used with permission.

phase and the Menard complex occupations along the Arkansas River. Solid evidence regarding Late Woodland occupations exists, but earlier Mississippian occupations are poorly represented in the known archaeological record.

The Pottery Trade

Until recently, most of the available information about Carden Bottoms phase sites was gleaned from observations of whole ceramic vessels looted from gravesites, mainly in the early twentieth century, and the scant records pieced together from interviews with those involved in this heyday of the antiquities trade. The earliest significant finds in the area apparently occurred following floods in the 1890s in which sections of riverbank caved away, exposing artifacts for the taking (*Arkansas Gazette*, 21 May 1926:4-5). Following several years of drought and a downturn in the agricultural economy of the area in the early 1920s, probing for pottery to sell in a bustling antiquities trade began in earnest (Hilliard 1981). The focus of this activity was to obtain museum-quality specimens, which were largely acquired from grave contexts. Fortunately, Mark Harrington, a professional archaeologist and representative of the Heye Foundation visited Carden Bottoms early in 1924 after being alerted to the frenzy of activity in the area. While he had no means of preventing the pot-hunting, he did leave behind an eyewitness account and purchased some of the finds. Harrington (1924:86) remarks: "I was impressed first of all by the great quantity of pottery found, —wagonloads of it, complete or nearly so, —literally hundreds of vessels of different types." His descriptions of this pottery correspond to the known collections of vessels attributed to Carden Bottoms, but the specific provenience of most vessels in these collections is not well-documented. Harrington (1924:88-89) also describes other grave goods collected from the Carden Bottoms area, noting the presence of conch-shell beads and ornaments, some European trade goods of glass beads and copper wire, and some arrow points, which he notes are all of the same type—"slender, delicate, leaf-shape, without stem or notch.[1]" Clancy (1985) provides a more detailed account of pot-hunting in Carden Bottoms and the collectors and antiquities dealers involved in the pottery trade.

Most of these artifacts (and others that continued to be collected in subsequent decades) now reside in a few large museum collections. Some finds attributed to the Carden Bottoms area were purchased by the University of Arkansas Museum in 1927 and 1931 (Clancy 1985:1). Another large collection is housed at the Thomas Gilcrease Museum in Tulsa, Oklahoma while a third collection now resides at the facilities of the National Museum of the American Indian. Most of the information we have concerning the Carden Bottoms phase comes from these collections and analyses of the ceramic vessels therein (e.g., Clancy 1985; Walker 2008). Moorehead (1931) also provides some cursory observations of site locations, artifact density, and artifact descriptions for the Carden Bottoms area and Yell County in general from his own surveys and those of C.B. Franklin in 1915. He states:

> In walking over the fields for some days the writer was impressed by the large number of broken and burned stones, arrow and spear points, and pottery fragments. Village site debris is very heavy and extends into the soil a foot or more [Moorehead 1931:11].

[1] Most likely, Harrington is referring to Nodena points.

The first systematic archaeological survey of the area was completed as part of the River Basin Surveys in preparation for the creation of Dardanelle Reservoir. Robert Greengo (1957) reports on the finds of this survey, briefly describing the location and characteristics of a number of archaeological sites. Most of the recorded sites were likely Archaic in age, but a number of later sites bearing pottery were also encountered. Although surface collections were made, no excavations were completed. Greengo (1957:21-22) advocated for further research and test excavations at many of the identified sites prior to the flooding of the reservoir, yet his recommendations went unheeded, and many of the sites he recorded are now underwater. Other Carden Bottoms phase sites have received only occasional attention during site surveys. The Carden Bottoms locality proper remained uninvestigated until Skip Stewart-Abernathy, along with volunteers from the Arkansas Archeological Society and Arkansas Archeological Survey, began work at 3YE25 and 3YE347[2] in the early 1990s.

Over a few seasons of fieldwork, Stewart-Abernathy's team conducted controlled surface collections and excavated a number of test units, recovering a large number of artifacts, including ceramics, lithics, abundant faunal remains, and a few items of European manufacture—most notably three blue glass trade beads and three copper alloy artifacts (Stewart-Abernathy 1994:5). Most artifacts appear to date to the Late Mississippian or protohistoric period and were derived from midden fill or were located in trash pits. Until the onset of the current CARV project, these investigations constituted the most sustained professional work at a Carden Bottoms phase site.

The Carden Bottoms "Puzzle"

[2] Although two separate site numbers were assigned, these locations appear to be part of one continuous occupation, simply divided into east and west halves by a modern farm road.

Much of the focus of inquiry surrounding Carden Bottoms phase sites centers on the identification of various ethnic groups in these communities. Harrington (1924:89-90) is the first to publish this belief, stating:

> It is certain, however, that a considerable part of the pottery is typically Caddo, especially the ware engraved after firing and much of that with patterns incised before heat was applied. Another large element, dark, and not so well made, with occasional animal effigies, resembles the typical pottery of eastern Arkansas, which may be Quapaw; the painted ware may belong to this group, and it may not,—the exact connection has not yet been satisfactorily worked out. Certainly the impression produced by the Carden Bottoms collection as a whole is that it was made by at least two or perhaps three separate peoples.

Harrington (1924:90) goes on to propose a means for testing this idea. He states that controlled excavations could be used to determine whether the various pottery traditions are found in separate graves or whether the different wares co-occur within single graves. He expects the former pattern to be indicative of distinct ethnic groups, possibly occupying the site at different times, and the latter pattern to demonstrate that the site was occupied by "one people of mixed culture" (Harrington 1924:90). Later Dickinson and Dellinger (1940:79) set out to specifically resolve this question by excavating portions of the Mainard Place, now referred to as the Kinkead-Mainard site (3PU2). Hoffman (1977) published their results, which indicated the co-occurrence of ceramic types within single grave lots. While intriguing, this finding does not necessarily confirm the presence of a multi-ethnic community or a coalescent society. It does, however, suggest the possibility of such an arrangement or of substantial regional interaction. Dickinson and Dellinger (1940:95) also suggest that movement of Caddo people into the Arkansas Valley could account for the presence of characteristic Caddo styles of pottery and further conclude that the "heterogeneous character of Arkansas River pottery is consistent with the mixed culture of the historic Quapaw."

In the first attempt to systematically describe the Carden Bottoms collection housed in the University of Arkansas Museum, Phyllis Clancy (1985) referred to this mixture of ceramic traditions as the Carden Bottoms "puzzle." Later, other researchers interested in the protohistoric period in Arkansas proposed various mechanisms that could account for the ceramic variability found in Carden Bottoms phase collections, with a multitude of possibilities abounding (e.g., Hoffman 1986, 1990, 1992, 1994; Jeter 1990, 2002; McGimsey 1989; Morse and Morse 1983). These studies typically emphasized Menard complex sites and discussed Carden Bottoms phase sites tangentially, so the speculations and hypotheses that arose from these works are presented in a discussion of Menard complex sites that follows.

De Soto's "Tanico"

Since the late 1980s the Carden Bottoms locality in particular has received renewed attention in part because of its possible association with the location of Tanico mentioned in the surviving chronicles of the De Soto entrada of 1539-1543. Earlier reconstructions of De Soto's route throughout the southeastern U.S. placed Tanico nearer to modern Hot Springs, Arkansas and equated the River of Cayas mentioned in the De Soto narratives with the Ouachita River (Swanton 1985:255). In a comprehensive reconsideration of De Soto's route, utilizing several more decades' worth of archaeological research, historian Charles Hudson and his archaeologist colleagues (Hudson 1985; Hudson et al. 1989; Hudson 1990) place Tanico within the Carden Bottoms locality and consider the River of Cayas to be the Arkansas River. This revised route has gained widespread acceptance among archaeologists and many historians who work in Arkansas and in the Southeast. If accurate, it is highly likely that the members of the Carden Bottoms community at 3YE25 were just a few generations removed from an encounter with the De Soto entrada. Thus, the information recorded in the surviving narratives likely offers insight into some of the settlement patterns, economy, and sociopolitical nature of the Early Protohistoric in the Central Arkansas River Valley and beyond, albeit through the eyes of European observers encountering new land and foreign customs. While the information gleaned from the De Soto chronicles is considered more completely elsewhere (e.g., Hudson 1998; Swanton 1985; Young and Hoffman 1993), I present some of the most pertinent material here after briefly discussing the narratives themselves.

In an edited volume on the De Soto expedition (Galloway 1997), Patricia Galloway and colleagues summarize the available contextual evidence for the four chronicles of the expedition and provides useful comments on their reliability and particular strengths and weaknesses. Luis Hernández de Biedma, an agent of the Spanish crown, produced a concise narrative of the expedition. His account is based on his own notes from the expedition, and his is the only surviving original manuscript. For this reason, it is frequently regarded as the most reliable account, yet it remains rather succinct (Altman 1997:3). The diary of De Soto's personal secretary, Rodrigo Ranjel, provides another perspective of the entrada, but the original diary no longer exists. Instead, an edited and embellished account appears in a volume produced by Gonzalo Fernández de Oviedo. This account is particularly valuable because of Ranjel's proximity to De Soto and because of its daily nature (Galloway 1997:12). However, Oviedo's Ranjel narrative is incomplete. For this reason, the account of an anonymous Portuguese "Gentleman of Elvas," published by André de Burgos in 1557, is useful. This account has been criticized for its apparent borrowing from Oviedo's Ranjel narrative (or from the source of that narrative). Yet, as Galloway (1997:26) states, this may be advantageous in one sense: the Elvas account provides details of the names and descriptions of towns, leaders, and the surrounding countryside west of the Mississippi while Oviedo's Ranjel narrative is incomplete for this portion of the journey. Thus, the narrative attributed to the Gentleman of Elvas is particularly useful for this study. The final known narrative of the De Soto expedition, first published in 1605, is a secondary source written by Garcilaso de la Vega ("the Inca"), who purportedly interviewed survivors from the De Soto expedition. Its reliability is the least secure, and most regard it as valuable mainly as a piece of literature rather than history (Galloway 1997:27).

From the account of the Gentleman of Elvas, a few notable observations can be made about the province of Cayas and the town of Tanico. First, it appears that when the Europeans entered the province, the settlements consisted of dispersed farmsteads instead of nucleated towns or villages (Gentleman of Elvas 1993:123). The reader also learns of the agricultural productivity of the area, which greatly impressed the Portuguese gentleman. He states that during the expedition's time there, "the horses grew fat and throve more than after a longer time in any other region because of the abundance of maize and the leaf thereof, which is, I think, the best that has been seen" (Gentleman of Elvas 1993:124). Compared to earlier descriptions of the expedition's journey through northeast Arkansas, it would appear that the Indians in the province of Cayas were not as devastated by drought and still had plentiful maize crops.

While the expedition paused near Tanico to make salt, we also get a glimpse of some of the sociopolitical details of the area. De Soto, ever on his quest for gold, inquired about the nearest large settlements and the presence of a great cacique or leader. The cacique of Cayas directs the Spaniards to the neighboring province of Tula (spelled "Tulla" in the Gentleman of Elvas narrative). The cacique states "that he did not have an interpreter, for the speech of Tulla was different from his; and because he and his forebears had always been at war with the lords of that province, they had no converse, nor did they understand each other" (Gentleman of Elvas 1993:125). Here we can make the assumption that there is a linguistic barrier between Cayas and

Tula and that tensions between the two “provinces” were high. There is disagreement among the De Soto narratives regarding the location of Tula in relation to Tanico, but based on the accounts of the Tula Indians’ settlements and customs along with the linguistic barrier, Early (1993b:72) hypothesizes that the Tula were Caddoan speakers who may be represented by the Fort Coffee archaeological phase found upstream from Carden Bottoms near Spiro, Oklahoma and distributed into Arkansas an unknown distance. Early (1993b:73) also notes that there is support for a cultural boundary between the Fort Coffee phase and the Carden Bottoms phase since ceramic styles and technological attributes differ markedly between the two as do other classes of material culture. The Spaniards did not perceive or record a stark cultural boundary on their travels to the province of Cayas, suggesting that relations, travel, and trade with people living north and east of the region were easier for residents of Cayas.

The Central Mississippi Valley and Lower Arkansas River Valley, ca. 1500-1700

Based on the artifact similarities present between Carden Bottoms phase assemblages and those found in contemporary settings in the Central Mississippi Valley and Lower Arkansas River Valley, it is important to consider what is known of these surrounding regions during the protohistoric period. The first archaeological investigations in this region began with work by Edwin Curtis of the Peabody Museum in 1879. Curtis excavated the Parkin site in northeast Arkansas and obtained an extensive (and understudied) artifact collection (Morse 1981:20). Shortly thereafter, Edward Palmer of the Bureau of Ethnology conducted work in the region from 1881-1883. Palmer performed excavations at what is now known as the Menard-Hodges site (3AR4) and visited several other protohistoric sites in the Lower Arkansas River Valley and Central Mississippi Valley, including a number of Nodena phase sites in Mississippi County, making artifact collections for the Smithsonian Institution (Jeter 1990). From 1908-1911 C.B. Moore made his way via his infamous steamship the *Gopher* to numerous protohistoric sites in the region, quickly excavating and amassing huge collections of artifacts as he went. Among the locations visited by Moore are the Menard locality (Moore 1908); the Parkin phase sites of Big Eddy, Rose Mound, Neeley's Ferry, and Miller (Moore 1910); and the Nodena phase sites of Rhodes, Bradley, and Pecan Point (Moore 1911).

From the 1930s-1960s, work at Late Mississippian and protohistoric sites in northeast Arkansas continued as major sites in the region were destroyed by looting (an account of which is provided by C.B. Moore [1910:303] for the Parkin site) and agricultural activity. Amateur archaeologist Dr. James K. Hampson conducted investigations at Nodena phase sites, particularly Upper Nodena (3MS4), mainly after 1927, collecting, excavating, and recording archaeological remains on the location of his family's plantation (Morse 1973:1). Unfortunately, many of the records of Hampson's work are lost or damaged today, although an extensive artifact collection remains. From 1939-1951 Philip Phillips, James A. Ford, and James B. Griffin undertook a major archaeological investigation of Mississippi Valley sites (Phillips et al. 1951; Phillips 1970), and Ford later completed extensive test excavations at the Menard site (Ford 1961). The work of Phillips, Ford, and Griffin—and the now familiar archaeological phases defined on the basis of their efforts (Phillips 1970)—formed the foundation of modern archaeological investigations in the area completed mainly by archaeologists associated with the Arkansas Archeological Survey (e.g., Hoffman 1986; House 1982, 1996, 1997; Mitchem 1996; Morse 1973; Morse 1981; Morse and Morse 1983). Notably, only limited modern excavations have been conducted on protohistoric sites in the region; much of our knowledge of the time period in question is derived from analyses of the surface collections made by Phillips, Ford, and Griffin and examinations of early written accounts left by European explorers.

The various accounts of the De Soto entrada have already been summarized. The next known European contact in the Central Mississippi Valley occurred in 1673 with the expedition of Father James Marquette and Louis Jolliet. Marquette and Jolliet traveled down the Mississippi River as far south as the mouth of the Arkansas River, creating maps and recording descriptions of the settlements and people they encountered along the way. Unfortunately, many of the original documents were lost, but a map remains as does a brief account given by Jolliet to Father Claude Dablon in 1674 and Dablon’s own account of information he derived from Marquette and Jolliet. Wedel (1989) provides a useful synthesis of relevant translations and editorial information for the Marquette-Jolliet expedition. Subsequent French contact in the Central Mississippi Valley and beyond took place with the expedition of Rene-Robert Cavelier de la Salle in 1682 and Henri de Tonti’s establishment of Arkansas Post at the Quapaw village of Osotouy in 1686. Galloway (1982) provides more information on the sources and available translations from these journeys, and Jeter (1990) highlights the most relevant pieces of information for archaeologists interested in protohistoric native groups living along the Mississippi River and up into the Arkansas Valley.

Chiefdoms in Northeast Arkansas

From these archaeological and ethnohistorical sources, a basic picture of life in northeast Arkansas during the protohistoric period emerges. Throughout the Mississippi period, there is a trend toward larger settlements with increased population density supported by maize-based agriculture. The predominance of shell temper in pottery vessels that take on a variety of forms is also a marker of Mississippian culture as are artifacts indicative of long-distance exchange and participation in the Southeastern Ceremonial complex (Rolingson 2004). Evidence recovered from late fifteenth century contexts and earlier indicates that house forms were small rectangular or square structures composed of wattle-and-daub walls with wall trench architecture and thatched roofs laid out somewhat formally in rows (Jeter 2002:185; Morse 1973). There are relatively few modern excavations of Mississippian residential areas from northeast Arkansas, however (Mainfort 2010:116). In northeast Arkansas this general Mississippian pattern continues through the Early Protohistoric, with some notable temporal changes. In terms of artifacts, motifs broadly associated with the Southeastern Ceremonial complex continue to be used, but with more localized expressions forming regional styles, indicating the fact that the Mississippian world was not one homogenous unified culture; both regional and temporal variation is apparent (Muller 1989:15-16).

Other temporal changes can be seen in shifting settlement patterns over time. Regional analysis of Parkin phase sites in northeast Arkansas indicates population movement into fortified towns over time; small farmsteads and hamlets were apparently abandoned (Morse 1981). In her analysis of Parkin phase settlement in the Saint Francis basin, Phyllis Morse (1981) convincingly argues that a hierarchical settlement pattern is discernable with the 17-acre Parkin site, which retains a large platform mound to this day, as the major ceremonial center. Smaller centers are present roughly eight kilometers out from Parkin. Sizable villages are located between the centers, and smaller sites are found between these. Morse (1981) also remarks on the ubiquity of ceremonial features such as mounds.

Clusters of Nodena phase sites just west of the Mississippi River show similar evidence of a hierarchical settlement pattern, with Bradley as the largest site and main ceremonial center (Morse 1990). The work of Dr. James K. Hampson described the presence of a palisade at the

Upper Nodena site (Morse 1973). It should be noted, though, that while there are suggestions of fortifications at many sites throughout the Late Mississippi and Early Protohistoric periods, Parkin and Neeley's Ferry are the only two sites in northeast Arkansas for which we have confirmed archeological evidence of palisades (Mitchem 2013).

While the typical portrayal of Mississippian chiefdoms includes evidence of hierarchical social status as members of upper ranking classes controlled access to luxury goods and maintained disproportionate political power, communities in northeast Arkansas during Late Mississippi and Early Protohistoric times do not exhibit some of the more obvious signs of social ranking apparent in other chiefdoms in the Southeast. Hierarchical settlement patterning constitutes the strongest line of archaeological evidence of chiefdom political organization (Rolingson 2004:543). The overall picture is one that suggests that inter-polity conflict increased during this time as people moved into nucleated settlements, leaving depopulated buffer zones between political factions and uniting groups under the leadership of chiefs.

Descriptions of these communities in the accounts left by the De Soto entrada also provide us with a glimpse of the sociopolitical landscape in the area in 1541. The following description is based on the summaries of this portion of De Soto's journey found in Dye (1993) and Hudson (1998:284-302). When the Spaniards were encamped on the eastern banks of the Mississippi River in the province referred to as Quizquiz, they were confronted by a native group in a large fleet of canoes traveling in organized ranks. This visiting party came from the province of Aquixo located across the river. The leader of this party gifted fish and plum loaves to De Soto and indicated that his community was subject to leadership of a more powerful leader named Pacaha located farther upriver. De Soto responded defensively to the visit and fired arrows upon the canoe fleet after which they retreated. Upon crossing the river weeks later, De

Soto's army traveled through Aquixo (now abandoned in light of the Spaniards' previous hostile behavior) and then turned north into the province of Casqui. The accounts describe Casqui as being composed of several villages organized around a large, fortified town. Based on archaeological finds at the Parkin site (3CS29), including its site plan, fortifications, and the presence of trade goods, it is presumed to be the location of this large town (Mitchem 2013; Morse 1993). While at Casqui, Spanish priests conducted a ceremony to pray for rain at the behest of the residents who told of a prolonged drought that had affected their food supplies. Additionally, the Indians of Casqui told De Soto of their conflicts and rivalry with the province of Pacaha and were able to secure an alliance with De Soto to conduct a joint attack on Pacaha by indicating that gold could be found there. This joint attack was completed a few days later when the main town of Pacaha was attacked and ransacked. Spanish accounts remark on the large size of the town as well as its impressive fortifications. The Nodena phase Bradley site (3CT7) is now generally accepted to be the location of the main town of Pacaha based on its size, organization, and location (Morse and Morse 1990:202). Although both the leaders of Casqui and Pacaha attempted to forge strategic alliances with De Soto, the entrada left the area upon the discovery that no gold was to be found, traveling through the provinces of Quiguate and Coligua before entering the province of Cayas and the town of Tanico in the Carden Bottoms vicinity.

Thus, these accounts paint a picture of multiple, competing polities present in northeast Arkansas, some of which apparently exercised some measure of control over smaller chiefdoms. Descriptions of large and well-fortified towns accord well with what is known from the archaeological record from this region and further support some level of political complexity in the area. Additionally, the devastating drought related in the accounts of the De Soto entrada appears to have been followed by even more severe drought conditions during the 1560s, which recurred during the 1580s to 1590s, evidenced by tree-ring data (Stahle et al. 2000). Galloway (2002) asserts that the effects of these climatic conditions on food production combined with the destructive effect of the De Soto entrada on native food stores may have undermined the authority of chiefs and exacerbated any already present internal discord.

Given these conditions, it should perhaps come as no surprise that the highly organized, nucleated settlements recorded in the De Soto narratives were nowhere to be found when French explorers entered the area in June of 1673. When Marquette and Jolliet intersected the route of the De Soto entrada in northeast Arkansas, they make no mention of any of the native groups described in the De Soto accounts. The chiefdoms of Pacaha, Casqui, and other polities mentioned in the Spanish accounts are not recorded, indicating substantial regional depopulation in the intervening years (Jeter 1990:48). While it is apparent that populations dispersed in the generations following encounters with Spaniards due to a combination of factors, the direction of population movement is unknown. Possibilities include settling farther south along the Mississippi River, heading west to live in the Arkansas Valley, or moving eastward into Tennessee. Assessing the various possibilities is currently difficult based upon the available evidence, but widespread population movement in the form of short, intermediate, and long distance moves from the late sixteenth through the middle to late seventeenth century is suggested for this region (Jeter 2002:221) as it is for areas farther into the interior Southeast (Smith 2002).

The Menard Complex and Quapaw Villages in the Lower Arkansas River Valley

While Marquette and Jolliet did not record any chiefdom occupations in northeast Arkansas on their voyage down the Mississippi in 1673, they did note the presence of four Quapaw (Akansea) villages near the confluence of the Mississippi and Arkansas Rivers. When they encountered the Quapaw, residents of the villages were already in possession of European trade goods (Jeter 1990:49). While the expedition of Marquette and Jolliet was brief, later French forays into the region similarly encountered Quapaw groups, and sustained contact between the Quapaw and the French began with Henri de Tonti's establishment of Arkansas Post at the Quapaw village of Osotouy in 1686. When Ford investigated the Menard site in the late 1950s, he identified the site as the likely location of the Quapaw village of Osotouy based on its location and asserted that the artifact assemblage at Menard, which contained some European trade goods, should be associated with the Quapaw (Ford 1961). As House (1996) describes, this led to the subsequent birth of the "Quapaw phase" (now known as the Menard complex) and its assignment to artifact assemblages resembling that recovered from the Mississippi and protohistoric period components of the Menard site. Many sites located in the Lower Arkansas River Valley that are now known to date to the protohistoric period were assigned to the Quapaw phase and were thought to be associated with the historic Quapaw people, including Kinkead-Mainard (Hoffman 1977), previously discussed in relation to the Carden Bottoms locality. Since the Carden Bottoms phase bears much resemblance to the Menard complex, a Quapaw affiliation was similarly extended to Carden Bottoms phase sites.

Problems with this association began to be voiced, including by some of its earlier proponents, and a "Quapaw paradox" (Hoffman 1986) was identified. At issue is the apparent disconnect between the archaeological remains associated with the Menard complex on the one hand and the oral traditions, linguistic evidence, and ethnological ties on the other. As Hoffman (1986:27) states: the ceramic types of the Menard complex "fit in Central Mississippi Valley taxonomies easily." Thus, there is continuity in the ceramic traditions from earlier Mississippian times through the protohistoric. Yet, the Quapaw are a Dhegiha Siouan tribe with "strong *recent*

…links with other Dhegiha Siouan tribes outside the lower Mississippi valley" (Hoffman 1992:37-38, emphasis mine). Many cultural characteristics similar to other tribes of the Central and Lower Mississippi Valley are lacking. An absence of conclusive linguistic evidence for Quapaw words in the accounts of the De Soto entrada also serves as evidence of a more recent arrival in Arkansas (Rankin 1993:220). Furthermore, Joutel's account of the Quapaw living at Osotouy in 1687 describes their residences as being very distinctive bark-covered rectangular longhouses, and there is no protohistoric archaeological evidence of any such structures at Menard complex sites (Hoffman 1992:39). A well-known Quapaw oral tradition also favors a more recent migration of the Quapaw into Arkansas after they split from their cognate tribes in the Ohio Valley and forced Tunicans living in the Mississippi Valley farther south (Bizell 1981:72).

Recently, House (2013) has proposed the existence of a Quapaw archaeological signature separate from the Menard complex discovered at the Wallace Bottom site (3AR179) near the mouth of the Arkansas River. The Wallace Bottom site has a small Menard complex component, but the majority of the archaeological assemblage dates to a later period, and House (2013) suggests that this later assemblage is an example of a Quapaw assemblage and may represent the historically known village of Osotouy rather than the Menard-Hodges site as proposed by Ford (1961). Significantly, the newly proposed Quapaw assemblage is quite different from earlier Menard complex materials. The assemblage is dominated by plain, coarse shell-tempered pottery (with much coarser temper than is observed for Menard complex ceramics), a predominance of Madison arrow points rather than Nodena points, and abundant endscrapers. European ceramics, metal items, and glass beads have also been recovered from the site.

While the “Quapaw phase” label is no longer used by most researchers due to the uncertainty of an ethnic Quapaw association, the Menard complex label is still used to describe the distinctive artifact assemblage described earlier in this chapter. Like Carden Bottoms phase sites, many Menard complex sites lack sustained archaeological investigation. The Goldsmith Oliver 2 site (3PU306), however, is an exception to this rule. Arkansas Archeological Survey personnel (Jeter et al. 1990) conducted large-scale excavations and multiple specialized analyses of the site near Little Rock in advance of an airport expansion in the late 1980s. This investigation examined both domestic and mortuary contexts; however, no complete house forms could be identified (only postholes and daub were found). Sixteen burials were recorded, which contained grave goods similar to those found at the nearby Kinkead-Mainard site and consistent with the sparse records for burials looted at Carden Bottoms phase sites. In terms of lithics, Nodena points were the most common diagnostic point type and were the exclusive point type found in burials. Madison points were the next most common followed by a minority of points classified as Maud, which are more commonly found in southwest Arkansas (Cande and Jeter 1990:325). A few early seventeenth-century Spanish trade beads were also among the grave offerings (Smith 1990:218). Ceramics included many of the vessel forms present at Carden Bottoms phase sites, such as helmet-shaped bowls. In terms of ceramic types, Barton Incised was among the most identifiable of the incised sherds (Jeter and Mintz 1990:267). While painted wares such as Old Town Red and Avenue Polychrome were among the ceramic assemblage, notably absent were Carson Red on Buff wares and Keno Trailed ceramics (which are well-represented in Carden Bottoms phase assemblages) (Jeter and Mintz 1990:267). One sherd that resembled Hodges Engraved wares from the Middle Ouachita region was also recovered (Jeter and Mintz 1990:270). Overall, the Goldsmith Oliver 2 assemblage reveals a similarity to Carden

Bottoms phase sites, although some variability in ceramic types is apparent. Interestingly, bioarchaeological analyses of the skeletal remains at Goldsmith Oliver 2 indicate that the population was under significant stress and experienced reduced adaptive efficiency, which Burnett (1990) attributes to the cumulative effects of destabilization that occurred during the protohistoric.

With the Quapaw cultural designation no longer assumed for Menard complex sites, new possibilities regarding the ethnic affiliations of the people who produced Menard complex assemblages such as that recovered from Goldsmith Oliver 2 were proposed (e.g., Hoffman 1986, 1990, 1992, 1994; Jeter 1990, 2002; McGimsey 1989; Morse and Morse 1983), most of which tangentially mention Carden Bottoms phase sites as well. These scenarios are based mainly on ethnohistoric and linguistic information with some archaeological connections thrown into the mix. Some of these scenarios still offer possible Quapaw affiliations, but then refer back to the aforementioned "Quapaw paradox" as providing room for doubt. For example, Hoffman (1994) entertains the possibility that the Quapaw are a coalescence of various Mississippian groups that formed following the collapse of the chiefdoms in northeast Arkansas and then settled in communities along the Akransas River in his "shreds and patches" scenario. While this possibility accounts for some of the ceramic similarities between Menard complex (and Carden Bottoms phase) sites and the Mississippian ceramics of eastern Arkansas, it still does not account for the other aspects of the Quapaw paradox. For this reason, several researchers, including Hoffman, propose a Tunican affiliation with many sites.

In Jeter's (2002) "Maximum Tunica" scenario anything that any researcher has suggested is Tunican is considered to be, including Carden Bottoms phase sites since linguistic evidence suggests that Tanico is Tunican as are many of the other terms recorded in the De Soto accounts such as Pacaha (Rankin 1993). With this scenario, a large region is considered to be Tunican, including eastern Arkansas, northwest Mississippi, and a swath covering the Arkansas River Valley across Arkansas into western Oklahoma. This broad extent is contentious, as Jeter (2002:206) acknowledges, and he proposes a variety of other possibilities that involve various combinations of Tunicans, Northern Natchezans, and Quapaws. Many of these scenarios are plausible to a degree based on the current evidence, but it will remain very difficult to associate archaeological remains from the protohistoric to particular historically known tribes. While many researchers currently favor a generally Tunican affiliation for Carden Bottoms phase sites (e.g. Hoffman 1992; House 2013; Jeter 2002), it is notable that both Menard complex and Carden Bottoms phase sites are also mentioned in terms of various cultural amalgamations. For example, Jeter (1990:51) asks: "Could the Middle Protohistoric "Dark Ages" have seen the development of a congeries of ethnic/tribal groups and subgroups in and near the Lower Arkansas River Valley?" Investigating this possibility rather than focusing on particular identifications is the focus of this current research of the Carden Bottoms locality.

The Caddos in Southwest Arkansas, ca. 1500-1700

Pottery made in the Caddo ceramic tradition that has been recovered from the Carden Bottoms locality bears the most stylistic resemblance to wares produced in the Middle Ouachita region. As such, this review concentrates on this area, but provides some comparative observations from nearby Caddo settlements to help provide a wider perspective of Caddo life in southwest Arkansas (see Early 1983 for a more detailed account).

While Edward Palmer again made an early archaeological venture into the region in 1882 and 1883, he did not spend much time on his investigation of native salt-making sites (Palmer

1917). Decades later, Mark Harrington, who produced the account of pot-hunting activity at Carden Bottoms, excavated several mound sites in the valley of Ozan Creek and explored the upper Ouachita valley. He provided an early account of Caddo activity in the area based on his discoveries and comparisons with ethnohistoric information and C.B. Moore's work along the Red River (Harrington 1920). These brief investigations would constitute the only published accounts of Caddo archaeology in the Middle Ouachita region for the first half of the twentieth century if it were not for the activity of collectors and local residents. In fact, much of the known database of archaeological sites in the area is derived from information from amateurs, such as Judge Harry Lemley and Dr. and Mrs. T.L. Hodges (see Hodges 1957; Hodges and Hodges 1943, 1945 for accounts of some of this work). In comparison, professional archaeological research on late prehistoric to protohistoric Caddo sites in the Middle Ouachita region is sparse. However, Philip Phillips did some early survey work and limited testing in the Ouachita valley and into the Ouachita Mountains in 1939, and archaeologists associated with the Arkansas Archeological Survey conducted test excavations and performed surface collections in the same vicinity in the 1960s and 1970s (Early 1993a:5-6).

Relatively few large-scale archaeological investigations have been completed in the Middle Ouachita region, but the excavation of the Hardman site in the late 1980s as part of a mitigation project completed on behalf of the Arkansas Highway and Transportation Department is a notable exception. This investigation was able to clarify regional chronology and produced a useful synthesis (Early [editor] 1993) of specialized analyses of artifacts, features, subsistence activities, and human remains. A similar project was undertaken at the Cedar Grove site in the Great Bend region of the Red River on behalf of the U.S. Army Corps of Engineers, which uncovered a protohistoric Caddo farmstead (Trubowitz 1984).

From these various sources of information, supplemented by brief narratives from European explorers, we can piece together a general account of protohistoric Caddo life in southwest Arkansas. In a general sense, the Caddos of southwest Arkansas and eastern Texas shared many societal features with Mississippian societies to their east. They were skilled farmers with a maize-based subsistence economy, had a hierarchical political organization, and shared general sets of iconographic motifs associated with the Southeastern Ceremonial complex; yet some distinctive cultural characteristics set them apart as well (Perttula 1997:52). As Perttula (1997:53-57) summarizes, Caddo settlements from prehistoric through protohistoric times tend to consist of dispersed farmsteads or compounds and are frequently associated with nearby ceremonial mound centers; fortified villages are unknown. While various house forms have been identified, the most commonly occurring type consists of circular structures consistent with the form of the beehive-shaped houses depicted in ethnohistoric sources.

The Hardman site, a Caddo salt-making settlement in the Middle Ouachita region, contains multiple components dating from A.D. 1200-1700. As such it provides insight into changes in the region over time. In relation to this research, the most relevant changes occurred between the Mid-Ouachita phase (ca. A.D. 1350-1500) through the Social Hill phase (ca. A.D. 1500-1650) to the Deceiper phase (ca. A.D. 1650-1700). Notably, these dates are estimates, and the Carden Bottoms locality may be contemporary with the Social Hill and/or the Deceiper phases. Artifact types common for both phases (Cook Engraved carinated bowls, early forms of Hodges Engraved and KenoTrailed vessels, and Maud points for the Social Hill phase; Hodges Engraved, Hudson Engraved, and Keno Trailed vessels for the Deceiper phase) have been found in Carden Bottoms phase assemblages. Throughout this time period, occupants of the Hardman site participated in salt-making activities, but evidence of interregional connections possibly associated with the trade of salt changes over time. In the earlier Mid-Ouachita phase, grave goods do not include any artifacts that appear to be nonlocal (Early 1993c:232). The later Deceiper phase assemblage, however, includes a small sample of vessels that appear to be made in the Arkansas River Valley as well as some vessels that are similar to those found at the Cedar Grove site in the Red River Valley and to vessels found near the Keno and Glendora sites in northern Louisiana (Early 1993c:232). In turn, artifact assemblages from the Arkansas River Valley, especially the Greer site downstream from Carden Bottoms as well as the Carden Bottoms locality itself, include wares stylistically similar to ceramics recovered from the Hardman site. Early (2002:9) posits that this change may be related to “changes in tribal boundaries and social networks that took place after De Soto’s sojourn in Arkansas that may have opened up new avenues of trade and contact between Deceiper Phase people and their neighbors.”

Interestingly, the unique artifact assemblage at the Kuykendall Brake site near modern Little Rock indicates a slightly earlier presence of Middle Ouachita Region ceramics in the Arkansas River Valley prior to the appearance of any corresponding Arkansas River Valley types in Caddo assemblages. Kuykendall Brake (A.D. 1469-1617) contains the remains of a ceremonial structure, apparently burned and buried beneath a small mound in which 17 individuals were interred (House 1997). The ceramic assemblage at the site is diverse and contains several vessels that are strikingly similar to those found in the Middle Ouachita region; no common Menard complex ceramic vessels are apparent, although House (1998) considers one vessel to be a precursor to later hourglass neck bottles commonly found in Menard complex burials.

The identification of vessels produced in the Caddo tradition of the Middle Ouachita region in other areas is made easier by their stylistic distinctiveness. Early (2012) describes such distinctiveness in terms of a design "grammar" in which certain rules for pottery production were observed by potters working in the Caddo tradition. On a general level, different rules are observed for utilitarian wares and fine wares. As Early (2012:28) states: "The two traditions maintained separate repertoires of vessel shapes, and there is no crossover between them." Most decorated Caddo pottery makes use of a variety of nonrepresentational designs, and these are executed in precisely patterned ways.

> With regard to decoration, specific designs were executed with specific techniques on specific body parts of specific vessel shapes, with virtually no exception to what must have been universally understood rules [Early 2012:28].

Furthermore, it appears as if identifiable stylistic differences can be associated with relatively small geographic areas. In one case study, Early (2012:33) notes that out of 251 vessels assigned to Friendship Engraved *var. Freeman*, all but two were recovered from a 30 km stretch along the Ouachita River. This example does not appear to be unique (see case study in Early et al. 2008).

A final interesting feature of this design grammar is the identification of certain design principles that appear to relate to broader principles or beliefs in Caddo life. Early (2012:43-46) identifies two principles apparent in her study of whole vessels. One principle relates to the decision-making process involved in decorating vessels. It appears as if this process was guided by a particular order or hierarchy. Such hierarchical principles are identifiable on a number of levels in Caddo life (e.g., in the use of household space, in the organization of Caddo settlements, and in Caddo rituals) and thus appear to express some larger structural features evident in kinship relations and Caddo mythology and belief systems (Sabo 1998). Additionally, Early notes that in terms of space organization on Caddo vessels, a principle of stacking fields is discernable (e.g., vertically stacked arrangements on vessel body parts). This principle can also be seen on another level in the placement of vessels in grave contexts in which nested vessels have been deliberately arranged within a grave.

The Central Arkansas River Valley Project

As the final paragraph of Hoffman's (1986:34) paper on the protohistoric period in the Central and Lower Arkansas River Valley states:

> It is possible to conclude that there was a sudden significant and florescent Protohistoric occupation of the Arkansas River Valley about which we know little except for mortuary remains. Such basic archaeological categories as subsistence, settlement, and sociopolitical organization are unstudied. In many cases such data are still there to be collected for modern research problems.

Hoffman's observations were rather prescient with regard to the current CARV project, which was seen as just such an opportunity to shed light on a particular region and time period noticeably lacking in professional research, but full of potential based on the finds of pot hunters and cursory archaeological surveys. The project included a systematic inventory of whole vessels attributed to Carden Bottoms phase sites in museum collections, multi-instrument geophysical survey of site 3YE25, and excavation of three complete houses and numerous residential features at the site over three field seasons (2010-2012). Initially, investigations of other Carden Bottoms phase sites via geophysical survey and excavation were also planned; however, the integrity and quantity of archaeological deposits at 3YE25 prompted a change in research design to devote more attention to this community. The results of these focused efforts so far are summarized in the following sections.

Village Layout

A broad-scale magnetic gradiometry survey of roughly 7.5 hectares at 3YE25 allowed for a quick assessment of the location and arrangement of potential features of archaeological interest and helped identify areas in which to conduct higher resolution geophysical surveys, using a suite of technologies (i.e., electrical resistance, magnetic susceptibility, electromagnetic conductivity, ground-penetrating radar, and high resolution gradiometry). After analyzing these combined datasets, Jami Lockhart identified several clearly defined rectangular anomalies indicative of potential house features along with hundreds of additional smaller anomalies of interest. Test excavations undertaken in 2010 and 2011 confirmed feature identifications and provided information on the likely geophysical signatures of different feature types (e.g., houses, refuse pits, outdoor work structures, and hearths) at 3YE25. Armed with this information, Lockhart was able to identify a total of 18 probable houses located in what appear to be spatially discrete "neighborhoods" (Sabo and Lockhart 2013:13). With the expansion of geophysical surveys in the eastern part of the site in 2012, a total of three neighborhoods have been provisionally identified, each exhibiting a slightly different spatial organization. In the western portion of the site, two distinct spatial arrangements are apparent (Figure 2.3). The neighborhood farthest to the west features a series of houses oriented to the cardinal directions and arranged in parallel rows. Just to the northeast of these house rows is a second neighborhood, featuring a series of houses of varying orientations (some aligned to the cardinal directions and others not) all arranged around a roughly oval-shaped space. This open space, perhaps a courtyard or plaza, is comparatively "quieter" with respect to geophysical anomalies, indicating that it may have been reserved for uses other than everyday work activities that took place in other outdoor spaces in the community. A third neighborhood is located approximately 60 meters to the east of the central neighborhood, near the eastern boundary of the geophysical survey.

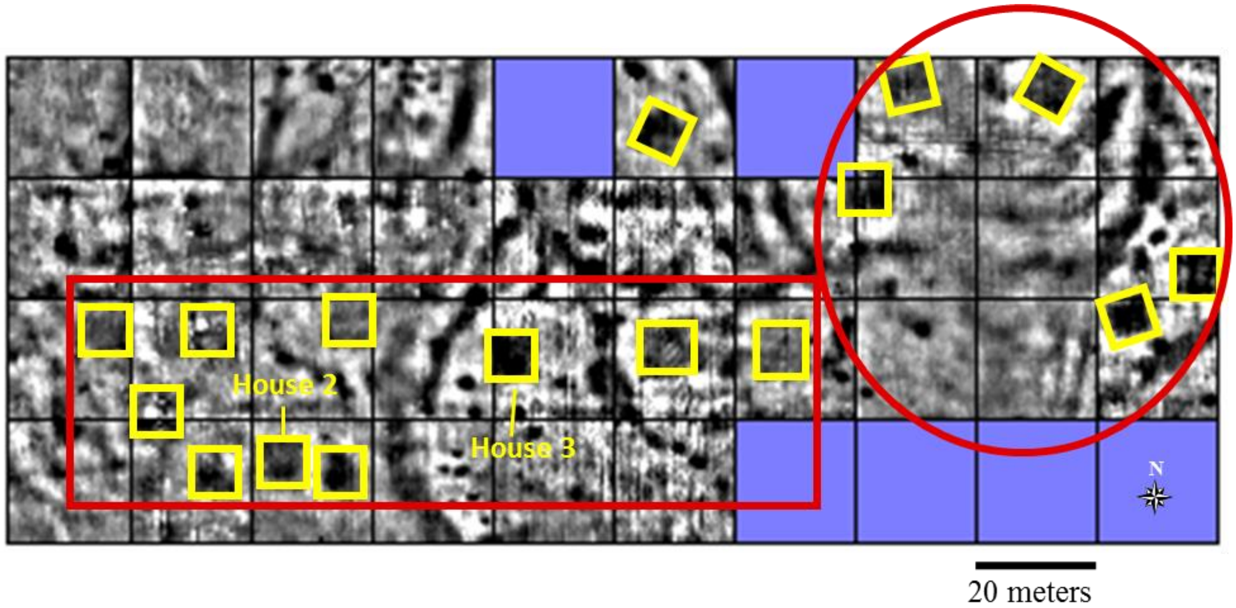

Figure 2.3. Electrical resistance image showing the arrangement of houses at 3YE25. Darker colors indicated increased resistance. Two proposed spatial clusters of houses are outlined in red. Geophysical map produced by Jami Lockhart, Arkansas Archeological Survey, used with permission.

While it may have contained other houses, only two are apparent in the current data. Like the houses in the westernmost arrangement, these houses are oriented to the cardinal directions, but a specific spatial arrangement is not discernable (Figure 2.4).

Situated among these houses are a series of other features indicative of work-related activity areas and places of refuse disposal. A series of intersecting trash pits that appear to be spatially associated with House 1 in the eastern neighborhood contained an abundance of ceramic sherds and lithics along with preserved faunal and floral remains. A shallow fire pit located a few meters west of House 1 may be an area where ceramics were fired, although few cultural materials were found in the feature. Additionally, a large pit feature (measuring three meters in diameter and over a meter deep) was found to be a large cooking pit filled with

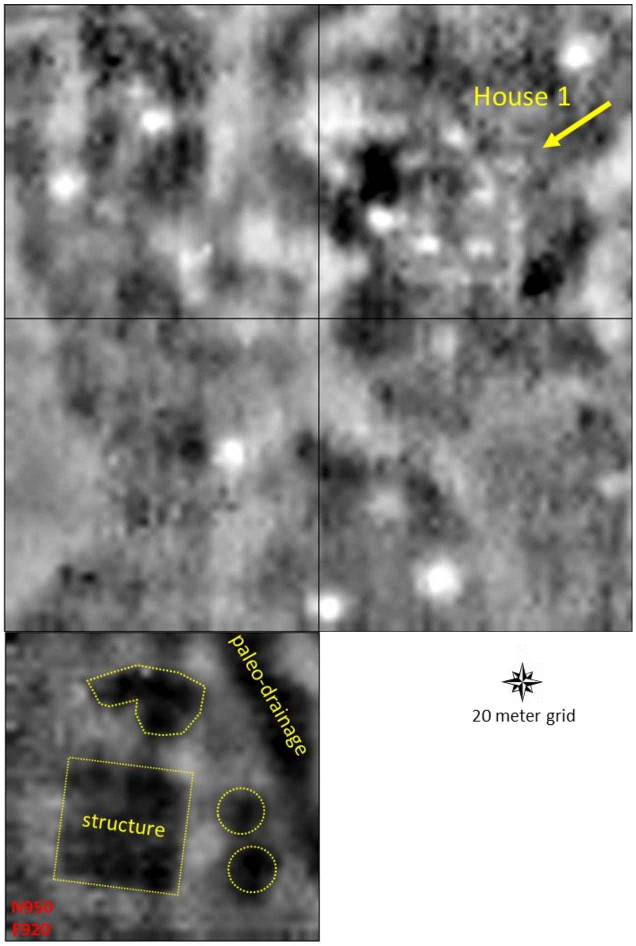

Figure 2.4. Electrical resistance image showing the arrangement of houses in the eastern neighborhood of 3YE25. Darker shades indicate decreased resistance. Geophysical map produced by Jami Lockhart, Arkansas Archeological Survey, used with permission.

charcoal, fire-hardened sediment, carbonized plant remains, ceramic sherds, and lithic debitage. In the western neighborhood, similar pit features were identified in the geophysical data, and a selection of these were excavated. Excavation of one pit a few meters away from House 2 was halted once the outline of the pit's shape became elongated, indicating that it may have contained a burial. Another pit near House 3 contained charcoal and burned sediment, but excavations ceased upon the discovery of fragmentary human remains in accordance with the wishes of the American Indian project participants discussed at the initiation of the CARV project and formalized in a Memorandum of Understanding.

Interestingly, one geophysical anomaly immediately west of House 2 shared similar features with anomalies associated with houses, but was not as well-defined. Excavation of this feature revealed some artifacts, a layer of sheet midden, and dispersed charcoal smears. Faint stains in the shape of postmolds have been interpreted as evidence of a temporary structure or outdoor ramada; similar geophysical anomalies adjacent to other house features may also represent ramadas (Sabo and Lockhart 2013). These findings indicate that a suite of domestic activities took place in several outdoor areas across the site. Many of these features appear to be multi-use; specialized ceramic firing areas have not been identified, for instance. Moreover, feature complexes appear to be similar across the site. Evidence of differential use of space in the currently investigated neighborhoods is not apparent.

Architecture

Thus far, three houses have been completely excavated at 3YE25 (Figure 2.5). House 1 (Figure 2.6) is located in the eastern neighborhood, and Houses 2 and 3 (Figures 2.7 and 2.8) are both located in the western neighborhood. Despite some variability in their orientation and their

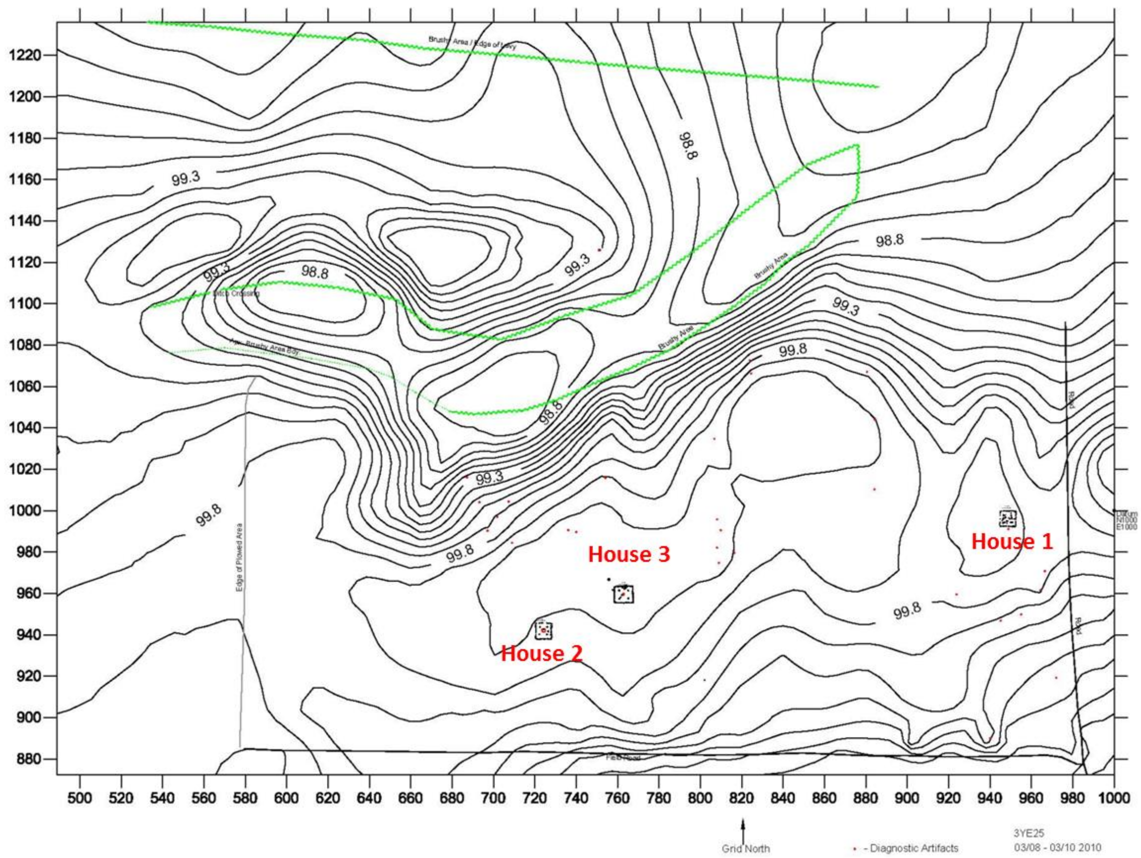

Figure 2.5. Arrangement of excavated houses at 3YE25. Map courtesy of Arkansas Archeological Survey, used with permission.

location in different neighborhoods, all three houses are surprisingly similar in terms of construction and interior use of space. The geophysical signatures of probable houses that have not been excavated suggest that these too exhibit striking homogeneity. It appears as if the houses were built to a common, and fairly exacting, plan (Figure 2.9). Jerry Hilliard conducted an analysis of house architecture at 3YE25 (Sabo et al. 2012), which identified the basic elements of house construction. Houses are square in shape, with each side measuring approximately eight meters in length (the range for all houses varied between 7.5-8.5 meters on a side). Construction began by the excavation of a shallow square pit in the subsoil to create an earthen floor. A large hearth pit, approximately a meter wide, is located in the center of each

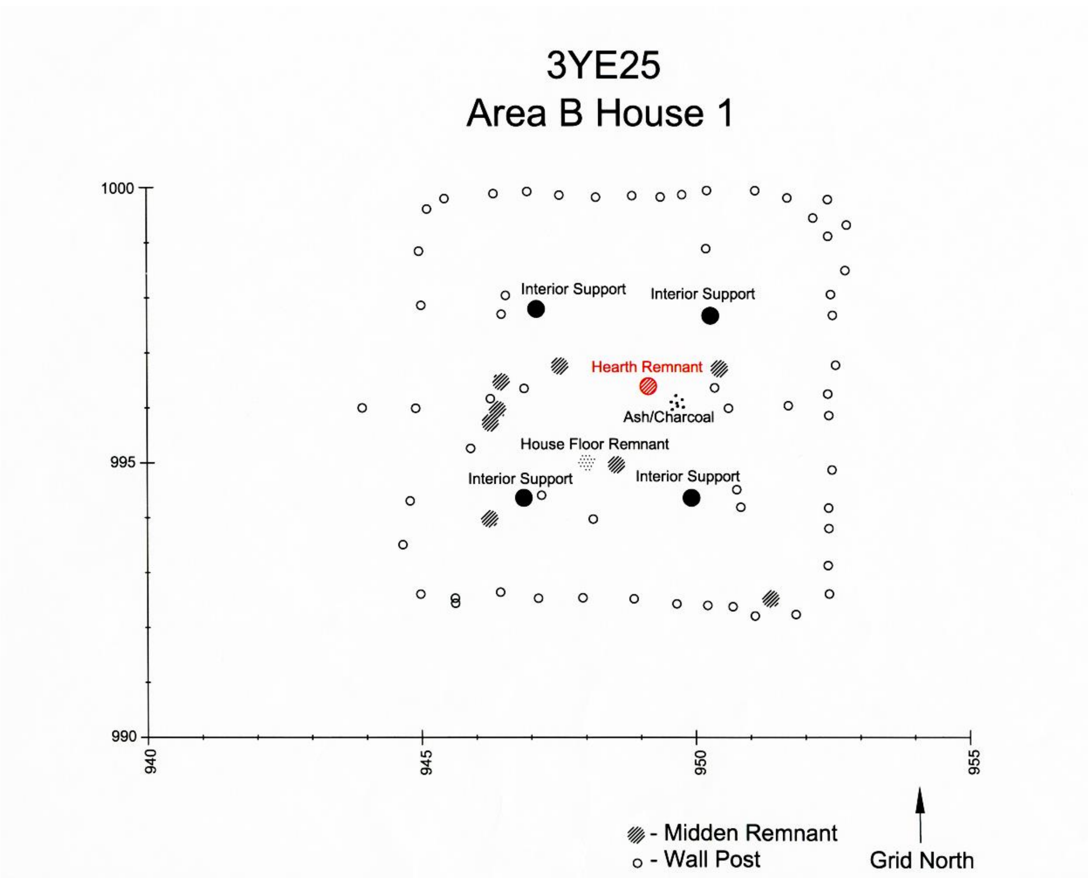

Figure 2.6. Floor plan of House 1 at 3YE25. Figure courtesy of Arkansas Archeological Survey, used with permission.

house around which are situated four large support posts positioned equidistant from one another. Additionally, posts were placed at nearly identical depths to a meter below the floor surface (bottom depths for post features were all within one centimeter of one another). Smaller wall posts were then placed into the ground at approximately 30-40 cm intervals around the house perimeter, and short earthen berms were created along the outer walls. Other interior post molds are evidence for the presence of benches along the outer walls and poles placed around the hearth, probably to form a way to hang cooking vessels. The paucity of daub found during excavations suggests that walls were not coated or plastered, but were likely covered in cane mats or smaller branches. Roofs were likely thatched since fragments of burned grass were encountered during excavations.

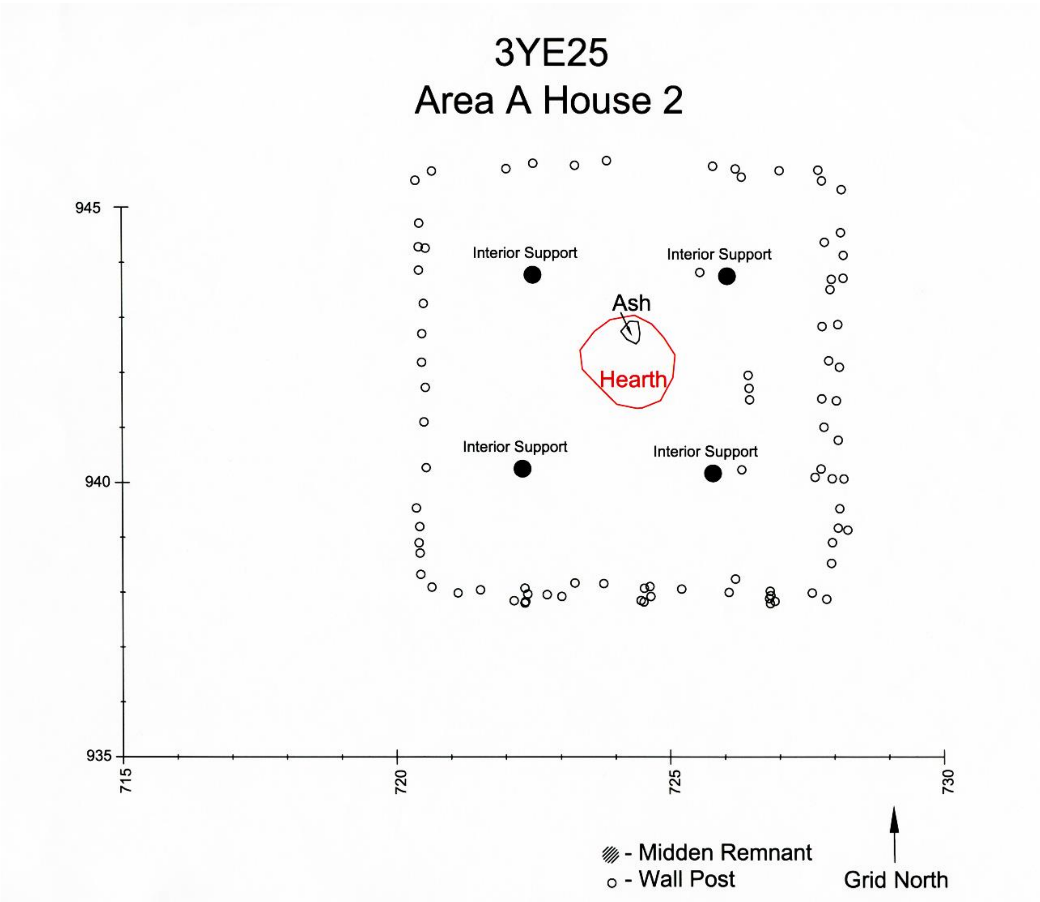

Figure 2.7. Floor plan of House 2 at 3YE25. Figure courtesy of Arkansas Archeological Survey, used with permission.

Hilliard also analyzed artifact distributions within houses (Sabo et al. 2012) and found evidence for a lofted storage area. Artifacts recovered from house floors, such as debitage or broken tools, were mostly clustered near interior walls in the area likely covered by benches, but were also distributed around the central hearth (in the case of many pottery sherds). Artifacts found in levels just above the floor are clustered only along the interior walls, suggesting that these artifacts were in lofted areas erected along the walls before they fell as the houses were dismantled.

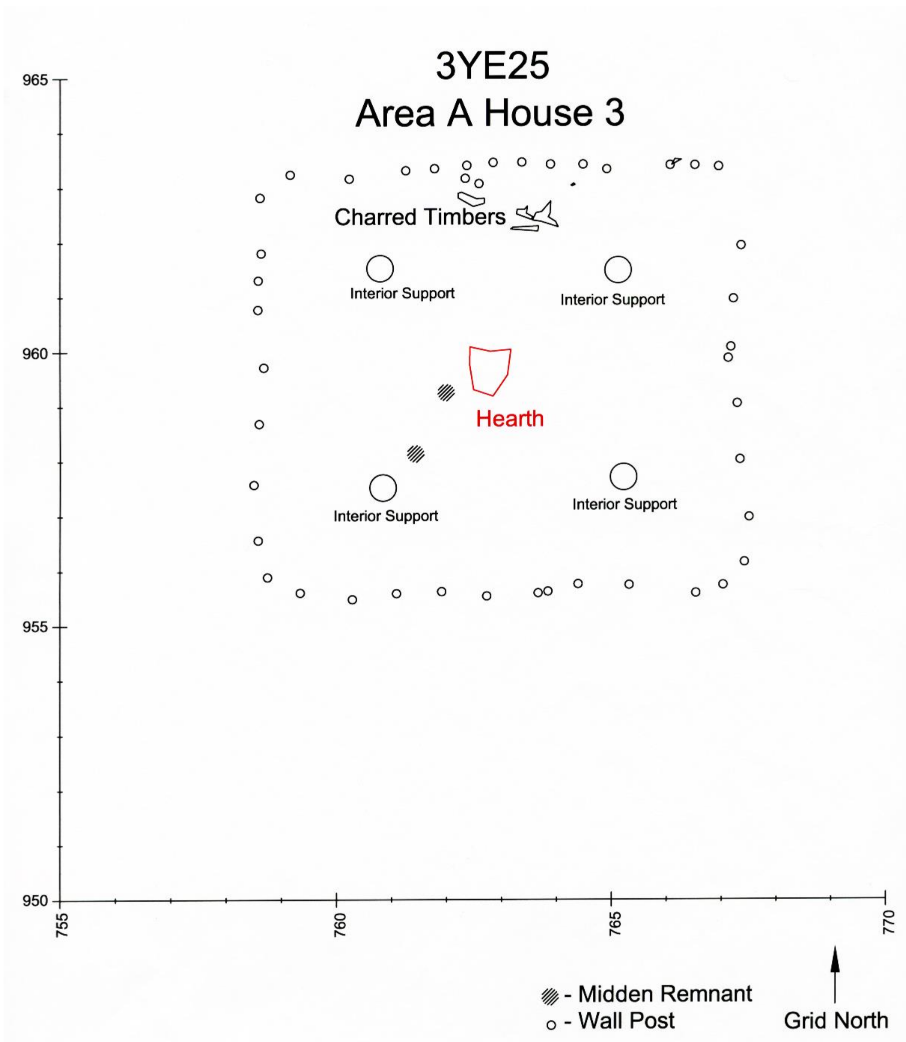

Figure 2.8. Floor plan of House 3 at 3YE25. Figure courtesy of Arkansas Archeological Survey, used with permission.

Interestingly, similar patterns in house razing have also been identified for Houses 2 and 3 (Sabo et al. 2011). During excavation of these house features, a layer of dark, densely compacted sediment rich in clay was encountered just beneath the plow zone in an area matching the houses' dimensions. It appears as if this layer of sediment was intentionally added to bury the house remains as they were burning. This process created a reducing atmosphere that led to the presence of a hard dark green surface over the central hearth and preserved some fallen wall posts and other post features. Prior to being set aflame, larger structural elements of the house were removed. House 1 may have been dismantled in a similar fashion, but it did not contain an intact floor due to years of mechanized agriculture at the site.

Artifacts

Excavations produced a large assemblage of artifacts with secure context in the residential area of the Carden Bottoms locality. A wide variety of lithic artifacts, including grinding implements, debitage, broken tools, and projectile points have been recovered. A wide variety of raw material types, including cherts originating in Texas, Oklahoma, and Kansas are represented; however, cobbles of these exotic cherts are available locally in gravel deposits along the Arkansas River. Thus, investigating issues of trade or exchange on the basis of lithic raw materials is difficult. In terms of diagnostic lithic artifacts, Nodena points make up over half of the identified assemblage; Madison points are nearly as common while Maud points make up just over five percent of types represented at the site. Proportions of these point types are roughly equal across the two neighborhoods investigated, though it should be noted that House 3 did not have many diagnostic lithics associated with it.

One of the most important findings from the excavations at 3YE25 is the discovery that many of the same ceramic types and styles found in the whole vessel collection are also present in the assemblage of excavated sherds from residential contexts (e.g., Carson Red on Buff, Old Town Red, Barton Incised, Keno Trailed, and Hodges Engraved) (Figure 2.10). Thus, while we do not have the same specific context for the whole vessel collection, we can be more confident in the association of these finds with the Carden Bottoms locality. Stylistic assessment by Ann Early of the data collected from whole vessel collections housed in museums indicates a likely

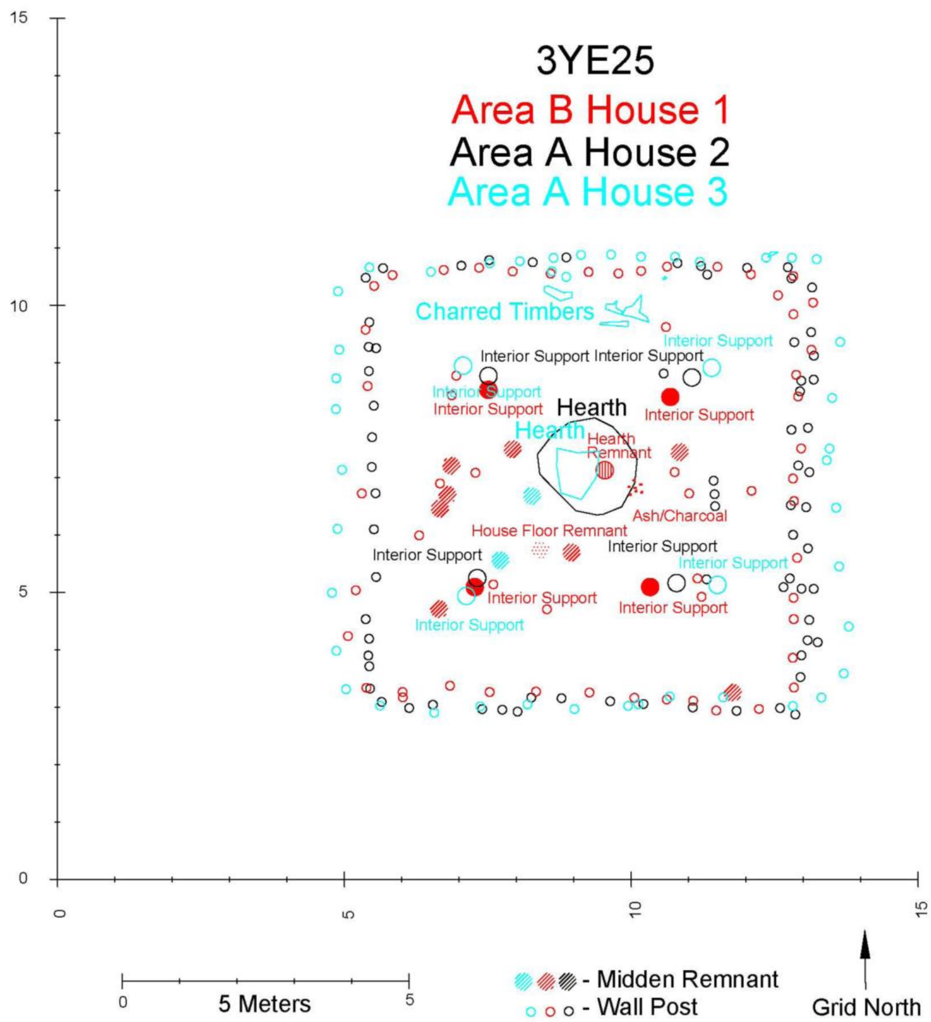

Figure 2.9. Superimposed floor plan of Houses 1, 2, and 3 at 3YE25. Figure courtesy of Arkansas Archeological Survey, used with permission.

association with the Middle Ouachita region for Caddo style wares although a minority of vessels and sherds are more similar to wares originating in the Red River Valley area. While not complete, Early's analysis has found that 23% of the vessels examined to date are Caddo types (Sabo et al. 2012).

Figure 2.10. Example of Keno Trailed vessel recovered from 3YE25. (ANID RWA009). Photo taken by the author.

Leslie Walker is also completing a stylistic analysis of the Carden Bottoms whole vessel collection and sherds excavated from 3YE25. Her research so far has led to the identification of a distinctive local style present in the Carden Bottoms vicinity, dubbed the Dardenne style (Sabo et al. 2012). While many design motifs present in the Carden Bottoms assemblage are also found in adjoining areas, shifts in stylistic expression are apparent. Although motifs may overlap, differences in vessel form and in the overall proportion of motifs represented are discernable. This style is expressed not only on painted ceramics but on rock art found on nearby Crow Mountain and Petit Jean Mountian. Thus, the Dardenne style represents a local artistic style zone. Similar, as yet unnamed, style zones may likewise occur among Menard complex sites downstream.

Similar to the distribution of diagnostic lithics, ceramics from the different identifiable traditions were present in all three households investigated so far. For example, sherds identified as being nonlocal Caddo imports were found associated with all three households as were wares exhibiting local styles. Possible sherds consistent with the Mississippian tradition of the Central Mississippi Valley are harder to identify in the fragmented residential assemblage, but may be present as well. The proportion of certain wares across the site is skewed to a certain extent, however. The majority of fine wares (both Caddo style ceramics and red-painted wares) were recovered from the refuse pits associated with House 1 (Sabo and Lockhart 2013). Utilitarian wares with various incised motifs and other surface treatments were found in roughly similar proportions across households, but very few fine wares were recovered from house floors. Furthermore, fine wares recovered from refuse pits exhibited very little use wear and appeared to have been disposed of soon after breakage. It would appear that differential disposal rules were applied to these fine ware vessels, which were likely used in ritual contexts. The concentration of these sherds around House 1 may indicate some interesting intra-site differences, but due to the differential disposal rules, sampling issues may also exist. While some refuse pits were excavated in the western neighborhood, we do not have a comparably sized sample of artifacts from pit contexts associated with Houses 2 or 3 as is available for House 1. This circumstance is partially due to the discovery of human remains in pit contexts in the western neighborhood. Closer stylistic analysis of the sherd data (ongoing by Walker) may identify other more subtle intra-site differences among households unknown at present.

Another notable discovery in the artifact assemblage from 3YE25 concerns the distribution of hematite and implements used to process this red pigment. Nodules of hematite and/or processing implements coated with red pigment were found in association with each household (Sabo and Lockhart 2013). This finding suggests that members of each household participated in the production of red-painted pottery and/or rock art found on nearby Petit Jean and Crow Mountains.

Finally, it is important to mention that the “hybrid” wares previously identified in whole vessel collections (Early et al. 2008) are also present in sherd form from excavated contexts. These wares often make use of typical elements of the Caddo ceramic tradition, but execute them in ways that violate the design grammar identified for Caddo wares (Early 2012). For example, design elements may be combined in ways not seen in Caddo wares or be executed on atypical vessel forms. Figure 2.11 provides one example of a hybrid vessel excavated from House 2. This carinated bowl with a cross-hatched rim treatment (a feature typical in the Caddo tradition) is distinctive in a number of respects. While the carinated bowl form is common for Caddo fine

Figure 2.11. Example of hybrid vessel recovered from 3YE25. (ANID RWA042). Photo taken by the author.

wares, this bowl is not shaped in quite the same way as many Caddo bowls. It has a less pronounced point of carination. Additionally, such a design would typically be engraved on a Caddo bowl; the design on this bowl appears to have been applied before the paste was dry enough to truly engrave. Finally, in terms of finishing, this bowl is not as well-smoothed as one would expect for a Caddo vessel.

The compositional analysis discussed in the following chapters provides a means to assess the provenance of these excavated finds. Together these sources of data provide insight into the social composition of the Carden Bottoms community and have implications for understanding protohistoric occupations throughout the Arkansas River Valley.

CHAPTER 3: COMPOSITIONAL ANALYSIS OF CERAMIC PASTE

As discussed in Chapter 1, INAA has a long history of use in provenance studies of archaeological ceramics; however, applications of INAA in the southeastern United States are comparatively few and relatively recent, with most analyses undertaken within the past 15-20 years. For the regions and time period of interest to this study, previous compositional analyses have not been completed. Still, studies from nearby regions (in the case of analyses of Caddo ceramics) or earlier time periods (regarding INAA research in the Mississippi Valley) provide some baseline expectations for this investigation.

Background on INAA Research in Surrounding Regions and Regional Geology

The findings of Lynott and colleagues (2000) are of particular interest to this project. In an effort to investigate the prehistoric movement of ceramics across southeast Missouri, Lynott et al. (2000) were able to distinguish ceramics produced in the Eastern Ozark highlands from those originating in the central Mississippi River valley, and different compositional source groups were identified from within the central Mississippi River valley itself. The latter finding is encouraging since the large alluvial setting of this region makes it likely that clay sources are homogenous over large areas. While Lynott et al. (2000) suggest that clays from the Eastern Lowlands of the Central Mississippi River Valley may belong to one large source zone, the fact that different compositional groupings were identified for Eastern and Western Lowlands ceramics and clays is useful for the purposes of this study. Moreover, Rains (2010) was able to distinguish sands sampled from the Arkansas, White, and Mississippi Rivers on the basis of elemental analysis. While clays derived from these different drainage systems may not follow the exact pattern found in the sand fraction due to their smaller particle size, these results nonetheless suggest that clays from in the region are potentially compositionally distinct.

Additionally, a large database of compositional data has been amassed by researchers interested in Caddo ceramics (see Perttula and Selden 2013 for a bibliography of these studies through 2012). The majority of this work has focused on sites in east Texas and southeast Oklahoma, although some data are now available for sites in the Red River region of southwest Arkansas. These data are utilized in this investigation to discuss broader regional relationships and are discussed at the end of this chapter.

Furthermore, in a now classic study, Steponaitis and colleagues (1996) describe broad patterns of chemical composition data for Mississippian ceramics across the Southeast, which links identified compositional groupings to geological clay-mineral provinces. They note that residual clays and alluvial clays from minor streams in the Ouachita-Ozark province of eastern Oklahoma and northwestern Arkansas are dominated by kaolinite-illite mixtures, accompanied by chlorite (Steponaitis et al. 1996:562). This province encompasses both the Central Arkansas River Valley and most of the Middle Ouachita region. However, clays within the Arkansas River Valley proper do not exhibit the same mineral profile due to the size of the Arkansas River basin. Instead, clays obtained from this alluvial setting should appear more like those from the Western Gulf Province, which includes the Central Mississippi Valley, and contain larger proportions of smectite and illite with smaller quantities kaolinite and traces of chlorite (Steponaitis et al. 1996:562). Yet, the Arkansas River drainage contains lesser quantities of smectite and larger quantities of illite than are found in the Lower Mississippi River basin (Steponaitis et al. 1996:564). Notably, the authors conclude that each broad region identified in the study exhibits internal patterning that may be indicative of chemical subgroups that could be identified with additional sampling. This study provides an opportunity to evaluate whether additional subgroups could exist among the authors' Western compositional group.

If we consider the geology of the particular regions of interest to this study in more detail, potential compositional distinctions of clays are likewise possible. The Central Arkansas River Valley is characterized by broad valleys bordered by resistant sandstone ridges interbedded with shales (Haley et al. 2008). Within this setting, the Carden Bottoms locality is situated on Quaternary alluvium, which is tan to buff in coloration. Both north of the locality along the hillsides of Carrion "Crow" Mountain and to its south-southeast along the Petit Jean River and the hillsides of Petit Jean Mountain lies the Pennsylvanian-aged Atoka Formation. The exposed upper member of this formation consists of micaceous clay, silty shales, and thin-bedded sandstones (Haley et al. 2008).

In the Lower Arkansas River Valley, near the mouth of the Arkansas River, more complex zones of sedimentation exist. In this area, many deposits are Holocene in age and are undifferentiated mixes of sands, silts, and clays. Abandoned stream channels and backswamps abound, and the central portions of these deposits often consist of uniform clays (Ausbrooks and Prior 2009). Native potters likely made use of these deposits to gather the raw materials for pottery production. Since these clays are from a large, complex alluvial setting, they likely exhibit a general similarity to alluvial clays from upstream in the Central Arkansas River Valley; however, potential for differentiation exists as well. Potters in the Carden Bottoms locality had abundant access to alluvial clays, but access to residual clays from the Atoka Formation also existed. These deposits exhibit the more distinctive profile of the Ouachita-Ozark clay-mineral province discussed by Steponaitis and colleagues (1996). Alluvial clays from the Central

Arkansas River Valley may also retain some of this distinctiveness in comparison to deposits from farther downstream.

Similarly, clays available to potters in the Central Mississippi Valley are mainly derived from abandoned stream channels and backswamps and consist of silty clays from Quaternary alluvial deposits (Haley et al. 1993). Previous compositional analyses in this region (Lynott et al. 2000; O'Brien et al. 1995) suggest that the Mississippi alluvial valley as a whole may consist of one large compositional source region that cannot be further subdivided. Yet, if potters obtained clays from the lowlands just west of the valley proper, these may be more geographically restricted. Additionally, Branner (1908:72) describes Tertiary beds of clay exposed along the base of Crowley's Ridge in Cross County, Arkansas that are geologically distinct from alluvial clays found elsewhere in the region.

From a geological standpoint, clay sources from the Middle Ouachita region offer the most promise for exhibiting a distinctive chemical composition that is geographically restricted to a relatively small source area. Alluvial clays found along the Ouachita River or in nearby bayous are weathered from local Cretaceous formations or from formations in the Ouachita Mountains (Haley et al. 2004; Hanson and Clardy 1994). Additionally, Branner (1908:113) notes the exposure of Tertiary aged clays, which he describes as particularly suitable for making pottery, along several hillsides and stream banks throughout Hot Spring County. These formations of different ages contain differential geologic chemistries, which should be detectable using INAA.

Methods

To determine whether the distinct ceramic traditions present at Carden Bottoms that were identified on the basis of stylistic elements (see Chapter 1) can also be recognized in chemical composition data, both ceramic samples from excavated contexts at 3YE25 in the Carden Bottoms locality and comparative samples from existing ceramic collections and select geological contexts pertinent to this project were undertaken. One complication of any compositional analysis of archaeological ceramics is the unknown size of the sample universe. It is impossible to know, a priori, how many samples are necessary to capture trends within the data (Baxter and Buck 2000:722). Thus, this study is in many ways a pilot effort at providing some baseline information about compositional variability within the Central Arkansas River Valley and surrounding regions that can be used in future research. Table 3.1 provides a

Table 3.1. Sherd samples selected for INAA.

Context	Site No.	Sample Description
Carden Bottoms excavations	3YE25	20 sherd samples from each of 3 houses and associated trash pits 2 fired clay samples (examples of local paste and pottery production) 1 raw clay sample (example of local clay from archaeological context)
Comparative collections		
Central Mississippi Valley	3CT8	7 sherd samples from the Beck Place site
	3CT7	6 sherd samples from the Bradley site
	3CS27	7 sherd samples from the Rose Mound site
	3MS8	7 sherd samples from the Bell-Catching Place site
	3CS29	7 sherd samples from the Parkin site
	3CS25	6 sherd samples from the Neeley's Ferry site
Lower Arkansas River Valley	3AR179	15 sherd samples from the Wallace Bottom site
Middle Ouachita Region	3CL23	7 sherds from the Rorie Place site
	3CL27	5 sherds from the Bayou Sel site
	3CL56	5 sherds from the Moore Mound site
	3CL418	6 sherds from the Hardman site
	3HS19	10 sherds from the Lower Meador site
	3HS33	11 sherds from the Upper Meador site
	3HS38	4 sherds from the Myers site
TOTAL INAA SAMPLES	**166**	

summary of the samples analyzed for this project. Procedures for sample selection, preparation, and statistical analyses are discussed in the remainder of this section.

Sample Selection

Ceramic samples were obtained from excavations of three entire houses and their associated trash pits at 3YE25 in the Carden Bottoms locality. These houses are located in two of the three currently known distinct spatial clusters or "neighborhoods." Samples were chosen to reflect the cross-section of wares found in each household that have provisionally been identified as local wares (including those that belong to the "hybrid" category), nonlocal Mississippian wares, and nonlocal Caddo wares. Every effort was made to ensure that sherds selected for analysis were not derived from the same vessel. In an attempt to establish a more certain signature of local clays, additional samples of archaeological clay from the site were obtained from a clay-filled pit feature and from fired pottery coils recovered during excavations (Figure 3.1). The clay filled pit is possibly evidence of the process of ceramic production within the community, and the pottery coils are a tangible indication of local ceramic paste recipes.

Figure 3.1. Pottery coil from 3YE25 excavations submitted for INAA. Photo taken by the author.

To establish the provenance of ceramic compositional groups identified during the analysis of ceramics from the Carden Bottoms site, a number of comparative samples were obtained from existing ceramic collections from protohistoric sites containing wares stylistically similar to those found at Carden Bottoms. These sites are located in the local Central Arkansas River Valley, the Caddo area of the Ouachita Mountain/Gulf Coastal Plain region, the Mississippian area of the Central Mississippi Valley, and the Lower Arkansas River Valley (Figure 3.2). Selection of these sites over others which may also be connected to the Carden Bottoms locality was based mainly on the size of the available ceramic assemblages from these sites, which offered the greatest potential for sampling a variety of sherds. Notably, the sherds sampled from the Wallace Bottom site (3AR179) are thought to postdate the excavated assemblages from the Carden Bottoms locality (3YE25). These samples are affiliated with a later

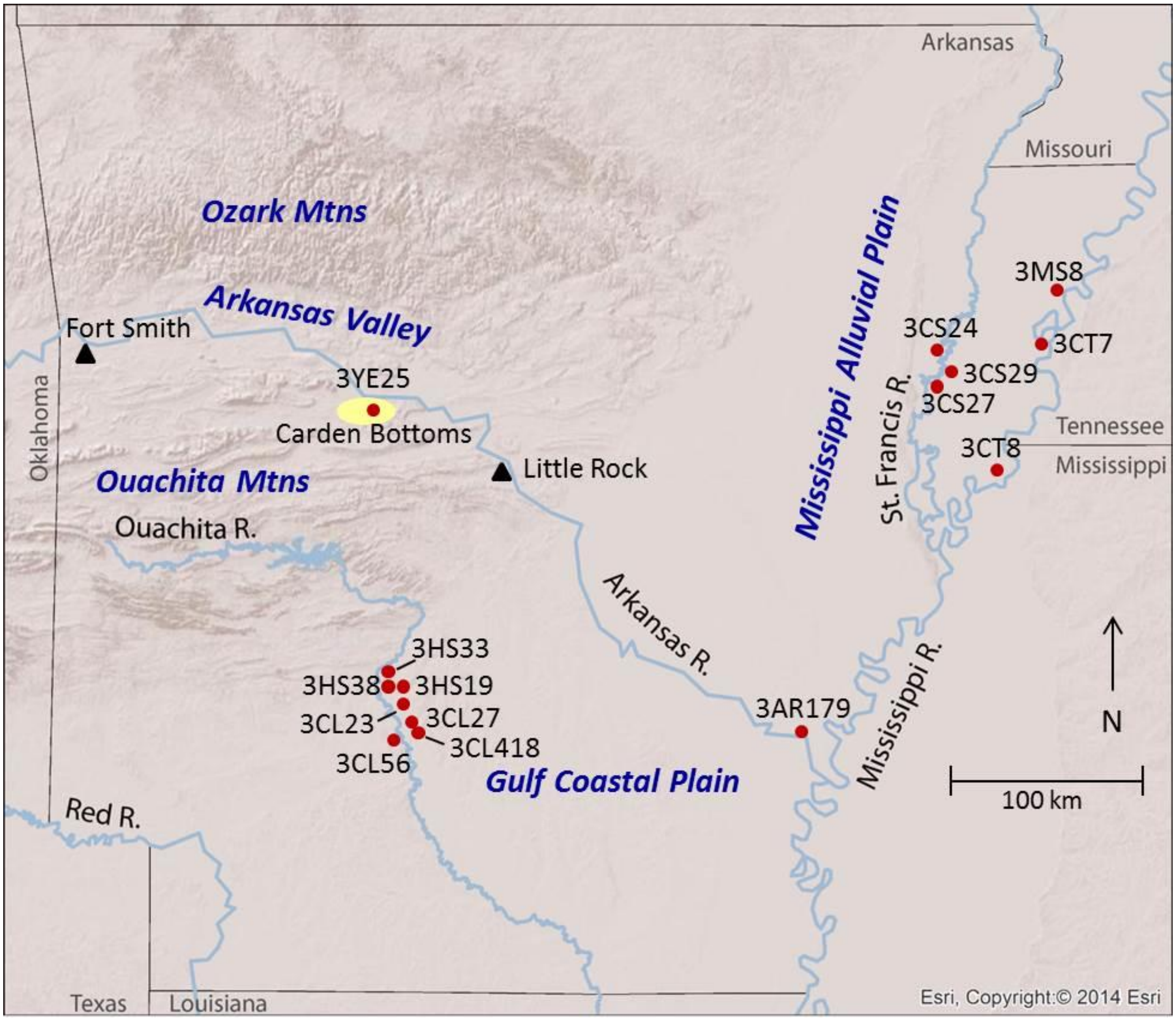

Figure 3.2. Map showing the approximate location of sites included in the study. Portions of this figure include intellectual property of Esri and its licensors and are used herein under license. Copyright © 2014 Esri and its licensors. All rights reserved.

Quapaw occupation (ca. A.D. 1680 – 1750) and are included to evaluate any possible relationship to Quapaw (or other) communities located downstream from Carden Bottoms. Immediately preceding the Wallace Bottom occupation are Menard complex communities, which share many features with Carden Bottoms phase communities. Potters at certain Menard complex sites may have utilized the same clay sources as their counterparts at Wallace Bottom.

Relationships among ceramics from Carden Bottoms and possible source regions can be determined following the "criterion of abundance" strategy (Bishop et al. 1982) in which the comparative ceramic samples are proposed to be local based upon their relative abundance in archaeological assemblages at their source sites. Submission of raw clays from each region of interest was initially planned, but funding limitations prevented their inclusion in the study. Since the relationship between raw clays and archaeological ceramics is complex, I determined that focusing on comparative ceramic collections would prove more fruitful for this initial study.

Certain practical limitations also affected the selection of sherds submitted for INAA. Recently excavated sherds from the Carden Bottoms locality are also the subject of other ongoing stylistic analyses; thus, destroying certain sherds during the INAA process could adversely affect other studies. Similarly, permission to destroy small portions of sherds from comparative collections housed in museums and curation facilities was not granted for some particularly rare or well preserved specimens. In other cases, sherds that would have otherwise been off limits for destructive analysis were used if they were large enough to obtain a smaller sample that could undergo INAA. In these instances, fragments were either broken off larger sherds using pliers or (in cases where greater precision was needed to preserve certain design motifs) sections of sherds were mechanically removed using a Dremel tool outfitted with a carbide tip (Figure 3.3). Any potential contamination issues associated with these sampling

Figure 3.3. Example of sherd cut with Dremel tool for analysis. The smaller fragment on the right was submitted for INAA while the larger portion was retained for future research. Photo taken by the author.

techniques were resolved through standard laboratory procedures at the Archaeometry Laboratory at the University of Missouri Research Reactor (MURR) where the samples underwent INAA. Finally, sherds that were known to have come from mortuary contexts were not included in this study in response to concerns from American Indian project participants. This issue is discussed in further detail in Chapter 6.

Sherd Data

Due to the destructive nature of INAA, sherds were thoroughly documented prior to undergoing analysis. Each sherd was photographed, and metrics and descriptive data were recorded (see Appendices A and B). Documented metrics include sherd weight, maximum thickness, and estimated rim diameter for rim sherds of sufficient size. Sherd temper and paste characteristics (i.e., texture, Munsell color, and hardness) were extensively described along with vessel form (if discernable) and any interior or exterior decoration (if applicable). Contextual information including provenience and the identification of the collector or excavator and the location of remaining artifact collections was also noted. Finally, determinations of the provenance of each sample (i.e., local wares, nonlocal wares from the Central Mississippi Valley, or nonlocal wares from the Ouachita/Gulf Coastal Plain region) based on macroscopic examination was recorded to compare with the findings of INAA.

I formed these initial hypotheses on the basis of both stylistic cues and an examination of paste characteristics. A common assumption regarding the provenance of archaeological ceramics in residential contexts is that most wares are likely locally produced, especially utilitarian wares. While this assumption is sometimes violated, it provides a starting point for provenance assessment. Most sherds recovered from the Carden Bottoms excavations were derived from utilitarian vessels with signs of use wear. These sherds were often soft and friable, with fine to medium texture, and were yellow to buff in coloration. Additionally, shell temper was nearly ubiquitous in these sherds, although a minority of sherds in this category contained bone temper. I labeled these sherds as likely local in my initial assessment. Similarly, I labeled decorated ceramics (most frequently red-painted wares) with a similar hardness, texture, and color as likely local.

In contrast, undecorated sherds with a noticeably distinctive hardness, texture, or color were labeled nonlocal. Most of these distinctive sherds exhibited harder and more compact pastes, were well-smoothed, and were more gray to brown in coloration. Based on comparisons with whole vessel collections, I labeled these sherds as likely or possibly imported Caddo ceramics. In other cases, I designated sherds that were burnished or polished and/or exhibited certain engraved or trailed design motifs as likely nonlocal Caddo sherds on the basis of their similarity to well-known Caddo fine wares.

Identifying sherds as possibly or likely originating from the Mississippi Valley proved more difficult. Without whole vessels available to observe differences in vessel shapes, most sherds present in the excavation assemblages could not be convincingly labeled as Central Mississippi Valley ceramics. Sherds in comparative collections found at Central Mississippi Valley sites had paste characteristics similar to those found in the sherds presumed to be local to the Carden Bottoms locality; however, some differences can be noted. Sherds from Central Mississippi Valley sites were often more dense and compact and less friable than those commonly found in the Carden Bottoms excavations. Additionally, several sherds from the comparative collections had a noticeably more sandy paste. Thus, I identified a few sherds exhibiting these slight textural differences from the Carden Bottoms excavations as possibly originating from the Central Mississippi Valley. As noted previously, Appendix A provides a more complete description of textural and decorative observations, including Munsell color designations, for all sherds submitted for analysis.

INAA Sample Preparation

Standard procedures at MURR were used to prepare ceramic specimens for INAA. Portions of each specimen, approximately $1cm^2$ in size, were prepared by grinding off the outer surfaces of the sherd with a silicon carbide burr to remove any pigment applied to the surface obtained from another source and reduce the possibility of contamination by issues related to weathering and leaching of minerals on the surface. Following this process, specimens were washed in deionized water and, once dry, ground into a powder using an agate mortar to homogenize the samples to characterize the overall ceramic paste. If specimen size permitted, archival samples were retained for future research. All sherd portions not consumed in this process were returned to their respective repositories.

For each source specimen, two analytical samples were prepared and sealed prior to irradiation. One sample, used to undergo short irradiations, consisted of approximately 150 mg of powder placed into clean, high-density polyethylene vials. The remaining sample, used for long irradiations, consisted 200 mg of powder placed into clean, high-purity quartz vials. Using an analytical balance, individual sample weights were recorded to the nearest 0.01 mg. Quality control samples (treated as unknowns) of SRM-278 (obsidian rock) and Ohio Red Clay (a standard developed for applications at MURR) and certified standard reference materials of SRM-1633a (coal fly ash) and SRM-688 (basalt rock) from the National Institute of Standards and Technology were similarly prepared and submitted for analysis along with the unknown ceramic specimens. The addition of such standards allows for any inaccuracies in instrumentation to be detected and ensures consistency across the analysis of all samples.

Collecting Chemical Data with INAA

Standards for INAA followed at MURR are similar to procedures used at most other INAA laboratories; however, at MURR samples are subjected to two irradiations and a total of three gamma counts on high purity germanium detectors instead of the more typical single irradiation (Glascock 1992; Neff 1992, 2000). This procedure allows for a wide variety of elements with differing decay schemes to be detected (see Glascock 1992 for further details). A short irradiation was carried out through a pneumatic tube irradiation system. Samples in the polyvials were sequentially irradiated, two at a time, for five seconds by a neutron flux of 8×10^{13} n cm^{-2} s^{-1}. Samples were then subjected to a 720-second gamma count, which yielded data for nine short-lived elements[3]. Then, the prepared samples encapsulated in quartz vials were irradiated for 24 hours at a neutron flux of 5×10^{13} n cm^{-2} s^{-1}. After the long irradiation, samples were allowed to decay for seven days after which they were counted for 1,800 seconds (the so-called "middle count"), yielding determinations of seven medium half-life elements[4]. Following an additional three-week decay, a final count of 8,500 seconds was carried out on each sample,

[3] aluminum (Al), barium (Ba), calcium (Ca), dysprosium (Dy), potassium (K), manganese (Mn), sodium (Na), titanium (Ti), and vanadium (V)

[4] arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb)

allowing determinations of 17 long half-life elements[5]. Based on the resulting gamma counts, element concentration data from the three measurements were tabulated in parts per million (see Appendix C).

Overall, 33 elements were detected in most of the analyzed samples. Data for Ni was too low in many samples to be counted (a common occurrence in New World ceramics) and was not considered during statistical analysis. The addition of shell temper to many of the analyzed specimens presented another challenge that had to be resolved prior to data interpretation. Shell tempering tends to elevate calcium levels (and its correlated elements such as strontium) in samples and essentially dilutes the concentrations of other elements. Fortunately, Cogswell et al. (1998) have shown that a mathematical correction can be applied to compensate for the effects of shell temper. In a controlled experiment, they demonstrated that the correction had the effect of restoring element concentrations to their original amounts (determined on the basis of untempered clay samples used as a control group).

In many of the specimens analyzed for this study, calcium levels were found to be up to 5.7%, high enough to warrant the application of the calcium correction to the dataset.[6] Following this correction, calcium and strontium were removed from subsequent statistical analyses. Similarly, manganese and sodium were also eliminated in order for this dataset to be compatible with others in the region. Shell temper acquired from different sources can differentially affect

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[5] cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), strontium (Sr), tantalum (Ta), terbium (Tb), thorium (Th), zinc (Zn), and zirconium (Zr)

[6] The mathematical equation for the calcium correction is as follows:

$$e' = \frac{10^6 e}{10^6 - 2.5c}$$

where *e*' is the corrected concentration of a given element in ppm, *e* is the measured concentration of that element in ppm, and *c* is the concentration of elemental calcium in ppm.

levels of sodium and manganese, and the calcium adjustment only partially corrects for these changes.

The raw chemical concentration data for the remaining 31 elements were then transformed to base-10 logarithms of concentrations prior to statistical analysis. This transformation effectively compensates for differences in magnitude between major elements, such as aluminum and iron, and trace elements, such as the rare earth elements, and simultaneously yields a more normal distribution for trace elements. All statistical analyses were carried out by or in consultation with Dr. Jeffrey Ferguson, a research scientist at MURR.

Interpreting Chemical Data

Over the past 40 years, a variety of methods have been used to interpret compositional data derived from archaeological materials (see Baxter and Buck 2000; Bieber et al. 1976; Bishop and Neff 1989; Glascock 1992; Harbottle 1976; Neff 2000 for detailed discussions of the most widely used techniques). In all cases, the ultimate goal is to identify compositionally distinct groups within the samples analyzed that are presumed to correspond with geographically restricted sources or source areas (i.e., the provenance postulate of Weigand et al. 1977). This task is somewhat easier for lithic materials such as obsidian in which sources tend to be more localized. For ceramics, regardless of how intensive one's sampling strategy is, it is impossible to identify all potential sources since clays are virtually ubiquitous. However, the locations of sources can be inferred by comparing specimens of unknown provenance (i.e., ceramic artifacts) to specimens of known provenance (i.e., clay samples), by indirect methods such as the "criterion of abundance" strategy (Bishop et al. 1982) in which members of the most abundant compositional group(s) at a site are assumed to be local, or by arguments based on geological and sedimentological characteristics (e.g., Steponaitis et al. 1996).

Glascock (1992:16) provides a useful perspective for envisioning compositional data, stating: "Compositional groups can be viewed as 'centers of mass' in the compositional hyperspace described by the measured elemental data. An individual group is characterized by the location of its centroid and the unique correlations of the element concentrations with one another." Assignment of a specimen to a group is then determined by the overall probability that its measured concentrations of elements could have come from that group.

Frequently, multivariate statistical techniques, such as cluster analysis, discriminant analysis, and principal components analysis (PCA) are used to recognize patterns within the chemical data. The appropriateness of one technique over the other is largely determined by the types and quantity of data available for interpretation. For this study, PCA was employed for reasons discussed in the following paragraphs.

A particular challenge in interpreting archaeological and geological chemical datasets is the large numbers of variables (measured elements) present and the fact that many of these variables are highly correlated. PCA is able to transform data into a smaller set of uncorrelated variables to facilitate interpretation. As described by Glascock (1992:17-18), PCA creates a new set of reference axes arranged in decreasing order of variance subsumed. Individual PCs are linear combinations of the original variables. Data can then be examined in combinations of the new axes. Overall, PCA can be used to partition a dataset into subgroups or to test the coherence of groups identified on the basis of other criteria.

As discussed by Baxter (1992), Baxter and Buck (2000), and Neff (1994, 2002), PCA can be applied as a simultaneous R- and Q-mode technique, with both variables (elements) and objects (individual analyzed samples) displayed on the same set of principal component reference axes, a distinct advantage in terms of viewing groups. This practice makes it possible to observe how particular elements contribute to the specific shapes of groups and contribute to the separation of groups. The inter-relationships between variables inferred from so-called “biplots” can be verified directly by scrutinizing bivariate elemental concentration plots (which are distinct from “biplots”).

In order to go beyond visual evaluations of possible compositional groups in two dimensions, statistical discrimination between groups can be achieved in multiple dimensions using a metric known as Mahalanobis distance[7] (or generalized distance), which was employed in this study. Probability of group membership can be calculated on the basis of Mahalanobis distances, which can be used with highly correlated data (as is the case with many chemical elements) and is analogous to the use of standard deviations to describe the distance from a univariate mean (Baxter 1994). For small sample sizes, probabilities can be based on Hotelling’s T^2, which is the multivariate equivalent of the univariate Student’s t (Glascock 1992).

One problem with using Mahalanobis distance-based probabilities with small groups is that probabilities of membership can noticeably fluctuate depending upon whether or not each specimen is assumed to be a member of the group to which it is being compared (Bishop and Neff 1989; Harbottle 1976). One solution to this problem is to conservatively remove each specimen from its presumed group before calculating its own probability of membership (i.e.,

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[7] The Mahalanobis distance of a specimen from a group centroid (Bieber et al. 1976, Bishop and Neff 1989) is defined by:

$$D_{y,X}^2 = [y - \overline{X}]^t I_x [y - \overline{X}]$$

where *y* is the 1 x m array of logged elemental concentrations for the specimen of interest; *X* is the n x m data matrix of logged concentrations for the group to which the point is being compared with $\overline{X}$ being its 1 x m centroid, and I_x is the inverse of the m x m variance-covariance matrix of group *X*.

cross-validation; Baxter 1994; Leese and Main 1994). While this approach is effective, it may also exclude true group members in certain instances.

Another issue with small sample or group sizes arises when there are more elements than samples present in a group, making the calculation of Mahalanobis distances impossible. Therefore, it is necessary to reduce the dimensionality of the groups. This study utilized an approach which calculated Mahalanobis distances using the scores on principal components for the complete dataset instead of basing calculations on the original element concentrations (Glascock 1992). This approach effectively approximates Mahalanobis distances calculated in full elemental concentration space as long as enough principal components are used to subsume at least 90% of the total variance in the data.

A final advantage of Mahalanobis distance calculations is their usefulness in coping with missing data (Sayre 1975). When many specimens undergo INAA, which detects a large number of elements, there are almost always instances in which a few element concentrations will be missed for some of the specimens (as is the case for this study). Typically, this occurs when the concentration for an element is near the detection limit. Instead of removing either the specimen or the element from analysis, "it is possible to substitute a missing value by choosing a value that minimizes the Mahalanobis distance for the specimen from the group centroid. Thus, those few specimens which are missing a concentration value can be included in all group calculations" (Glascock 1992:19).

Results

An important element of this research is to see if distinct chemical compositional groups can be identified in the sherds recovered from 3YE25 in the Carden Bottoms locality and assess whether any groupings correspond to regional patterns suggested by the stylistic characteristics of these ceramics. To address this issue, the internal variability of the dataset will be examined prior to comparing the data from this project to previous studies conducted at MURR to identify other possible groupings or regional relationships.

One sample (RWA068, a punctated sherd from the Beck Place site) is chemically distinct from the rest of the specimens in this and other regional studies (Figure 3.4). This

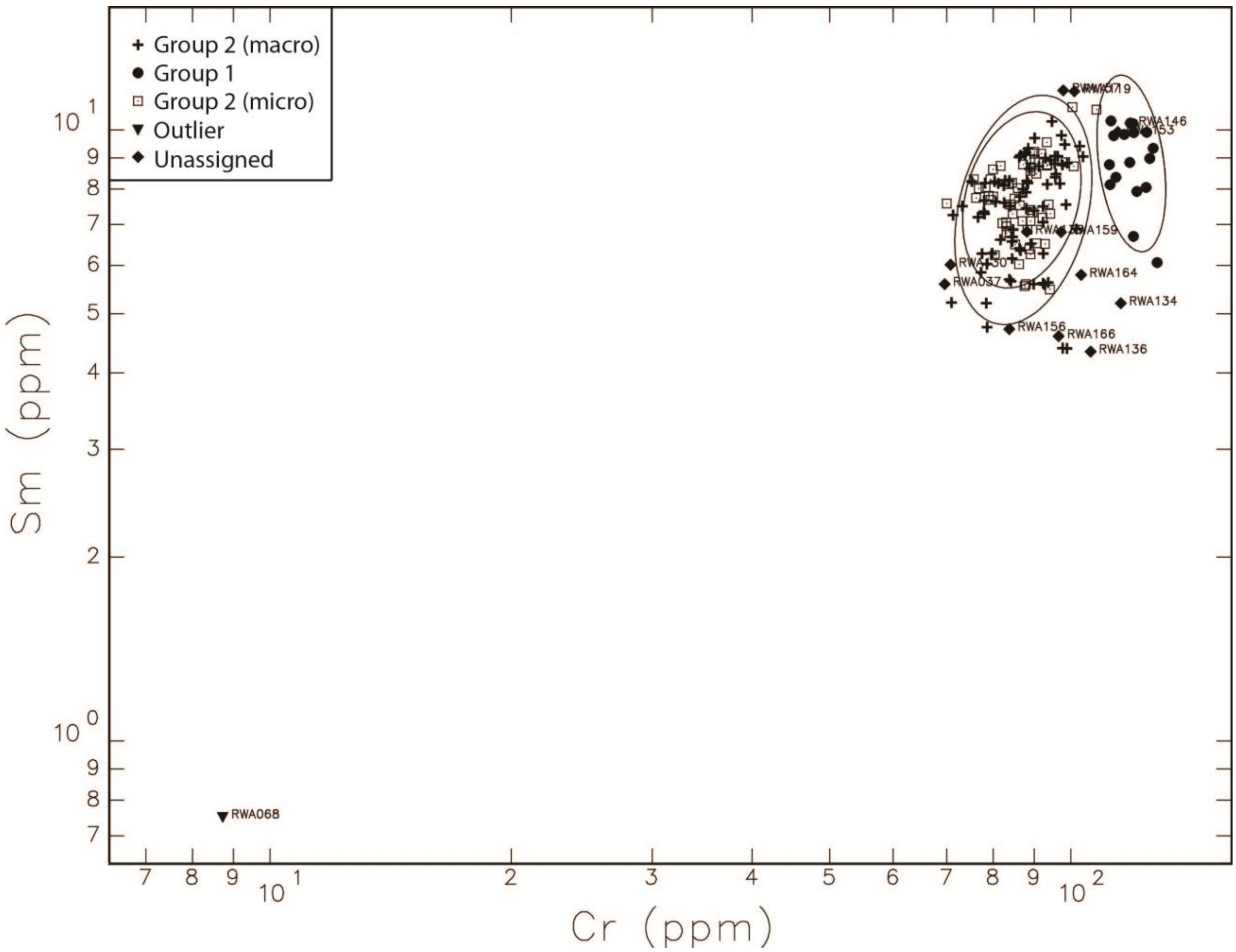

Figure 3.4. Bivariate plot of chromium and samarium showing internal variability among the specimens submitted for this project. Outlier and Unassigned samples are individually labeled. Ellipses represent 90% confidence levels for membership in the groups.

unusual finding could be the result of the use of a unique clay source, but sample contamination or analysis error could also account for such a difference. Reanalysis of the sample is needed to distinguish among these possibilities. As it currently stands, no close matches were identified in the Master MURR database. Thus, this sample is classified as an "outlier" and is not discussed further in this chapter.

Two major compositional groupings are apparent in the 166 samples submitted for analysis. A third group of sherds, also individually labeled in Figure 3.4, exhibits a wide range of internal variability and remains unassigned to a compositional grouping. These unassigned specimens exhibit a general chemical similarity to the rest of the dataset, but have distinctly different concentrations of one or more elements that eliminate them from membership in one of the two identified groups using Mahalanobis distance projections. Interestingly, all but one of the ceramic samples unassigned to a compositional group come from comparative collections in the Middle Ouachita region, and every site investigated in this region contains unassigned specimens except for the Hardman site. Only one ceramic sample from excavations at the Carden Bottoms locality is unassigned.

Of the two assigned compositional groupings, Group 1 is the most distinctive and clearly separates in a number of elemental concentrations, particularly chromium. Group 1 contains 17 specimens, notably all from the comparative samples submitted from sites in the Middle Ouachita region with all sites investigated in this region represented. No samples from the houses excavated at the Carden Bottoms locality are members of Group 1.

In contrast, Group 2 is considerably more complex than Group 1 and contains 132 specimens from all regions of interest. After numerous attempts were made to identify pattern variability within Group 2 without result, the group as a whole was subjected to a Mahalanobis distance calculation, and those samples with the lowest probability of membership were removed. This process was repeated until a stable micro-group containing 57 specimens was established. While not commonly employed, this approach can sometimes be revealing in compositional analyses of archaeological ceramics. In this case, the distribution of the micro- versus macro- members of Group 2 shows striking spatial patterns discussed in the following section.

Overall, there appears to be three levels of increasing variability from Group 2 micro, to Group 2 macro, to Unassigned. Group 1 is the only group to show clear, patterned separation. Figure 3.5 provides a more focused view of Groups 1 and 2 along with the unassigned samples.

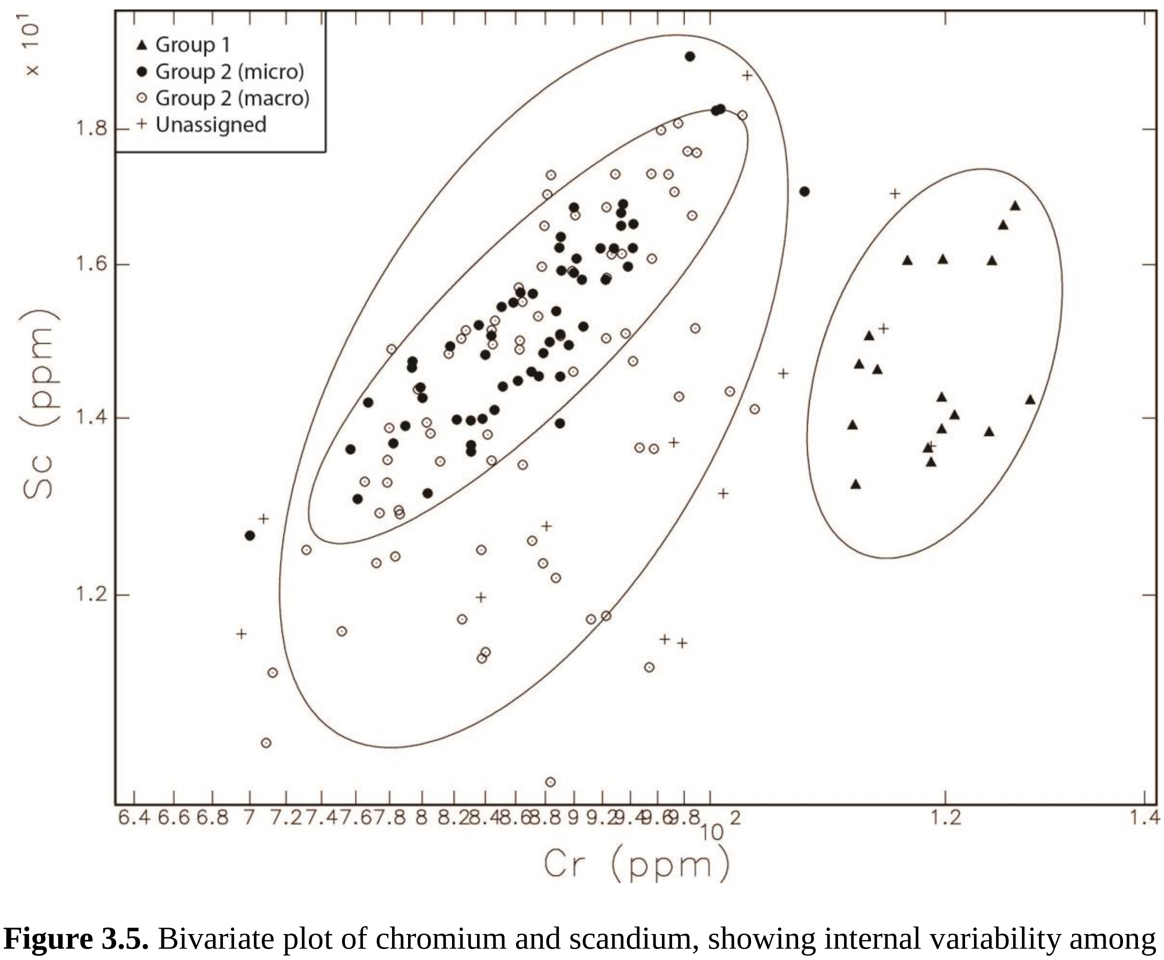

Figure 3.5. Bivariate plot of chromium and scandium, showing internal variability among the assigned specimens. Ellipses are shown only for Groups 1 and 2 (micro and macro). Ellipses represent 90% confidence levels for membership in the groups.

Internal Data Patterns

Strong spatial patterning is evident in the compositional group distribution by site as shown in Table 3.2. Group 1 is found only in the Middle Ouachita region and consists of a fairly

Table 3.2. Distribution of group assignments by site. Clay samples and the outlier are not included.

	Compositional Group				
Region and Site	**1**	**2 (macro)**	**2 (micro)**	**Unassigned**	**Grand Total**
Central Arkansas River Valley					
Carden Bottoms locality		30	29	1	60
Central Mississippi Valley					
Beck Place		2	4		6
Bell-Catching Place			7		7
Bradley		2	4		6
Neeley's Ferry		6			6
Parkin		4	3		7
Rose Mound		4	3		7
Lower Arkansas River Valley					
Wallace Bottom #2		8	7		15
Middle Ouachita Region					
Bayou Sel	3	1		1	5
Hardman	1	4		1	6
Lower Meador	5	4		1	10
Moore Mound	2	1		2	5
Myers	1	1		2	4
Rorie Place	2	4		1	7
Upper Meador	3	4		4	11
Grand Total	17	75	57	13	162

even distribution of samples from all seven Middle Ouachita sites investigated during this study. This distribution suggests that this group provides a characteristic signature for Caddo ceramics produced in the region. Additionally, the higher concentration of chromium present in Group 1 samples is consistent with modern geochemical data which show that of the counties investigated in this study, Hot Spring and Clark counties in the Middle Ouachita region have the highest chromium concentrations; corresponding data for Yell county in the Central Arkansas River Valley and for the counties in eastern Arkansas are all noticeably lower (United States

Geological Survey 2012). Since Group 1 members are not found in other regions examined in this study, ceramic exchange from the Middle Ouachita region into the Carden Bottoms locality is not supported. In contrast, all regions investigated are represented among the Group 2 macro samples; however, members of Group 2 micro are found in all regions *except* the Middle Ouachita region. Group membership of specific samples and descriptive information for these samples is provided in the tables found in Appendix D.

Given the similarities in compositional group distribution, especially among the Group 2 micro specimens, it is likely that the Carden Bottoms community participated in a regional interaction sphere with communities from the Central Mississippi Valley and the Lower Arkansas River Valley. Interaction with communities in the Middle Ouachita region is not indicated by the current compositional data. These findings must be viewed as provisional, however, since alternate explanations exist. In fact, it is possible that, given the variable nature of Group 2, all ceramics included in this study were locally produced. Any similarity among specimens could be due to local materials exhibiting similarity across a broad geographic region. Evaluating this possibility would necessitate extensive clay sampling around the Carden Bottoms locality or the examination of clear evidence that indicates local ceramic production, such as a pottery firing area or prepared materials.

Clay Samples

As mentioned previously, the relationship between clays and ceramic samples is complex. While examining raw clays provides one of the most direct methods of establishing geographic provenance, it is unlikely that researchers today will collect raw clays identical to archaeological sources. One reason for such a lack of congruity is that potters may prepare clays in various ways, adding or removing materials or mixing clays from different sources together.

These practices can alter the composition of archaeological ceramics and make it difficult to match raw clays to ceramic samples. However, if local clays were used with minimal preparation other than the addition of bone or shell temper, it is reasonable to expect some match between clays and sherds following the use of the aforementioned calcium correction.

Three examples of local clays were submitted for analysis from the Carden Bottoms locality. Two of these samples were fired clay: one clay "plug" and one pottery coil, neither of which contained visible temper. The third sample was raw clay from a pit feature excavated at the site. Based on a combination of bivariate plots and multivariate statistics, there is some similarity between the compositional groups and the two fired clay samples. Sample RWA063, the raw clay sample, shows the greatest variance from the sherds, and if classified, it would safely fit into the Unassigned category. It has less than a 0.1% chance of membership in any of the compositional groups based on a Mahalanobis distance projection using the first seven principal components. In contrast, RWA062 (the fired clay "plug") is a decent match for Group 2 (micro) and RWA061 (the fired pottery coil) fits into Group 2 (macro).

Intra-site Patterning at 3YE25

While all the sherds assigned to a compositional grouping from the excavated samples at the Carden Bottoms locality belong to Group 2, it is worthwhile to examine the distribution of Group 2 micro and Group 2 macro members among the three households investigated. As shown in Figure 3.6, House 2 shows a roughly even split among the macro and micro subdivisions of Group 2 while House 1 is dominated by Group 2 macro sherds. House 3 exhibits the opposite pattern, with a majority of sherds belonging to Group 2 micro. While this pattern should be interpreted cautiously due to the small sample size from each household (n = 20), it may suggest

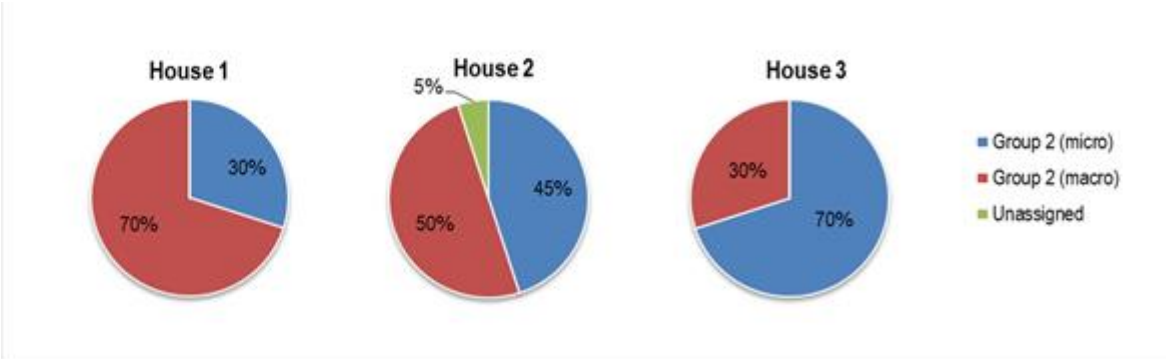

Figure 3.6. Distribution by compositional group of samples from each of the three houses excavated at 3YE25 in the Carden Bottoms locality.

that the inhabitants of House 3 had stronger social ties to communities farther east and were more likely to participate in the interaction sphere that included communities from the Lower Arkansas River Valley and perhaps northeast Arkansas.

It should also be mentioned that sherds initially identified as being nonlocal (or possibly nonlocal) or local on the basis of stylistic elements or visual examination of ceramic paste and texture are found in both Group 2 macro and Group 2 micro. Moreover, their frequency in each of these groups is nearly identical to the overall proportion of samples belonging to each of these subdivisions of Group 2. Therefore, this possible subdivision within the compositional data does not appear to correspond to any outwardly visible qualities of the ceramics.

Comparisons to Other Regional INAA Data

One of the advantages of conducting INAA studies at MURR is the large comparative database available to researchers. While there has been little previous compositional analysis within the particular area of interest to this study, some regional comparative data is available for the Mississippi Valley (see Neff 2008 for a summary of INAA studies in this region), and a growing database of INAA from Caddo ceramics, mainly from east Texas, is available for comparison (see Perttula and Selden 2013 for a bibliography of this research). One challenge of utilizing this comparative database in a large river drainage like the Mississippi Valley is that large, overlapping compositional groups (particularly following a North – South distribution along the river) are the norm, rendering large-scale comparisons difficult. Previously analyzed Caddo ceramics present similar challenges, detailed in Ferguson et al. (2008), with overlapping or otherwise complex compositional groups present in this region. Jeffrey Ferguson undertook a Euclidean distance search of the MURR ceramic INAA database and found remarkably few close matches with previously analyzed specimens. Most of the closest matches are with Caddo ceramics from east Texas analyzed by Tim Perttula and Darrell Creel.

East Texas Caddo Comparison. The large number of samples from Caddo sites in east Texas reveals complex compositional patterns. Attempts to identify clear patterns within the database have been only moderately successful (Ferguson et al. 2008). Currently, 11 core groups have been identified for each region Perttula has defined for the area (Figure 3.7), but it remains impossible to assign unknown samples to a particular production region with confidence since each core group overlaps with others, with the exception of Region 1.

A comparison between the samples analyzed for this project and previously analyzed materials from east Texas shows a broad similarity in compositional profiles. Such similarity, however, likely is not due to long distance exchange and instead reflects broad similarities in clays from east Texas into Arkansas. Figure 3.8 compares samples from this project to the east Texas regional core groups. A slight shift is visible in the samples from this project. Although multivariate statistics like Mahalanobis distance calculations could be used to assess group membership, their use in this instance is potentially misleading. Since the core groups in east Texas are nearly all highly variable, it is likely that they will show possible matches with a wide variety of specimens to which no true relationship exists.

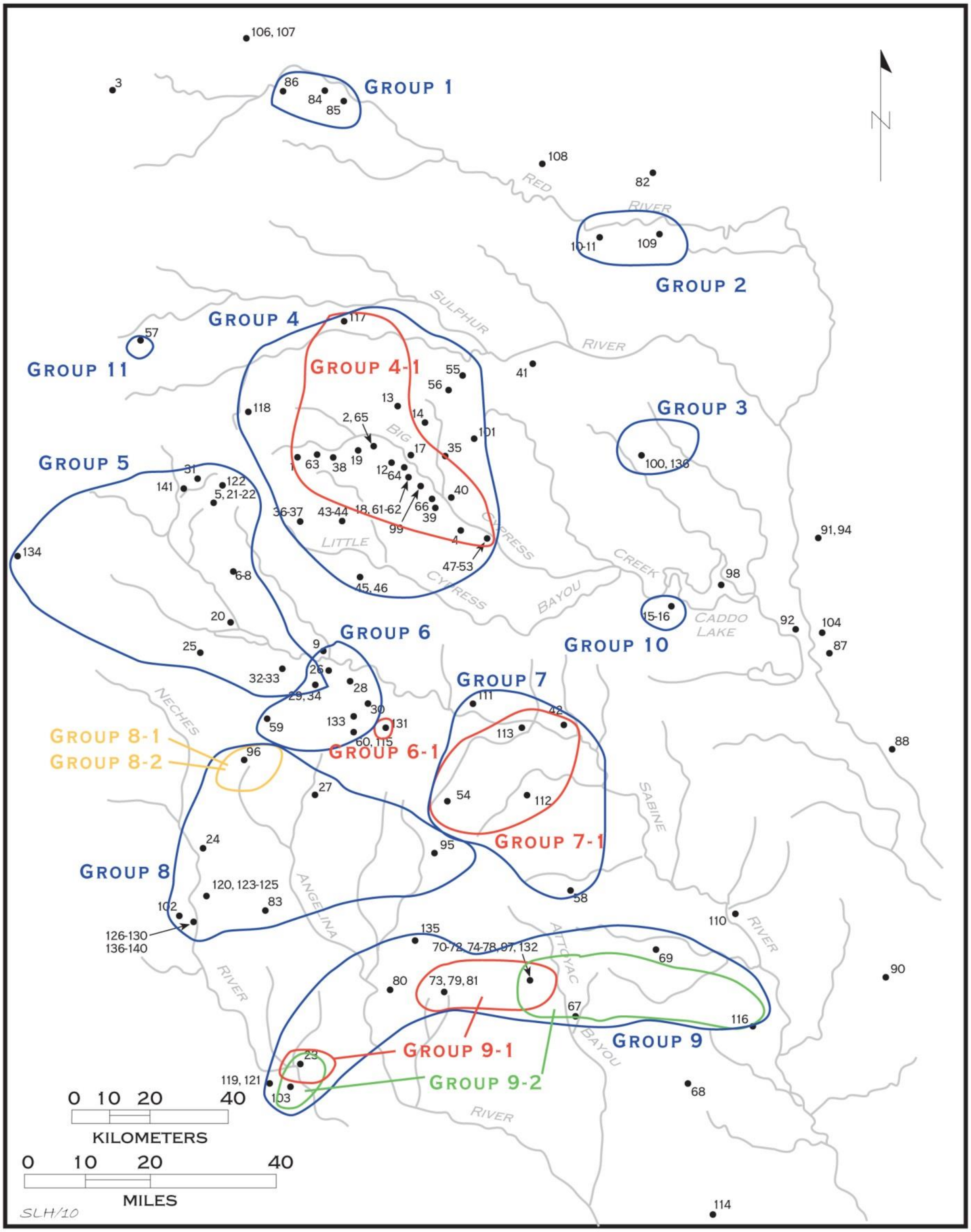

Figure 3.7. Regional map of the east Texas Caddo database (Perttula and Selden 2013:94, used with the permission of the *Caddo Journal*).

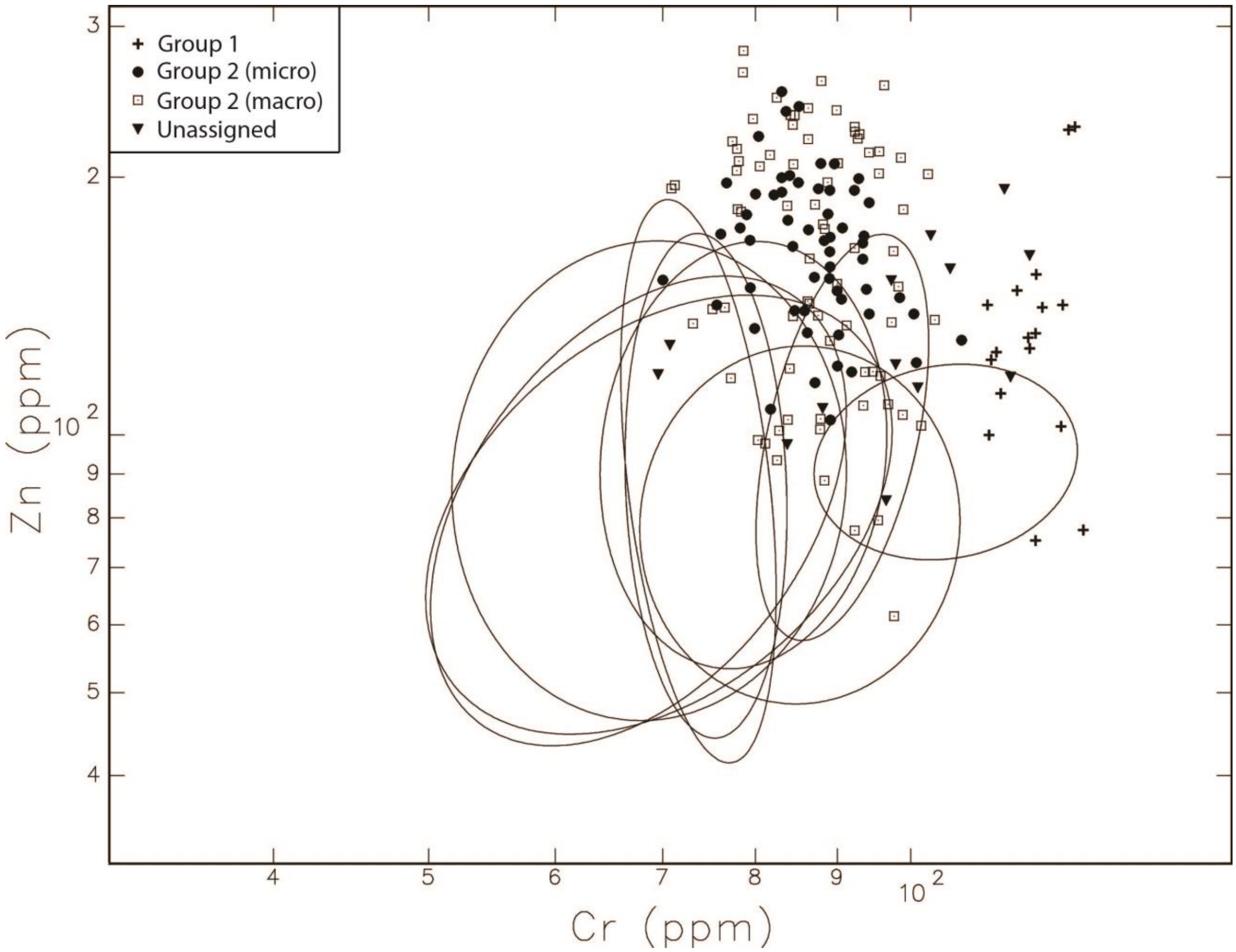

Figure 3.8. Bivariate plot of chromium and zinc showing the new Arkansas samples from this project and the regional core groups from east Texas. Ellipses are shown only for the east Texas regional core groups. Ellipses represent 90% confidence levels for membership in the groups.

Arkansas and Oklahoma Caddo Comparison. More recently, Tim Perttula has also submitted samples from Caddo sites in Oklahoma and some from along the Red River in southwest Arkansas to MURR for analysis. These samples include 40 sherds from southeast Oklahoma, 20 of which are from the Clement site (34MC8) along with five sherds from each of four additional sites (34MC50, 34MC52, 34MC57, and 34MC58). An additional 20 samples were submitted from southwest Arkansas (many selected by Duncan McKinnon) from 10 different sites (3HE63, 3LA1, 3LA18, 3LA35, 3LA87, 3LA91, 3LA97, 3LA128, 3LR46, and 3MI6). A comparison of this project's samples to Perttula's recent submission shows a clear separation between Oklahoma Groups 2, 2b, and 3 from the sherds analyzed here. Perttula's

Oklahoma Group 1, however, likely represents a chemically diverse pattern characteristic of the Red River Valley that appears to encompass ceramics likely manufactured well into Arkansas (Figure 3.9).

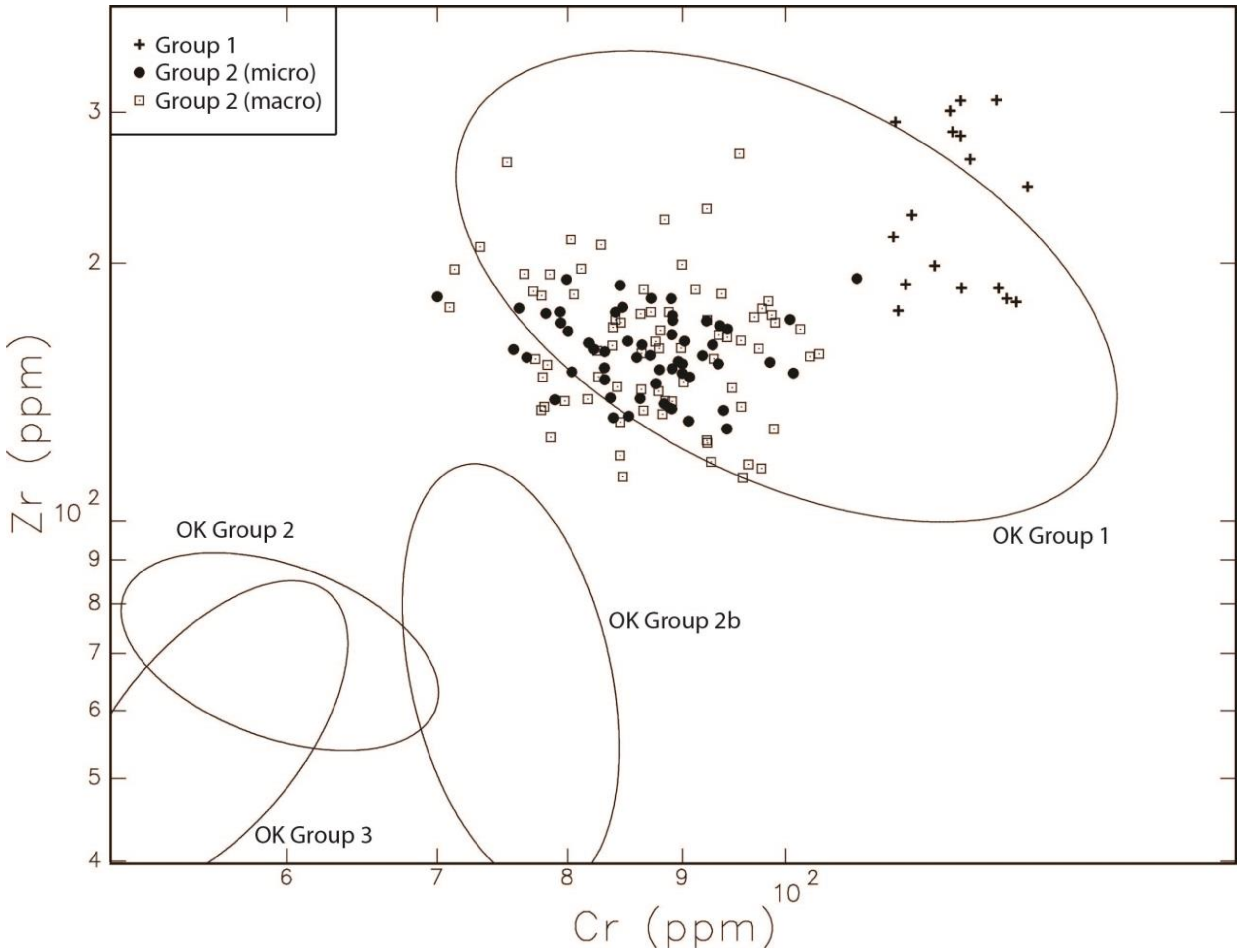

Figure 3.9. Bivariate plot of chromium and zirconium showing the new Arkansas samples from this project and groups identified in Perttula's recent Oklahoma Caddo sample. Ellipses are shown only for the Oklahoma groups. Ellipses represent 90% confidence levels for membership in the groups.

More relevant are Perttula's recently submitted samples from Caddo sites in Arkansas. These samples reveal a similarity to the ceramics submitted as a part of this project (Figure 3.10). Most of Perttula's Arkansas samples are generally similar to Group 2 macro (defined in this study). One other sample is a clear outlier, but the last of Perttula's Arkansas sherds is similar to

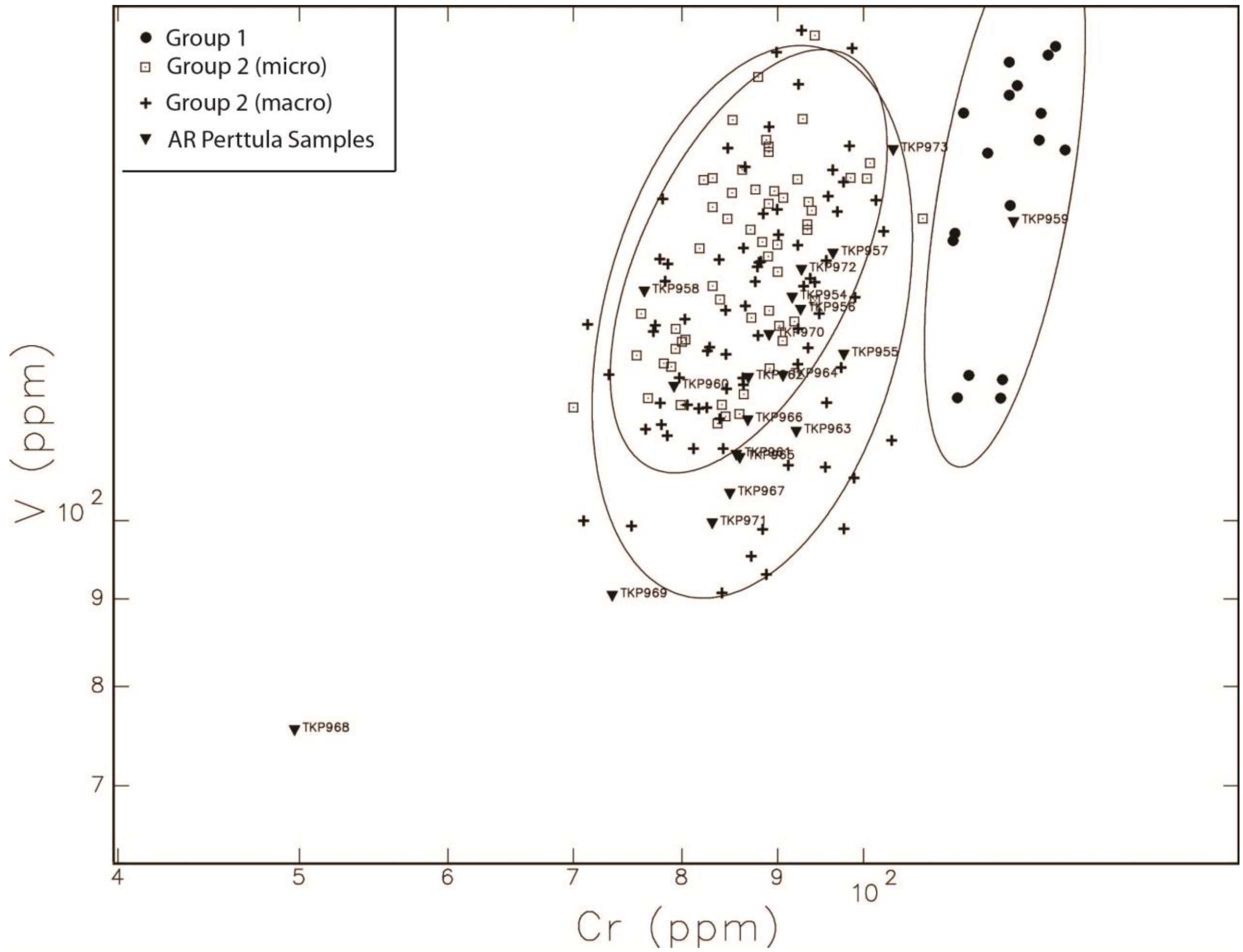

Figure 3.10. Bivariate plot of chromium and vanadium showing the new Arkansas samples from this project and Perttula's recent Arkansas Caddo samples from the Red River region. Ellipses are shown only for the new groups defined in this study. Ellipses represent 90% confidence levels for membership in the groups.

Group 1 (defined in this study). Table 3.3 provides the membership probabilities in each of the compositional groups identified here for Perttula's Oklahoma and Arkansas samples. These probabilities clearly indicate that most of the samples in Perttula's recent study have either no relationship with the compositional groups identified in this research (in the case of Oklahoma Groups 2, 2b, and 3) or are generally similar to the newly defined Group 2 macro. In the case of the sherds belonging to Group 2 macro, similarity among these samples should not be assumed to indicate any type of large-scale regional exchange. Once again, general similarity in raw materials across these regions is more probable. However, Perttula's sample submitted from

Table 3.3. Group membership probabilities (%) using Mahalanobis distance for Perttula's Oklahoma and Arkansas Caddo samples within the compositional groups defined in this study. Results are based on the first seven principal components that explain 88.6% of the variance.

Region and Site	Sample ID	Compositional Group 1	2 (macro)	2 (micro)	Best Group
Southwest Arkansas Caddo					
Crenshaw (3MI6)	TKP954	0.009	64.895	8.900	Group 2 macro
Crenshaw (3MI6)	TKP955	0.002	21.820	0.021	Group 2 macro
Crenshaw (3MI6)	TKP956	0.008	16.774	0.004	Group 2 macro
Gum Point (3LA87)	TKP957	0.006	36.030	0.195	Group 2 macro
Battle Mound (3LA1)	TKP958	0.000	0.256	0.000	Group 2 macro
Battle Mound (3LA1)	TKP959	52.089	0.000	0.000	Group 1
Battle Mound (3LA1)	TKP960	0.011	71.710	0.004	Group 2 macro
Battle Mound (3LA1)	TKP961	0.100	82.787	10.067	Group 2 macro
Battle Mound (3LA1)	TKP962	0.254	74.829	14.798	Group 2 macro
Red Cox (3LA18)	TKP963	0.385	4.509	0.000	Group 2 macro
Red Cox (3LA18)	TKP964	0.016	75.025	0.107	Group 2 macro
Joe Russell (3LA91)	TKP965	0.002	7.590	0.000	Group 2 macro
Joe Russell (3LA91)	TKP966	0.052	52.463	0.298	Group 2 macro
Cedar Grove (3LA97)	TKP967	3.518	99.194	2.711	Group 2 macro
Cryer Field (3LA35)	TKP968	0.000	0.000	0.000	
Sentell (3LA128)	TKP969	0.425	19.408	0.000	Group 2 macro
Bowman (3LR46)	TKP970	0.007	1.783	0.000	Group 2 macro
Ferguson (3HE63)	TKP971	0.004	12.485	0.000	Group 2 macro
Ferguson (3HE63)	TKP972	7.568	55.939	0.001	Group 2 macro
Ferguson (3HE63)	TKP973	0.260	0.007	0.000	Group 1
Oklahoma Caddo Group 1					
Clement (34MC8)	TKP914	0.001	22.377	0.097	Group 2 macro
Clement (34MC8)	TKP915	3.013	60.584	0.000	Group 2 macro
Clement (34MC8)	TKP916	5.146	0.000	0.000	Group 1
Clement (34MC8)	TKP917	0.000	0.483	0.000	Group 2 macro
Clement (34MC8)	TKP918	0.008	3.728	0.000	Group 2 macro
Clement (34MC8)	TKP921	0.116	46.843	6.358	Group 2 macro
Clement (34MC8)	TKP922	0.000	1.435	0.000	Group 2 macro
Clement (34MC8)	TKP923	0.003	15.531	0.007	Group 2 macro
Clement (34MC8)	TKP925	0.048	0.014	0.000	Group 1
Clement (34MC8)	TKP927	0.227	0.000	0.000	Group 1
Clement (34MC8)	TKP928	0.778	82.894	0.008	Group 2 macro
Clement (34MC8)	TKP929	0.003	3.297	0.000	Group 2 macro
34MC57	TKP935	0.037	0.159	0.000	Group 2 macro
McCurtain County, OK	TKP940	0.065	3.351	0.000	Group 2 macro
McCurtain County, OK	TKP944	2.234	3.094	0.000	Group 2 macro
McCurtain County, OK	TKP945	0.000	0.043	0.000	Group 2 macro
McCurtain County, OK	TKP947	0.000	0.006	0.000	Group 2 macro
McCurtain County, OK	TKP948	0.000	0.001	0.000	Group 2 macro

Battle Mound (3LA1) along the Red River in Arkansas (TKP959) shows a strong affiliation with the newly defined Group 1 and is likely the result of shared production and exchange with Caddo groups in the Middle Ouachita region.

Summary

Overall, two compositional groups were identified during this study. The smaller of these groups, Group 1, is better defined and distinctive and includes only samples submitted from comparative collections from the Middle Ouachita region, south of the Carden Bottoms locality. Although Group 2 is a large, chemically-diverse compositional group, a micro-group within its bounds was identified, and the geographic distribution of micro- and macro- Group 2 members combined with the limited distribution of Group 1 reveals a striking pattern. This pattern seems to indicate a lack of ceramic exchange or movement of pottery between Caddo communities in the Middle Ouachita region and with other areas included in this study (either the Central or Lower Arkansas River Valley or the Central Mississippi Valley). Regional comparisons with previous INAA studies show some general similarity between sherds analyzed here and those from surrounding regions to the west and south, but this similarity is likely not linked to long-distance ceramic exchange. In all cases, there is little evidence of movement of ceramics to or from the Middle Ouachita region.

This result is surprising given the findings from stylistic analyses of ceramics from Carden Bottoms. Many whole vessels found in museum collections from the locality reveal a striking similarity to Caddo ceramics found near the Arkadelphia area of Arkansas, yet none of the possible Caddo sherds submitted from excavated contexts at Carden Bottoms clearly match ceramics from the region. Conversely, exchange or population movement from the Central

Mississippi Valley is more supported by these INAA findings. Based on stylistic assessments alone, many researchers noted a general similarity among ceramics found at Carden Bottoms phase sites and those from the Mississippi Valley in northeastern Arkansas, but supposed that such similarity could just as likely arise from different communities employing similar stylistic motifs rather than indicating exchange. I consider the implications of these findings in more detail in Chapter 5 and synthesize these results with other lines of archaeological evidence from CARV Project excavations at 3YE25 and work at other Carden Bottoms phase sites nearby. Next, I discuss the methods and results of a compositional analysis of the temper of the shell-tempered sherds included in this study.

CHAPTER 4: COMPOSITIONAL ANALYSIS OF CERAMIC TEMPER

The analysis in the preceding chapter assessed possible compositional groupings of samples based on the chemical characteristics of the ceramic paste without a consideration of other aspects of the ceramic fabric. In a complementary fashion, this chapter focuses on the possibilities for sourcing ceramics on the basis of the chemical characteristics of temper rather than clay. Since most of the sherds submitted for INAA were shell tempered and exhibited elevated levels of calcium, a mathematical correction was applied to the dataset prior to statistical analysis, and calcium, strontium, manganese, and sodium were eliminated as variables. While these actions were necessary to more accurately characterize the chemical composition of the ceramic paste, they also had the effect of removing possibly telling variables from consideration. In an attempt to make use of this lost information, I undertook an analysis which examined only those elements known to be associated with shell temper to determine whether different regions of production could be identified on the basis of geographical differences in tempering materials.

Background

Recent studies have demonstrated the promise of various techniques for isolating and analyzing the temper signature of shell tempered ceramics, producing results that suggest that geographical patterning is apparent in different shell temper sources. In a pioneering study, Peacock and colleagues (2007) performed a chemical analysis of whole freshwater mussels from archaeological contexts in different drainages in the southeastern United States and found evidence of patterned separation between drainages. This geographic distinction is based on the correspondence between the proportion of various chemical elements in the environment and their incorporation into the shells of aquatic mollusks, a well-established fact in ecological pollution studies (Brown et al. 2005; Fuller 1974). A second aspect of this study used laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) to target and analyze individual pieces of shell temper in samples of archaeological ceramics (Peacock et al. 2007). While this analysis only examined a small sample of ceramics from the Lyon's Bluff site in northeast Mississippi, it found potential compositional groupings and established a protocol for use in future studies. Moreover, Collins (2012) evaluated the effects of firing on trace element concentrations in mussel shells and found that several trace elements retain their original concentrations and are analytically useful.

While these two investigations demonstrate the potential for sourcing studies focused on shell temper, they make use of different techniques for obtaining chemical data (LA-ICP-MS and a variety of different methods in the Collins 2012 study) than were available for this research. However, Selden and colleagues (2014) offer an attractive alternative to obtaining chemical data on shell temper that incurs no additional cost or data collection time. Using already obtained INAA data, Selden et al. (2014) attempt to mathematically isolate the chemical contributions of temper for shell-tempered Caddo ceramics. A subsequent statistical analysis of their results reveals a striking correspondence between compositional groupings identified on the basis of temper and information from stylistic and technological analyses of Caddo ceramics, thereby identifying potentially geographically distinct production areas (Selden et al. 2014:118).

Based on this success, I examine the potential for this technique to differentiate between local and nonlocal shell-tempered sherds from 3YE25 in the Carden Bottoms locality. If the ceramics excavated from the Carden Bottoms locality indeed include a mixture of local wares and nonlocal wares from both the Central Mississippi Valley and the Middle Ouachita region and the temper sources of these sherds are chemically distinctive, a pattern should emerge. All or most of the sherds from comparative collections in the Central Mississippi Valley should group together. A similar grouping is expected for sherds from the comparative collections in the Middle Ouachita region. Sherds from the Carden Bottoms excavations, however, should belong to at least three different groupings: one larger group of presumably local sherds and two other smaller groups that correspond to those found in the comparative material.

Methods

I closely followed the methodology outlined in Selden et al. (2014:117). Since this methodology is designed to isolate the chemical contribution of shell temper, I only applied it to sherds from my dataset with shell as the major temper type ($n = 132$). The mathematical calcium correction described in the previous chapter was still applied to the raw concentrations of elements obtained via INAA since the correction is necessary to account for the diluting effect of calcium on other elements. However, in this instance, I did not exclude calcium, strontium, manganese, and sodium from analysis. Instead, these elements were the target of my analysis since they have been shown to correspond to the geochemical contribution of shell temper (Cogswell et al. 1998). All other chemical elements were removed. A value of one was then added to the corrected chemical concentrations after which the standard log-10 transformation was calculated. This step replaces all missing values with zeroes, and the log-10 transformation once again mitigates the effects of differences in magnitude between major and trace elements.

For this study, a K-means cluster analysis was employed to delineate possible compositional groupings, using version 3.1.0 of the program R (www.r-project.org). This pattern recognition technique uses a clustering algorithm to measure the level of similarity or dissimilarity between specimens, providing a means to group similar samples together. K-means clustering effectively partitions data into a pre-determined set of clusters, assigning specific data points to a cluster with the nearest mean. As Tan and colleagues describe (2005:497), data points are not permanently committed to the initial assigned cluster; the algorithm may move observations to a new cluster to improve the overall solution. The assignment of points to clusters continues until no observation changes clusters.

One of the criticisms of K-means analysis is that it tends to be a sort of self-fulfilling prophecy since the various clustering algorithms require the analyst to input the number of desired clusters. Thus, an objective means of assessing the number of appropriate clusters is necessary. The package NbClust in R proves useful in this regard since it applies up to 30 different indices for determining the best number of clusters identifiable within a dataset. For my dataset, NbClust was able to apply 27 such criteria, and a three cluster solution was suggested as the best fit (Figure 4.1).

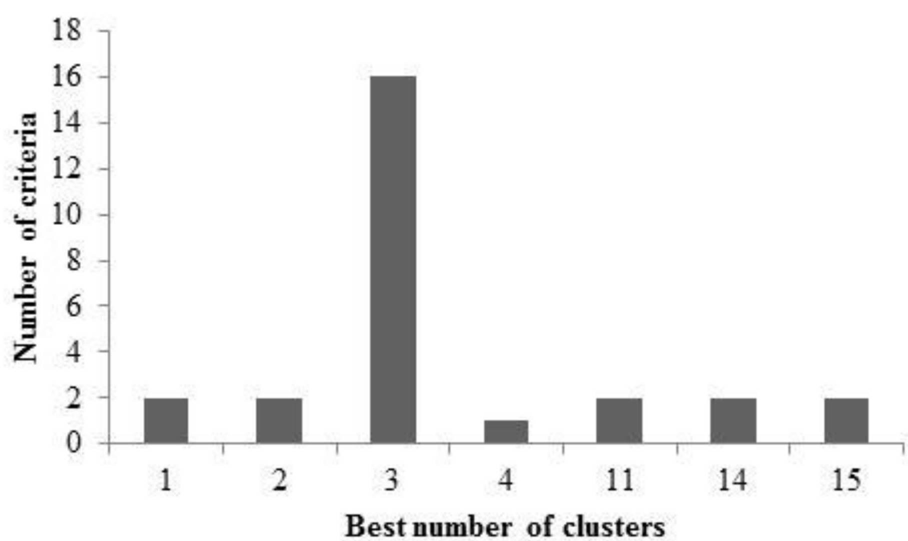

Figure 4.1. Recommended number of clusters using 27 criteria provided by the NbClust package in R.

Results

The results of this analysis reveal two large clusters, labeled Clusters 1 (*n* = 57) and 3 (*n* = 67) in subsequent tables and figures, and one small cluster (Cluster 2, *n* = 8). A series of three-dimensional scatterplots illustrates the resulting clusters (Figures 4.2 – 4.4). Sherds classified as members of Cluster 1 exhibit higher mean levels of all the elements of interest while members of Cluster 3 exhibit generally lower concentrations of all the elements. Cluster 2 consists of sherds for which strontium values were not detected. The mean values of calcium, manganese, and sodium are also lower for Cluster 2. While the spatial distribution of these clusters is intriguing (Table 4.1), it is not as compelling as the distribution identified for compositional groups based on ceramic paste discussed in the previous chapter.

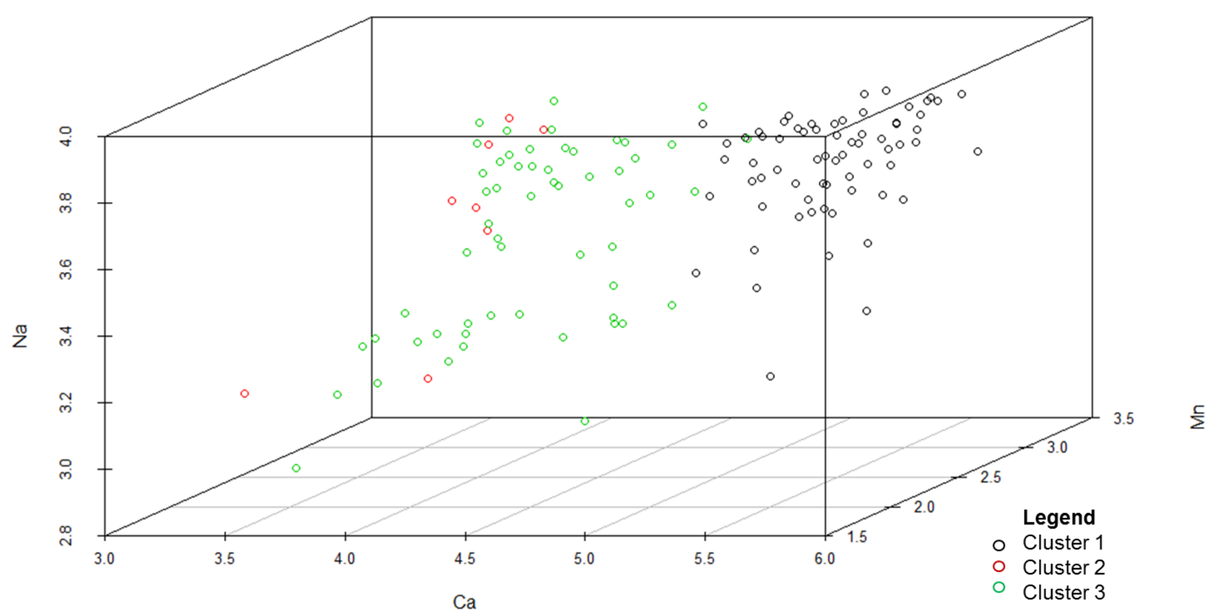

Figure 4.2. Shell-tempered sherd clusters defined on the basis of Ca, Na, and Mn. Values shown are log-10 transformations of element concentrations after the aforementioned corrections were applied.

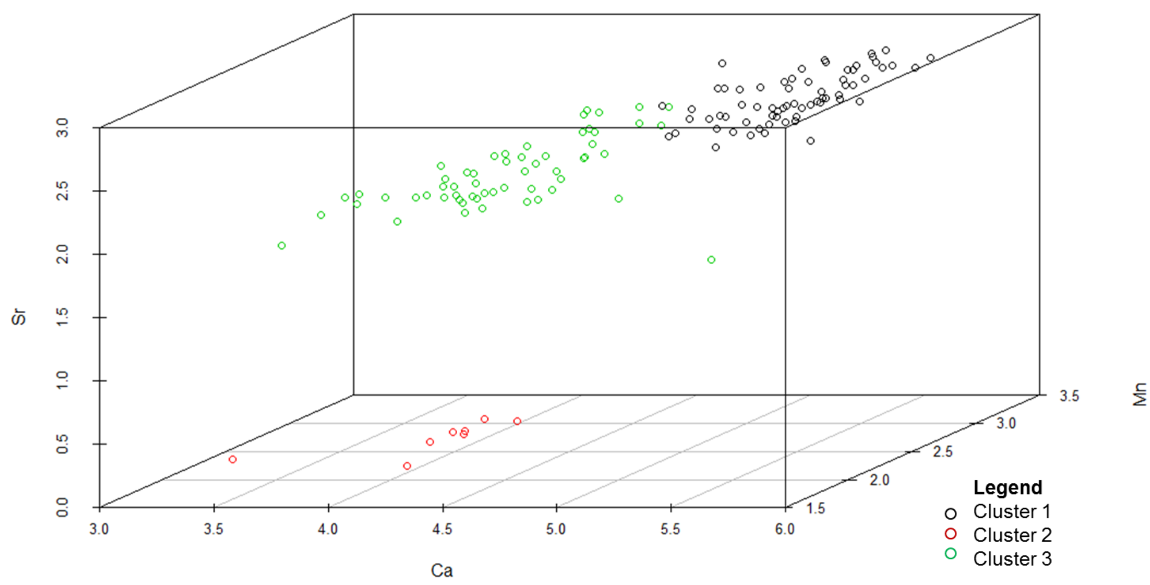

Figure 4.3. Shell-tempered sherd clusters defined on the basis of Ca, Sr, and Mn. Values shown are log-10 transformations of element concentrations after the aforementioned corrections were applied.

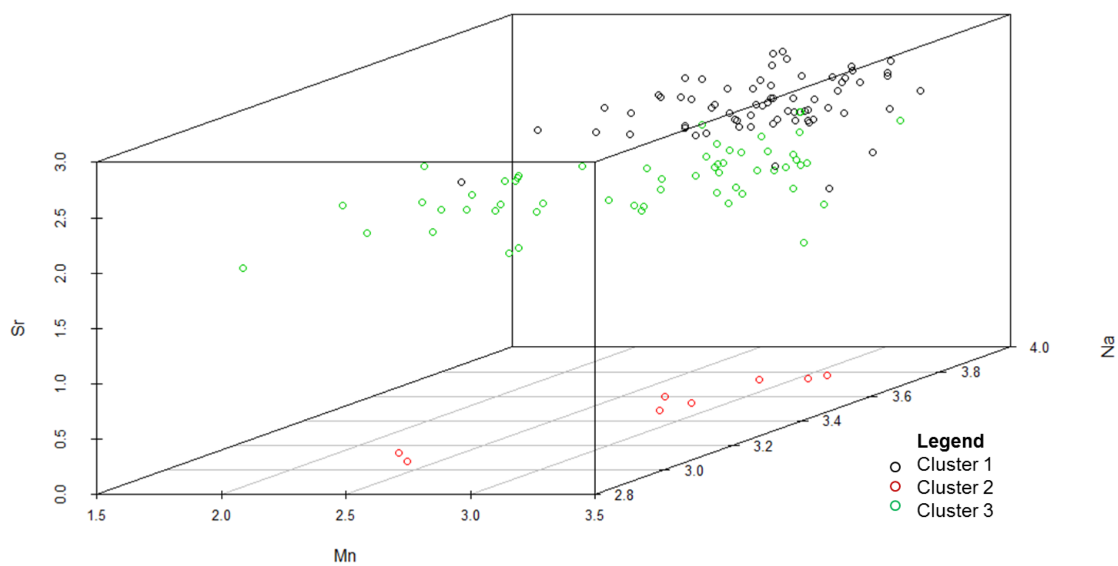

Figure 4.4. Shell-tempered sherd clusters defined on the basis of Mn, Sr, and Na. Values shown are log-10 transformations of element concentrations after the aforementioned corrections were applied.

Table 4.1. Distribution of temper cluster assignments by site. Only sherds with shell as the major temper are included.

Region and Site	Temper Cluster 1	2	3	Grand Total
Central Arkansas River Valley				
Carden Bottoms locality	12	7	24	43
Central Mississippi Valley				
Beck Place	4		3	7
Bell-Catching Place	4		3	7
Bradley	4		2	6
Neeley's Ferry	6			6
Parkin	7			7
Rose Mound	7			7
Lower Arkansas River Valley				
Wallace Bottom #2	12		3	15
Middle Ouachita Region				
Bayou Sel	1		2	3
Hardman	4		2	6
Lower Meador	3		5	8
Moore Mound	2		2	4
Myers	1		3	4
Rorie Place			2	2
Upper Meador		1	6	7
Grand Total	67	8	57	132

Members of all three clusters are represented in the sample from Carden Bottoms. The Central Mississippi Valley and the Lower Arkansas River Valley comparative collections are dominated by sherds that belong to Cluster 1, although 11 sherds from these regions were classified as members of Cluster 3. Contrastingly, the Middle Ouachita region comparative collection is dominated by sherds belonging to Cluster 3 with fewer sherds classified into Cluster 1 and only a single sherd grouped into Cluster 2. Upon further examination of the descriptive data for sherds belonging to Cluster 2, it seems apparent that this grouping is not indicative of a production area or true compositional grouping. The undetectable levels of strontium in this group are probably due to diagenetic processes. Two of the eight samples included in this cluster had leached shell temper, and the others that retained visible shell temper were eroded—perhaps to such a degree that the concentrations of chemicals associated with shell temper were significantly affected.

The distribution of Cluster 1 appears to be analogous to that of Group 2 macro from the compositional analysis of ceramic paste. While most of the members of this cluster belong to the Central Mississippi Valley and Lower Arkansas River Valley comparative collections, the group as a whole has a broad distribution, which cannot be linked to a geographically restricted production area. The prevalence of Cluster 3 members in sites from the Middle Ouachita region suggests the possibility that shell from streams in this area are chemically distinctive. The corresponding presence of Cluster 3 members from the Carden Bottoms locality may indicate some interaction with communities from the Middle Ouachita region or at least from sites located along smaller drainages that are more likely to exhibit the chemical distinctiveness of the Ouachita-Ozark clay-mineral province.

This possibility is strengthened upon a closer examination of the particular samples from Carden Bottoms that were classified in Cluster 3. All shell-tempered sherds from Carden Bottoms that were hypothesized as being nonlocal Caddo imports belong to Cluster 3. Likewise, all "hybrid" sherds from Carden Bottoms fall into Cluster 1, suggesting that a different temper source was used in their production (perhaps one local to Carden Bottoms locality). However, the presence of Cluster 3 sherds, albeit in smaller quantities, in both the Central Mississippi Valley and Lower Arkansas River Valley comparative collections (from wares not stylistically similar to Caddo wares from the Middle Ouachita region) and on sherds identified as likely local from Carden Bottoms reveals that there is perhaps significant overlap in all the different regions investigated, at least based on the methods used here to isolate the chemical contribution of shell temper. Thus, one cannot assume with confidence that a sherd grouped into Cluster 3, for example, can be associated with a production area in the Middle Ouachita region.

Overall, the patterning identified in this examination of shell-tempered sherds is not as strong as that found in Selden and colleagues' (2014) pilot study. However, these results highlight some possible patterns that indicate that shell temper from the Middle Ouachita region may contain detectably smaller quantities of calcium, strontium, manganese, and sodium. An examination of the mean concentrations for these elements available from modern geochemical surveys lends support to this idea. Of the counties included in this study, Clark and Hot Spring counties in the Middle Ouachita region have much lower concentrations of sodium, calcium, and manganese; data for strontium levels were not available (United States Geological Survey 2012) (Table 4.2). Further research, perhaps utilizing LA-ICP-MS as employed by Peacock et al. (2007), may be able to further isolate a shell temper signature from this and other regions of interest. Such analyses are able to target individual pieces of temper and can help ensure that issues resulting from diagenesis or from differing temper amounts are controlled. With the methods employed here, it is possible that meaningful patterns are obscured. Diagenetic factors

Table 4.2. Mean concentration of elements by county (data not available for Sr).

Region and County	Na (wt%)	Ca (wt%)	Mn (ppm)
Central Arkansas River Valley			
Yell	0.176 +/- 0.047	0.110 +/- 0.046	714 +/- 223
Middle Ouachita Region			
Clark	0.085 +/- 0.069	0.086 +/- 0.093	200 +/- 122
Hot Spring	0.113 +/- 0.058	0.071 +/- 0.036	377 +/- 241
Lower Arkansas River Valley			
Arkansas	0.505 +/- 0.090	0.257 +/- 0.119	647 +/- 213
Central Mississippi Valley			
Crittenden	0.754 +/- 0.137	0.476 +/- 0.089	558 +/- 96
Cross	0.618 +/- 0.107	0.342 +/- 0.052	500 +/- 143
Mississippi	0.930 +/- 0.116	0.760 +/- 0.135	532 +/- 76

may thus be responsible for some of the overlap among clusters and specimens from different comparative collections noted herein.

CHAPTER 5: EVALUATION OF RESULTS

The results presented in the preceding chapters allow for the consideration of ceramic traditions present in the Carden Bottoms community in a new light—one based on the chemical properties of the materials used in ceramic production. This perspective serves as a revealing counterpart to the investigation of ceramics based on stylistic attributes alone. This chapter examines various interpretive possibilities that could account for the compositional results. Additionally, these results are considered alongside the findings of remote sensing surveys, archaeological excavations at the Carden Bottoms locality, and stylistic analyses of whole vessel collections undertaken during the larger CARV project. The theoretical framework described in Chapter 1 provides a means for grounding these interpretations in a way that allows for the examination of identity construction among the residents of the protohistoric Carden Bottoms community.

Implications of Compositional Results

The findings of the INAA study conducted on ceramic pastes presented in Chapter 3 suggest that residents at the Carden Bottoms community may have participated in the same regional interaction sphere as communities originating in the Lower Arkansas River Valley and the Central Mississippi Valley, but not with Caddo communities living in the Middle Ouachita region. However, the nature of the compositional evidence makes this proposition warrant additional scrutiny. Evidence for regional interaction rests on the distribution of samples assigned to compositional Group 2 (especially Group 2 micro which does not include any samples from the Middle Ouachita region), yet Group 2 is not a well-defined compositional grouping. Its broad nature and distribution make it difficult to apply the “criterion of abundance” strategy with much meaning since members of Group 2 are found in large numbers in all of the regions investigated herein. In other words, we cannot associate particular sherds with a production area in the Central Mississippi Valley, for instance, because there is not a compositional grouping that is more abundant in the comparative samples submitted from the Central Mississippi Valley with which to associate Carden Bottoms sherds belonging to the same compositional group. As such, similarities among sherds excavated from the Carden Bottoms locality and those from Central Mississippi Valley or Lower Arkansas River Valley comparative collections do not necessarily indicate exchange or population movement from these locations. As stated in Chapter 3, it remains a possibility that the sherds analyzed from all three regions were locally produced and simply exhibit broad compositional similarity. The fact that Group 2 contains a fair amount of variability in terms of the range of element concentrations subsumed within it makes this a possibility not to be dismissed lightly. Future studies employing a larger number of samples from other potential source areas along the Arkansas River Valley, for example, are needed to clarify this compositional grouping and assess whether more defined subgroupings are present.

In anticipation of future work, I evaluated a Euclidean distance search conducted on each of the specimens submitted for INAA to help determine if any specimens were more likely a product of exchange rather than others, and if so, which source region they were most like. This search calculated the nine most chemically similar samples for each sample submitted for INAA based on the squared-mean Euclidean distance in elemental space. The following elements, which were the most useful in discriminating groups in the compositional analysis of ceramic pastes, were used in the distance search: Sc, V, Cr, Fe, Zn, Rb, Zr, Sb, Cs, La, Ce, Nd, Sm, Eu, Tb, Dy, Yb, Lu, Hf, Ta, and Th. While this technique is imperfect, it can be useful as an exploratory method. The benefit of this technique is that it is able place the focus on individual samples and their specific relationship to other samples rather than simply lumping together a number of different specimens in one compositional group or another. In this way, we are able to parse the broad nature of Group 2 and identify other possible patterns in the data available.

Figure 5.1 shows the proportion of matches from each region of interest for the sherds

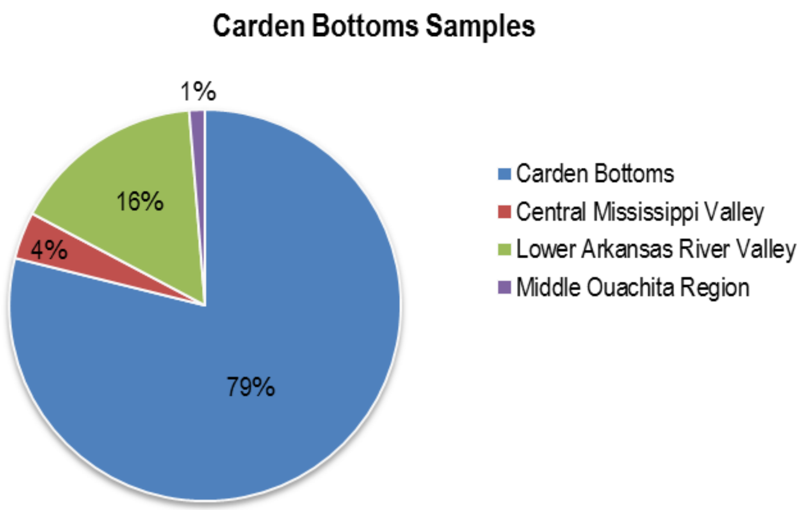

Figure 5.1 Proportion of Euclidean distance matches from each region of interest for sherds excavated from 3YE25.

excavated from the Carden Bottoms locality. Evaluation of the Euclidean distance search data revealed that the majority of the analyzed sherds excavated from the Carden Bottoms locality were found to be most similar to other sherds from the Carden Bottoms assemblage although it was not uncommon to find a sherd or two from the Central Mississippi Valley or Lower Arkansas River Valley among the top nine matches for each sample. This result is unsurprising given the assumption that many of the sherds examined were locally produced. Other sherds, however, most closely matched the compositional profile of specimens from the comparative collections, most frequently those from the Lower Arkansas River Valley. It is likely that these samples may be the result of exchange or population movement from farther downstream, although perhaps not as far as the Wallace Bottoms site from which the Lower Arkansas River Valley comparative samples were derived. Overall, 8.3% of the total Carden Bottoms samples had four or more matches among their nine most similar samples to sherds from other regions[8]. In fact, one of these sherds had no close matches to any of the other sherds excavated from Carden Bottoms (sample RWA037). This is the single sherd from the Carden Bottoms assemblage that was placed in the Unassigned compositional grouping. Notably, none of the sherds most similar to the comparative samples had any matches to sherds from the Middle Ouachita region, and matches to the Middle Ouachita region for any of the Carden Bottoms sherds were a rarity (Figure 5.1). Additionally, out of these potentially nonlocal sherds, two are from House 1 in the eastern neighborhood while the other three are from House 2 in the western neighborhood. Thus, it seems as if occupants of both neighborhoods had exchange relationships with communities downstream.

Examination of the sherds analyzed from the Middle Ouachita region comparative collections revealed that they were likewise most similar to other sherds from the Middle Ouachita region, although there are perhaps more matches to sherds outside the Middle Ouachita region than initially expected (Figure 5.2). These matches to sherds from other regions, however, are largely the result of sherds that were classified as Unassigned in the compositional analysis and exhibit some very different and variable element concentrations from the other samples. Their closest matches in the database were not as close in terms of Euclidean distance as were the matches for other analyzed sherds. Additional sampling of sherds and clays from the Middle

[8] The following sherds labeled by their MURR identification number, comprise this subset of the Carden Bottoms assemblage: RWA002, RWA005, RWA036, RWA037, and RWA038.

Ouachita region in the future may allow for the placement of these Unassigned sherds into new compositional groupings more reflective of their chemical makeup.

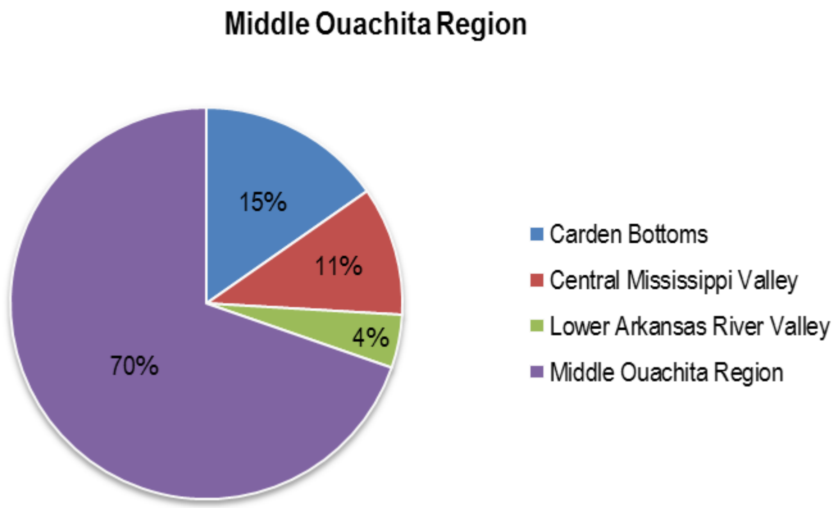

Figure 5.2 Proportion of Euclidean distance matches from each region of interest for sherds from Middle Ouachita region comparative collections.

Samples from the Central Mississippi Valley comparative collections exhibit the most regional cohesiveness in their Euclidean distance matches; only a small proportion of sherds from these sites have close matches outside of the Central Mississippi Valley (Figure 5.3). Moreover, no individual sherds from the Central Mississippi Valley had more than two matches to specimens from another region. Based on this information, it is perhaps more probable that potential nonlocal sherds from Carden Bottoms are not the result of interaction with Central Mississippi Valley communities. Interaction with other communities farther downstream on the Arkansas River is more supported by the current data.

Sherds from the Lower Arkansas River Valley, excavated from the Wallace Bottoms site, reveal an interesting pattern in their closest chemical matches. Unlike the other regional samples, the majority of matches were to other regions, excluding the Middle Ouachita region, rather than

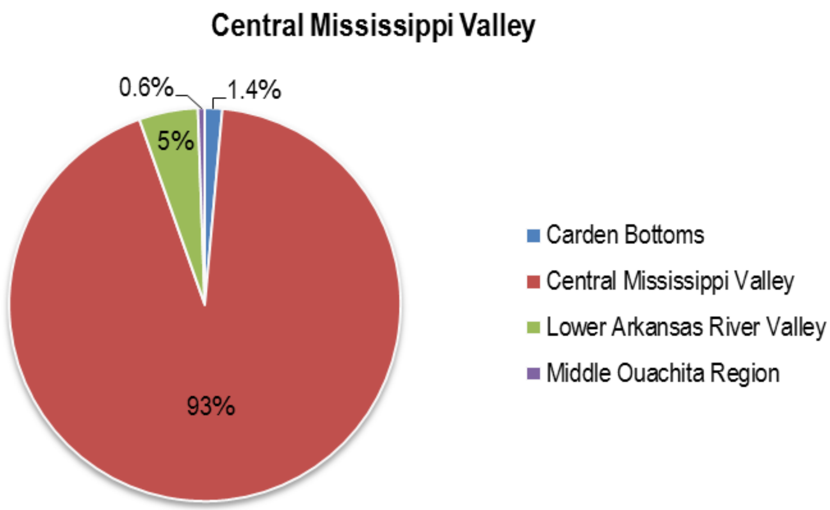

Figure 5.3 Proportion of Euclidean distance matches from each region of interest for sherds from Central Mississippi Valley comparative collections.

other samples from the Lower Arkansas River Valley (Figure 5.4). While exchange cannot be ruled out as an explanation for this pattern, it is more likely that the geographic location of the Wallace Bottoms site near the confluence of the Arkansas and Mississippi Rivers is the cause. As discussed in Chapter 3, two of the main clay sources for the Wallace Bottoms community are abandoned stream channels and backswamps. Some of these sources are located nearer the floodplain of the Mississippi while others receive the majority of their sediment load from the Arkansas. The samples analyzed from the Wallace Bottoms site, therefore, may represent the use of local clays from these two different areas—one with a chemical signature more similar to the Central Mississippi Valley comparative collection and the other exhibiting more of an Arkansas River Valley signature like the sherds from Carden Bottoms.

The other major finding of the compositional analysis described in Chapter 3 is the lack of any connection of the Carden Bottoms samples to the Middle Ouachita region despite strong stylistic evidence to the contrary. This surprising result is worth detailed consideration, and

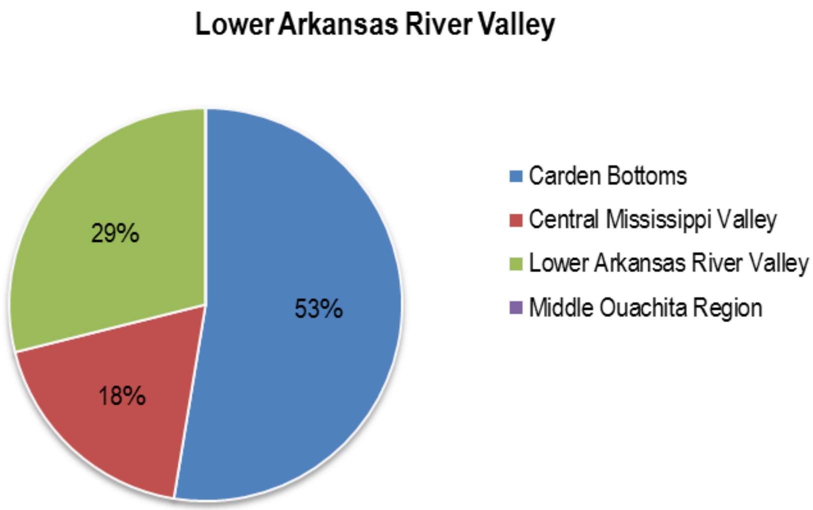

Figure 5.4 Proportion of Euclidean distance matches from each region of interest for sherds from Lower Arkansas River Valley comparative collections.

multiple potential explanations exist. One possibility is that ceramics recovered from the Carden Bottoms locality with Caddo design motifs may indeed originate from the Middle Ouachita region, but were made from a different clay source that is not represented in the comparative samples analyzed here. Some support for this scenario comes from my preliminary examination of compositional groupings on the basis of shell temper. The results of that analysis, detailed in Chapter 4, identified one sherd cluster that contained a high proportion of samples from the Middle Ouachita region along with all of the samples from the Carden Bottoms assemblage that were identified as being likely Caddo imports prior to compositional analysis. This pattern leaves open the possibility for a Middle Ouachita region source for these ceramics; however, these results from the temper analysis should be viewed with caution as this method is still relatively untried, and other information from the analysis suggests that the results were influenced by diagenesis. Accordingly, a more rigorous examination of temper which is able to objectively assess the presence of problematic diagenesis prior to chemical analysis is essential to any confident interpretation of results.

Alternatively, these ceramics may have been produced at a different Caddo community outside the area considered in this study. This project examined samples from the most likely archaeological sites known in the region for which sufficient ceramic samples were accessible, but it is quite possible that there are other contemporary sites in the region that are unknown to archaeologists or which have since been destroyed.

The most intriguing possibility which accounts for the presence of Caddo style sherds at Carden Bottoms without a corresponding chemical signature is that the ceramics were produced locally at Carden Bottoms by individuals of Caddo heritage who may have been residents of the site. This explanation is strengthened upon an examination of the Euclidean distance search data for the sherds identified as being likely Caddo imports prior to undergoing INAA. Of the eleven sherds in this category (and a total 99 possible Euclidean distance matches) only one match for one of the sherds was to a comparative sample from the Middle Ouachita region. Thus, even though some of the sherds from the Middle Ouachita region are classified as being part of Group 2 macro along with some of the sherds from Carden Bottoms, they are not close matches to the Caddo style ceramics from the Carden Bottoms locality.

Of the examples of ceramics representing the Caddo tradition at Carden Bottoms, most (if not all) are fine wares executed on what appears to be a local paste; good candidates for Caddo utilitarian vessels are not present in the current assemblage. If this is indeed the case, it is unusual among what is frequently mentioned in the literature linking the practice of ceramic production to social identity (e.g., Clark 2002; Gosselain 1998; Stark 1998). In most cases, decorated ceramics tend to conform to local styles while utilitarian wares may retain certain hallmarks of production in the tradition of the potter's natal village. In such cases, decorated ceramics are more frequently employed in public settings where conformity to local styles may be encouraged. In the case of Caddo style ceramics at Carden Bottoms, the importance of Caddo fine wares in ritual contexts may have some time depth in the Arkansas River Valley as evidenced by the assemblage at the earlier Kuykendall Brake site in Pulaski County (House 1997). This history of use may have facilitated the continued production of Caddo ceramics by newcomers to Carden Bottoms.

Other ceramic analyses utilizing practice theory have suggested that aspects of technical style, particularly those associated more with unconscious or highly routinized choices, are more indicative of social identity or ethnicity rather than more visible decorative choices that, due to their visibility, may be manipulated more easily to communicate a desire to be identified as a member of a particular group or for other advantageous purposes (e.g., to mimic highly valued trade wares) (Clark 2002). Thus, it is possible that potters native to the Carden Bottoms community were producing ceramics that mimicked those of Caddo communities in the Middle Ouachita region. Yet, other case studies reveal that certain attributes of the more visible elements of style may be good identity markers illustrative of particular "ways of doing" (Albers 1996). Regarding wares produced in the Caddo tradition found at the Carden Bottoms locality, the latter situation appears to be a better fit. These Caddo style wares are virtually identical from those found most frequently in the Middle Ouachita region. These wares follow the elaborate "design grammar" rules described by Early (2012) that would be difficult for the uninitiated to copy expertly. In addition, these wares are not only similar in terms of the use and arrangement of certain design motifs. Potters were also selecting and preparing clays, firing wares in the same manner, and using similar surface treatments (e.g., burnishing or polishing) in a way indistinguishable from Middle Ouachita region ceramics. Thus, all of the steps involved in ceramic production are reflective of a particular community of practice most frequently identified at Middle Ouachita region Caddo archaeological sites. Such a situation suggests that the potters producing these wares were raised and trained in the Middle Ouachita region tradition and continued producing ceramics, specifically fine wares, while living in the Carden Bottoms community.

Implications of Archaeological Investigations

While the ceramic compositional data provides support for the existence of multiple social groups living in the Carden Bottoms community, these data must be viewed in light of the current archaeological investigations undertaken at the site to understand how these different groups may have related to one another and whether the Carden Bottoms community is an example of societal coalescence. Evidence regarding the layout of the village and house architecture provides one means of considering this process.

The identification of multiple, spatially distinct neighborhoods consisting of house structures in various orientations across the surveyed portion of the site suggests the presence of different social groupings, perhaps at the level of the ethnic group. Spatial organization at several levels is significant the framework of practice theory. Spatial arrangements structure daily interactions and influence how individuals move through and use space and can influence conceptions of identity as the patterned use of space comes to be associated with certain social divisions (e.g., age, gender, kin group, or ethnic group) over time (Bourdieu 1977). Spatially discrete areas are often evidence of delineations within the larger community (see Wilson 2010 for a discussion of clan and subclan spatial organization at Moundville and their connection with social identity). Notably, such organizational arrangements may not be fully intentional or designed to erect social boundaries, but they are often reflective of current social ties (Giddens 1984:10).

In an example from the more recent past, Cipolla (2013) identifies a changing settlement pattern for communities of Brothertown Indians in nineteenth-century New York and Wisconsin, which provides an interesting context with which to view the finds from Carden Bottoms. Cipolla's (2013) volume traces the ethnogenesis of the Brothertown Indians out of seven formerly distinct ancestral tribal groupings (the Narragansett, Mohegan, Montaukett, Tunxis, Eastern Pequot, Mashantucket Pequot, and Niantic). These ancestral tribal groupings came to live together in new Brothertown settlements and over a period of generations came to be recognized under the ethnonym of "Brothertown Indians" rather than by their different tribal ancestries.

In considering their spatial practices Cipolla (2013) investigates whether tribal ancestry played a primary role in the decisions that individuals and families made regarding where to live in their new settlements. Early on, it appears that there is statistically significant ethnic segregation into separate neighborhoods, but these separate residential clusters became more dispersed as time went on (Cipolla 2013:174). Cipolla (2013:175) accounts for this shift in two ways. First, intermarriage among groups over time influenced residence patterns and dissolved boundaries. Additionally, the social process of ethnogenesis was at work as individuals of all tribal ancestries began to share a unified history as Brothertown Indians. Importantly, Cipolla (2013:177-178) also suggests that the initial tribal residence clusters may have been based primarily upon extended kinship networks and obligations rather than on tribal identification per se since corresponding ethnic clusters are not represented in Brothertown cemeteries.

Thus, it may be the case that the spatial clusters apparent at the Carden Bottoms site correspond to corporate kin groups, but that these groups may also fall along ethnic lines to an extent due to the existing kinship networks of individuals moving into the Carden Bottoms community. While the current evidence does not allow for a more conclusive identification of the neighborhoods at Carden Bottoms, this possibility is intriguing. In Cipolla's (2013) example, it is noteworthy that the differential spatial arrangements were not intended to serve as boundaries among culturally distinct groups (and indeed did not in practice), yet they reflected social relationships in a manner consistent with practice theory. Such a conclusion accords well with other studies of social identity in pluralistic settings in Native North America (e.g., see case studies in Mills 2002) in which conceptions of ethnic identity in modern nation-states may not appropriately capture concepts of ethnicity at work in native communities like Carden Bottoms where kin relationships (consanguinal, affinal, and fictive) are more important to identity construction than particular cultural distinctions. As Hegmon (1998:274) rightly cautions, the social groups that we identify in archaeological settings may have had more flexibility than what our modern notions of "ethnic" group implies.

Despite the evidence for residential clustering along social lines at Carden Bottoms, house forms are remarkably similar across the site. This similarity may be understood in light of Cipolla's (2013) study. If the neighborhoods at Carden Bottoms were formed primarily on the basis of kin relations and were not associated with the erection or maintenance of distinct cultural boundaries, the similarity in house form is not as surprising. In fact, the nearly identical house plans apparent throughout the site may indicate that house building was a communal activity and would have served to integrate community members as expected for a coalescent society in which means of integration are emphasized to unify disparate groups (Kowalewski

2006). Certain stages of house building, such as the placement of the large support posts, would have necessitated collaborative effort, and the cooperation of the wider community would have certainly made the entire process less burdensome.

While the situation at Carden Bottoms may have differed in certain respects, ethnohistoric accounts provide a description of the communal nature of house building among Caddo communities around the turn of the eighteenth century in northeast Texas. Franciscan friar Isidro Felix de Espinosa left an account of the house-building process typical of these Caddo communities (recounted in Swanton 1942:149-151). According to Espinosa, the owners of a house would notify the *caddí* (an inherited position of community leader) of their desire for a house to be built. The *caddí* would then order his *tammas* (minor functionaries who act as overseers) to make the necessary arrangements and notify the community members of the plan. Men and women from the different households within a community were required to assist with the house construction on the specified day, bringing with them a certain amount of prepared materials. With the joint effort of the community members, directed and supervised by the *tammas*, the house would be built according to a common plan within the day. The house owners would then be responsible for hosting a feast in which all those who helped build their house were generously fed and entertained. The entire event was described as a joyous affair that brought together the entire community. The benefits of this model are multiple. The labor intensive task of house construction is divided among many people and is completed efficiently, and those involved in the process are rewarded for their hard work with food at an enjoyable social event. At the same time, the process of house building promotes social interdependence and strengthens ties of reciprocity. Commonalities in house razing that were identified in the recent Carden Bottoms excavations (see Chapter 2) may also reflect a communal activity or, at the very least, shared ideas about the proper way to dismantle a structure.

A consideration of artifactual evidence recovered from the Carden Bottoms locality is also consistent with the character of a coalescent society. The presence of multiple artifact traditions at the site suggests the presence of multiple cultural groups from neighboring regions. Although some of these artifacts may be the result of exchange with communities from farther downstream on the Arkansas River, other ceramics exhibit elements of the Mississippian ceramic tradition of eastern Arkansas or the Caddo tradition of the Middle Ouachita region and appear to be executed on local clay. This circumstance is very similar to Regnier's (2006:255) findings for settlements in the Alabama River Valley in which potters maintained their native ceramic traditions after establishing a new and multiethnic community following the decline of both the Moundville and Bottle Creek chiefdoms and subsequent population fissioning and the migration of individuals from the Etowah chiefdom. Interestingly, Regnier's (2006) findings in the Alabama River Valley provide an example of a coalescent community occupied during the fifteenth century—prior to the more dramatic social disruptions of the later protohistoric period and more similar to the situation at Carden Bottoms than some of the historic examples of coalescent societies. Together, these examples suggest that coalescence may indeed be a strategy to cope with regional instability that has some time depth in the Southeast.

The distribution of artifacts among households at 3YE25 also supports the existence of integrative social tactics within the Carden Bottoms community. In terms of diagnostic lithic artifacts, both the eastern and western neighborhoods have similar proportions of Nodena, Madison, and Maud projectile points. As stated in Chapter 2, Nodena and Madison points are common Mississippian types with a wide geographic distribution while Maud points are distributed mainly in the Caddo area of southwestern Arkansas (Cande and Jeter 1990:325). Moreover, all households investigated contained evidence of ceramics with similar vessel forms and design motifs that were likely produced locally. Likewise, ceramics produced in the Caddo ceramic tradition were found in all three households. While House 1 did contain a higher proportion of both Caddo style ceramics and red-painted ceramics than the households in the western neighborhood, these ceramics were recovered from artifact-rich trash pits spatially associated with the household since House 1 did not contain an intact floor. The artifact sample for the other two houses was obtained mainly from within-house contexts; fewer trash pits were excavated in this neighborhood, partially due to the identification of human bone in one pit feature as discussed in Chapter 2. Since fine wares like the Caddo style ceramics and red-painted wares appear to have been disposed of immediately upon breakage, this differential proportioning may be the combined result of disparate disposal patterns and archaeological sampling.

Overall, the distribution of ceramics from the different represented traditions among all investigated households along with the distribution of diagnostic lithics may be the result of intra-site reciprocity or exchange. Again, this circumstance is one of the commonly occurring traits of societies that have experienced coalescence. Coalescent societies are often characterized by "elaborate community integration by means of corporate kin groups" (Kowalewski 2006:117). These corporate kin groups—like the clan systems, moieties, and unilineal descent groups commonly found among native groups of southeastern North America—served as the basis for positioning an individual within a network of reciprocal social obligations (see Swanton 1928 for a discussion of these obligations in ethnographic context). Exchange of goods like ceramic vessels (and their contents) is one piece of material evidence for these reciprocal networks and the strengthening of group ties.

Additionally, the identification of a local style zone present on multiple media (e.g., rock art and ceramics) similarly argues for a measure of social integration within the Carden Bottoms community. This local style is a tangible expression of an inclusive community identity, and evidence recovered from excavations suggests that individuals from each investigated household took part in the production of this style. Fragments of hematite and/or abrading or polishing implements used to process this red pigment were found in association with each house and were most likely used in the production of red-painted pottery, many vessels of which are executed in the local Dardenne style, or nearby rock art utilizing similar motifs and patterns.

Finally, the identification of hybrid ceramic artifacts offers additional insight into the nature of the Carden Bottoms community. As discussed in Chapter 2, these artifacts frequently apply the design motifs and surface treatments commonly employed in the Caddo ceramic tradition to vessel forms and paste preparations commonly found locally within the Carden Bottoms locality. In this process, the grammatical rules of the Caddo tradition described by Early (2012) are frequently violated. Similar combinations of different material culture traditions are broadly discussed in archaeological literature, but are most frequently emphasized in the acculturation and assimilation literature surrounding colonial contact. Today, this acculturation model has been challenged, but has not been replaced by any dominant theory or concept. In an edited volume dedicated to the current research of hybridity in material culture, Silliman (2013) provides a cogent summary of the various ideas presented in the volume and describes some productive avenues for understanding hybridity in archaeological contexts, which he notes are not limited to colonial settings.

As Silliman (2013:488) describes, the hybridization of material culture tends to

> apply to situations when a group (1) encounters or has sustained interaction with another group or its material culture, whether by force or by choice, and (2) adjusts to or incorporates new material, practical, genetic, and symbolic elements associated with the encountered group in *experimental*, *creative*, or seemingly imitative ways, again whether in coercive or equitable relations.

Although several approaches to hybridity are taken by archaeologists, Silliman (2013:492) argues for viewing hybridity as both a quality of multicultural interactions and a set of practices rather than as a product in and of itself. In this sense, the quality of hybridity in an artifact can draw attention to moments of transformation (of identity, social relationships, and culture). As such, this view intersects with Sahlins's (1981) conception of the transformative capacity of culture contact discussed in Chapter 1.

These ideas provide a useful context for understanding the ceramics identified as "hybrids" in the Carden Bottoms assemblage. In the artifact assemblage at Carden Bottoms, we have evidence of different communities of practice at work. Based on the compositional data, it seems as though potters working in the Caddo ceramic tradition were producing vessels on local clays within the Carden Bottoms community. These potters worked alongside other residents of the community who produced ceramics in a local Central Arkansas River Valley tradition, utilizing different decorative motifs, surface treatments, and vessel shapes. Thus far, the hybrid vessels identified in the Carden Bottoms assemblage appear to be produced by an inexpert hand and often contain designs executed with less finesse than most Caddo wares. This observation suggests that these wares were made by younger individuals learning the craft.

While some of the grammatical "violations" observed on these hybrid wares could be written off as part of the learning process as novices, it is interesting to note that it is not only the placement and usage of design motifs that make the hybrid wares distinct, but also the use of different vessel forms and paste preparations—those more at home in the Central Arkansas River Valley. Consequently, I argue that the creators of the hybrid wares were influenced by the multicultural setting of the Carden Bottoms community and were being brought up in, and transformed by, multiple communities of practice. Sustained interaction with the potting practices of different traditions allowed for experimentation and the creative adaptation of vessel styles. Interestingly, the result of this process is a series of vessels which do not follow the "rules" of Caddo ceramics produced in the Middle Ouachita region, undermining the hierarchical organizational principles present in Caddo wares and creating a different aesthetic (perhaps intentionally or perhaps unbeknownst to the potters themselves). Similar hybrid wares have been identified in whole vessel collections for other sites in the Arkansas River Valley, such as Kinkead-Mainard near modern Little Rock (Early et al. 2008). Consequently, this scenario may have occurred among several protohistoric Arkansas River Valley communities.

Discussion: The Carden Bottoms Community in Context

The implications discussed in the preceding sections must be considered in terms of the broader regional context in which the Carden Bottoms community was situated. Just a few generations removed from the destructive path of De Soto's entrada, the Carden Bottoms community may be a place where people more severely affected by the entrada's depletion of food stores and general violence resettled. Some of these newcomers may have come from the nucleated villages of northeast Arkansas which were abandoned sometime between contact with De Soto and the late seventeenth century when French explorers traveled down the Mississippi. Additional population movement and resettlement throughout Arkansas is likely in light of severe multi-year drought conditions associated with the Little Ice Age that occurred in the late sixteenth century. Prime agricultural bottomlands near large streams, like those found in the Carden Bottoms area, would have been very desirable locations. This regional instability, though not as severe as what would come later, mark the beginning of the Mississippian shatter zone, and societal coalescence is one strategy for coping with such instability.

As Kowalewski (2006) emphasizes, corporate kin groups often increase in importance during coalescence as a means of social integration. One piece of evidence that may serve as further support that coalescence was a frequently employed strategy throughout eastern North America is the existence of a high number of sibs, matriclans and matri-traits recorded for groups in the Southeast in the ethnographic record (Driver and Massey 1957:410, 412, 419). Kowalewski (2006:121) notes that these institutions would have been prominent in coalescent societies, and their high distribution could be linked to widespread occurrences of coalescence and subsequent social integration.

Overall, the reshuffling of groups living along the Mississippi and elsewhere into coalescent communities may explain the sudden florescence (at least in terms of archaeological visibility) and general character of sites assigned to the Carden Bottoms phase and Menard complex along the Arkansas River. These sites are generally "Mississippian" in terms of their economy and characteristics, but they lack evidence of the hierarchy associated with Mississippian chiefdoms. Moreover, they share a broad similarity in material culture—the existence of incised wares exhibiting motifs designated as Barton Incised in the traditional type/variety system of the Mississippi Valley along with the common occurrence of red or red and white painted ceramics. Yet, a careful look at ceramic assemblage beyond the traditional type/variety system (see Walker 2008) reveals the existence of local diversity in terms of vessel forms patterned associations of design motifs such that different style zones may be identifiable along the stretch of the river like the Dardenne style recognized at Carden Bottoms locality.

During this time it is also apparent that these Arkansas River Valley communities were increasingly interacting with Caddo communities from southwest Arkansas, particularly those from the Middle Ouachita region (Early 1993c). Such increasing interaction is consistent with typical responses exhibited by coalescent societies (Kowalewski 2006:117). While it does not appear that there was a large influx of population from the Middle Ouachita region, some intermarriage or small population movement is possible and is supported by the current data from ceramic compositional analysis. As discussed in Chapter 2, wares stylistically at home in the Central Arkansas River Valley have been recovered from protohistoric grave contexts at the Hardman site in the Middle Ouachita region (Early 1993c), and there is likewise a noticeable component of the Carden Bottoms ceramic assemblage that is stylistically part of the Caddo ceramic tradition.

This project, however, has revealed that these Caddo wares can no longer be assumed to be the result of trade or exchange alone. In fact, it is quite possible that these wares were produced locally in Carden Bottoms by potters intimately familiar with this tradition who learned their craft in Middle Ouachita region communities or from family members from this area. Thus, it appears that newcomers to the Carden Bottoms community were not discouraged from continuing to work in their native ceramic traditions. In fact, many of the recovered wares stylistically consistent with Caddo types are fine wares that were likely used in ritual contexts as evidenced by the lack of use wear and the disposal patterns of fine ware sherds at the site. This acceptance may have been predicated by a longer standing tradition of ritual interaction between Caddo communities and communities in the Arkansas River Valley as evidenced by the interesting artifact assemblage present in the ritual structure at the Kuykendall Brake site near modern Little Rock (House 1997).

At the same time, the community as a whole does not appear to have been highly segmented; several arguments for a focus on social integration exist. Regularities in house form, the existence of a distinctive local art style shared across the community and the similarity in artifact distribution across spatially distinct neighborhoods are all consistent with this idea. Such integration and the presence of hybrid ceramics at the site support the idea that the Carden Bottoms community had developed/was developing its own community identity from coalescent origins that incorporated and modified aspects of other cultural traditions.

CHAPTER 6: CONTEMPORARY COMMUNITIES IN COLLABORATION

Within the past two decades, the relationship between archaeologists and American Indians has received considerable attention in the archaeological community. Some of this attention has been of a contentious nature, usually related to the passage or implementation of the Native American Graves Protection and Repatriation Act and the concerns of archaeologists that their objects of investigation may be compromised, but much current work stresses the importance and benefits of archaeologists working with Indians in a partnership. Similar developments are occurring worldwide in areas with identifiable indigenous populations. Current research is being carried out under the aegis of many different labels, each with its own distinctive perspective and goals, but is united by the desire to demonstrate contemporary benefits of archaeological research and to accord respect to indigenous beliefs, practices, and material remains. Indeed, the literature on these various approaches is now quite vast and diverse (see Stump 2013 and Wiewel 2008 for recent summaries).

This chapter will first provide some background on one line of this recent work, collaborative archaeology, as it is currently perceived since the CARV project was undertaken in an attempt to move toward a true collaborative endeavor with American Indian groups who may have some relationship to or interest in the archaeology of the Carden Bottoms locality. Then a discussion of American Indian project participants' perceptions of this research project is provided along with a summary evaluation of the effectiveness and success of the CARV project.

Background

One major theme of collaborative archaeology centers on the need to move beyond legally mandated consultation to true collaboration (Colwell-Chanthapohn and Ferguson 2008; Silliman 2008; Swidler et al. 1997; Watkins 2001). The collaboration continuum described by Colwell-Chanthapohn and Ferguson (2008) is one way to conceive of this issue. As they describe it, collaborative efforts can range from resistance on one end of the scale (the well-known Kennewick Man debacle is an example of this) to participation somewhere in the middle of the scale to full collaboration. Legally mandated consultation tends to fall closer to the resistance end of the spectrum (although some forms of consultation are notable exceptions) simply because it is typically done in a compliance framework. The impetus to initiate a relationship is primarily out of necessity rather than desire. Once all obligations or legal requirements are met, the relationship between Indians and archaeologists ends.

Watkins (2001) advocates for the inclusion of Indians as full partners in a collaborative process who are involved in all stages of research and on equal footing with archaeologists. This model for collaboration means that archaeologists and Indians must form a partnership at the outset of a project; identify research questions, priorities, and areas of concern jointly; communicate often; and be involved in interpretation and the dissemination of any project materials (Colwell-Chanthapohn and Ferguson 2008; Silliman 2008; Swidler et al. 1997; Watkins 2001). This relationship requires that archaeologists do more than simply present a research plan and communicate results to Indians, but instead develop research plans jointly and maintain contact throughout the course of a project. In this way, Indians move from being the objects of study to being partners involved in the study.

Another major theme of collaborative archaeology is the desire to make archaeology relevant to descendant communities. As Chilton and Hart (2009) describe, justification of archaeological work to descendant communities was a critical component of their collaborative research projects. After one field season of a project that was developed in a collaborative framework, Chilton was asked to make a formal presentation before a council meeting to show why archaeology was of benefit to the tribe (Chilton and Hart 2009). This presentation was not merely a hoop for Chilton to jump through; it actually made her consider the project's focus more deliberately. This theme of relevance is present throughout the literature on community archaeology. Moser and colleagues (2002) exemplify this focus when they state that archaeologists cannot continue to reap the benefits (material or intellectual) of studies done on the indigenous past without benefiting indigenous communities as well. Establishing relevance may be done in a number of different ways—developing education programs, heritage tourism, and addressing preservation concerns are some examples (Silliman 2008).

Establishing relevance and forming collaborative relationships are complementary processes, and my research plan seeks to address these issues. Part of my research involves ascertaining the perspectives of Caddo, Osage, and Quapaw project partners regarding INAA and similar technical analyses and identifying research questions/concerns of interest to them. As Marshall (2002) observes, if archaeologists and Indians develop and discuss questions together before research proceeds, the results of that research are more likely to address issues of interest to Indians and in turn, research results will be more interesting to them. Additionally, it is important to note that the overall CARV project was initiated in a collaborative framework and lies somewhere between the "participation" and "full collaboration" areas on Colwell-Chanthapohn and Ferguson's (2008) collaboration continuum. The grant obtained to complete the CARV project was submitted jointly by the Arkansas Archeological Survey and the Caddo, Osage, and Quapaw nations. The project involves frequent communication with the Indian partners throughout the course of research and participation by Indians in many aspects of the work. It is the hope that this effort will lead to broader perspectives regarding the significance of the project and the materials we examine.

Perceptions of INAA and Technical Analyses

The specific research direction of this dissertation project was conceived of after the initiation of the larger CARV project. As such, its focus on compositional analysis and the techniques it entails was not previously discussed with project participants. In order to proceed in a collaborative fashion, I endeavored to ascertain the perceptions of American Indian project participants toward the use of technical analyses like INAA in an attempt to better understand the origins of some of the artifacts from the Carden Bottoms locality and ultimately address issues related to the identity of the artifacts' creators before undertaking any research. I also wished to identify any questions of interest to the project participants which my research might be able to address so that I could modify my research design accordingly.

In this effort I participated in formal project meetings in which all involved parties were assembled to discuss matters related to the project. These meetings included formal presentations on the part of the archaeologists involved with the project after which an open discussion forum was held to address topics raised in the presentations and make plans for different stages of research. I gathered additional information by virtue of participating in the project myself and having informal conversations with other participants during project work. I took notes during these times when a pertinent issue arose. Finally, I obtained data from a questionnaire provided to all project participants (developed by CARV project principal investigators with the answers compiled by American Indian project participants themselves), which helped evaluate the CARV project in its entirety. Project participants were largely self-selected out of the populations of the Caddo, Osage, and Quapaw nations. As mentioned in Chapter 1, the Tunica nation was also asked to join the project, but declined to participate in light of other tribal priorities. Participants included individuals associated with tribal heritage programs or tribal NAGPRA representatives, elders, and a few other community members who were interested in the project. Thus, my sample is not necessarily representative of the entire communities in question. Instead, it reflects those most interested in issues of tribal and cultural heritage and those able to travel and/or take time out of their schedules to engage with the project. Participants from the archaeological community included several archaeologists employed by the Arkansas Archeological Survey and graduate students at the University of Arkansas.

I was first able to formally discuss my research plans at a CARV project meeting held in May of 2011. I first gave a presentation outlining the technical process of INAA, discussing the questions I hoped to address through my research and describing the type of samples I planned to submit for analysis. Following my presentation, general discussion followed. The American Indian participants in attendance were very supportive of my proposed INAA study. The possibility of linking pottery vessels to a particular place through the analysis of the elements contained in clays was a topic of interest and much discussion. After one person voiced the opinion that knowing the place from which a vessel originated was important and meaningful, other group members expressed agreement. While I do not know the particular intent with which this comment was made, this notion seems to express a couple of related issues: one is that the raw material from which an object is made can actually imbue that object with power, in this case the power of the place from which the raw clay is derived (Speilmann 2002:211). In a similar fashion, objects derived from particular places symbolically associated with a certain meaning are perceived as having similar qualities. The latter interpretation has been referred to as the “pieces of places” concept (Bradley 2000:81-84).

After discussing some more straightforward questions, the main concern raised regarding my research was that samples from burial contexts be avoided. In this case, the need to show respect for ancestors was emphasized. Others in agreement with this concern noted that they lacked specific knowledge about what might be acceptable to an ancestor to do with regard to a certain vessel, and for this reason it was important to be cautious. In response to this concern, I assured those in attendance that the sherds excavated from the Carden Bottoms locality would be coming from residential contexts and not mortuary contexts. I also took care during my selection of comparative materials to avoid known grave goods. Many of the comparative collections were obtained from surface collections, so their particular association is not known, but for all others, grave goods were avoided. The destructive nature of the analysis was not a major hurdle to overcome as I had anticipated; the context of the artifact to undergo analysis was far more important to American Indian project participants.

Following my presentation I engaged in an informal discussion with some Caddo participants over refreshments. One woman inquired about whether my research could identify connections to more distant regions like the Cahokia site which she had heard might be connected to the Caddo. I clarified that Cahokia was occupied centuries prior to the Carden Bottoms occupation. Any trade relations that the Carden Bottoms residents had would have been with other contemporary communities. I also informed her that I would be able to make use of the large database at MURR, enabling me to investigate some additional possibilities for regional connections beyond the sites chosen for my study.

Importantly, Quapaw representatives were unable to attend the aforementioned project meeting; however, I was able to discuss my research plans with them on a trip to the Quapaw tribal cultural center in Quapaw, Oklahoma later in the year. After I explained my planned analyses, I fielded some perceptive questions about the technique, including whether modern practices like the use of agricultural fertilizers would affect my results if I sampled raw clay sources today. After discussing these issues and some of the limitations of and difficulties inherent in compositional analyses, everyone was receptive to the project and wished me well. Once again, the only caveat was that samples for the project should not be taken from grave contexts.

Interestingly, one participant stated her interest in studies of trade and exchange and related it to the traditional Quapaw practice of "giveaway." The principle that ceramic exchange is reflective of social ties has significance to American Indian project participants. Notions of gifting and the social bonds this process creates and maintains are familiar to modern American Indian communities, and as this exchange demonstrates, there is interest in identifying such processes in the past. Today, "giveaways" or "specials" are ubiquitous at tribal powwows and involve the performance of a requested honor dance followed by the giving of gifts (Dowell 2013:17). In an interview regarding the practice, Alicia Renee Chaino-Ahkeahbo discusses the importance of this tradition. While she acknowledges that there is not an obligation for anyone to have a giveaway, she states: "If you are honored and approached to take a leadership role it's important that you have the time and respect to show your gratitude the way my ancestors did by giving gifts" (quoted in Dowell 2013:17). This quote emphasizes the connections that exchanges like giveaways create today; not only is there a tie of reciprocity among those who take part in the practice, but the continuation of this tradition in a new setting creates an important connection between modern American Indians and their ancestors. Furthermore, this discussion with the Quapaw project participants emphasizes the need to consider exchange in past Indian societies in terms of reciprocal relationships and the social institutions upon which they are founded rather than simply viewing the process in economic terms.

Evaluation of the CARV Project

The literature surrounding collaborative archaeology underscores the need for the evaluation of collaborative efforts to identify successes and weaknesses of particular practices and build more meaningful relationships in the future (Silliman 2008). In this endeavor, I first consider my own perceptions of the project before synthesizing the results of a questionnaire given to all project participants.

Overall, the CARV project was undertaken in more of a collaborative spirit rather than one based on consultation, yet it may not reach the level of full collaboration envisioned by Colwell-Chanthapohn and Ferguson (2008) or Marshall (2002). Importantly, American Indian participants were partners in the project from its inception, and communication between archaeologists and American Indian project participants occurred throughout all stages of the project. Furthermore, collaboration was not simply a matter of presenting archaeological results or plans to Indians for approval. Instead, Indian project participants were able to directly engage in archaeological research by recording ceramics during museum visits, excavating alongside Arkansas Archeological Survey staff, processing artifacts in the lab, and presenting results in a Society for American Archaeology annual meeting session. This allowed for Indian participants to learn firsthand what archaeological research entails and erase some common misconceptions regarding archaeological practice. Likewise, the presence of Indian participants on archaeological projects made archaeologists more aware of the implications our research has for descendant communities and provided insight into Indian perspectives, potentially offering new interpretive possibilities. Additionally, working alongside non-archaeologists, Indian or not, forces one to learn how to communicate outside of our disciplinary comfort zones.

Despite these encouraging project results, one obstacle in the way of realizing a fully collaborative project involves the practical issue of coordination among many different parties. There were often times throughout the project when some participants had to cancel plans to work on the project or attend a meeting, making participation in some stages of research limited to one or two Indian project participants. While sheer numbers of participants are not at issue, the larger concern is that this created a substantial time gap between periods of project involvement for some participants. Thus, it became harder for everyone to build rapport and create a sustained interest in the project which could encourage participants to take a more active role in the research process.

I will turn now to a consideration of other participants' perspectives on the relevance of archaeology for learning about the past and on the possible benefits of working with archaeologists or anthropologists. The questionnaire featured in Table 6.1 was distributed to Caddo, Osage, and Quapaw participants by CARV project principal investigators and interviews were conducted by community members themselves. A modified version (Table 6.2) was given to archaeologists involved in the CARV project. The results of these surveys are synthesized in the following section with the American Indian responses discussed first; answers for archaeological participants are then incorporated for those questions to which both groups responded or which address similar issues.

Table 6.1. Questions asked of American Indian project participants.

1.	How important is it for people today to understand the past—their history? What lessons from our ancestors do we need to understand? How do these lessons relate to life in today's world?
2.	Where does knowledge of the past come from? What are the most important sources for understanding history?
3.	Do you have any thoughts about the relative importance of information handed down from elders, information from historical documents, and information from the study of archaeological sites? Are these sources compatible, or do they reflect separate ways of knowing about the past?
4.	Do you see any benefits from members of the Caddo/Osage/Quapaw community working with historians, anthropologists, and archaeologists to learn about the past? If so, what are the most productive ways for these people to work together? What kinds of questions should be addressed?
5.	The Arkansas Archeological Survey is presently collaborating with the Caddo, Osage, and Quapaw communities in a study of archaeological sites and collections from the Arkansas River Valley. The sites date to the early 17^{th} century—after Hernando de Soto's expedition (1539-1543) but before French exploration and colonization of the region. What would you like to see coming out of this study?
6.	What is your own perspective on Caddo/Osage/Quapaw history? What do you find most interesting and important? What additional things would you like to know?

Table 6.2. Questions asked of academic archaeologist project participants.

1.	In terms of understanding the past, what are your thoughts regarding the relative importance of information derived from American Indian oral traditions, information from historical documents, and information from the study of archeological sites?
2.	Are these three sources compatible, or do they reflect separate ways of knowing about the past?
3.	Do you see any benefits of archaeologists working with members of the Caddo, Osage, and Quapaw communities? If so, what are these benefits?
4.	What are the most productive ways these communities can work together?
5.	How successful (or productive) do you think the CARV Project was in carrying out a collaborative project with the Caddo, Osage, and Quapaw communities?
6.	Do you have any additional comments?

In terms of the importance of understanding the past and its lessons, most respondents indicated that history is very important, but significantly, their focus on history was framed in terms of kinship relationships and genealogies foremost. Then, the importance of larger cultural histories was mentioned. While responses to specific lessons were not obtained, a general emphasis on oral traditions was communicated along with the understanding that listening to such lessons was imperative since many things have not been recorded in books.

In response to the second question, respondents again emphasized that knowledge is derived from elders passed down via oral traditions and stories. Among Caddo respondents, there was also a general consensus that the act of practicing and participating in cultural traditions provided knowledge about their Caddo identity and history. Thus, as discussed earlier in regard to pottery production, this illustrates how larger cultural principles or cultural knowledge are reproduced through practice.

Regarding the third question, Indian respondents indicated that all three sources of knowledge are important, yet they emphasized the significance of oral tradition. In relation to the compatibility of history, archaeology, and oral tradition, respondents agreed that these sources are separate ways of viewing the past, but that they can be complementary. Interestingly, the archaeologists who answered this question did not give archaeology primary importance. All respondents agreed that archaeology, history, and oral tradition were necessary to understand the past. While the majority of archaeologists stated that these sources are generally compatible, issues with rectifying widely divergent accounts were raised.

Responses to the fourth series of questions are the most illuminating with regard to the effectiveness of collaborative archaeology projects. Interestingly, there was unanimous agreement that working with historians, anthropologists, and archaeologists was beneficial and informative. However, respondents indicated that insights from archaeologists and archaeological reports were often difficult to understand due to a preponderance of jargon. As such, it is evident that archaeologists need to improve our ability to communicate clearly and effectively if we would like to engage non-archaeologists and convince them of our relevance.

Encouragingly, most felt that the CARV project was a good model for working together since there is direct involvement by Indian participants in archaeological work. Yet, respondents were hesitant to provide specific questions that could be addressed with archaeological research. Again, responses indicate that the relevance of archaeology has not been clearly communicated.

Archaeologists were similarly positive in their views of collaborative endeavors and stated that the exposure to alternative perspectives was the most rewarding aspect of the CARV project. Additionally, most felt that the general structure of the CARV project was a productive way to approach collaboration. One respondent suggested that American Indian participants also provide contributions to project reports, which would further place Indians in the role of partners rather than consultants. All judged the project a success. In fact one respondent indicated that working alongside the Indian participants during excavations and sharing stories and traditions has changed his understanding of the ways archaeological sites can be viewed.

Despite some of the difficulty experienced in articulating general questions for collaborative archaeological research, respondents did have some questions regarding the specific outcomes of the CARV project analysis of the Carden Bottoms locality. There was a general interest in learning the identity of the potters who produced the diverse assemblage at the site. Additionally, Caddo respondents were interested in learning whether the Caddo style ceramics found at Carden Bottoms were actually made by Caddo people or were simply copies of Caddo designs. While my research may not provide the more definitive answers that respondents were likely seeking, my analysis is able to speak to some of these issues.

Responses to the final question reiterated previous answers, indicating a perspective on tribal history that is derived from oral traditions and knowledge passed down by elders, with some interviewees emphasizing the responsibility for living Indians to continue to teach younger generations. Furthermore, respondents again questioned the practical applicability of archaeology to their lives.

Overall, responses from American Indian project participants demonstrate a positive view of archaeology, yet most interviewees rely more on their own oral traditions for knowledge about the past, indicating a generally different orientation to history from that of archaeologists. One of the biggest insights from survey responses is the need for archaeologists to more clearly articulate what we do, how we do it, and what kinds of knowledge we can provide. Indeed, I faced this issue when I asked project participants if they had any questions which my compositional analysis could address. Participants were not well-equipped to respond to my question. A more useful approach may have been to provide some ideas and examples about the types of issues I could conceivably address. Additionally, future collaborative efforts could be further strengthened if archaeologists elicited some general interests from native communities prior to formulating a research plan and sought to design a project around those interests. This suggestion would take some considerable effort on the part of archaeologists to implement successfully and could prove impossible in some cases, but attempting this strategy has the potential for substantial rewards.

While the interests of these two communities and their understandings of the past differ in several respects, this project has shown that all project participants gauged the effort a success. However, as some of the American Indian responses to the project reveal, the need for archaeology to demonstrate its relevance to descendant communities is stronger than ever and remains a challenge in light of the many pressing issues confronting modern American Indian communities today. The CARV project has approached the issue of relevance by communicating project results in an accessible and relatable format online and developing educational resources and products that can be used by American Indian communities and the general public alike. These efforts are certainly appropriate, but it will take a continual and concerted effort to make archaeology relevant to descendant communities and other publics. Involvement in a collaborative effort like the CARV project serves to highlight some fundamental differences in the ways archaeologists and American Indians approach the past.

Within the context of this project, the differences between American Indian perspectives and those of academic archaeologists was highlighted by their variable relationships with the material record that archaeologists investigate. Just as the material culture of the residents of Carden Bottoms likely had multiple, overlapping meanings for the maker of the object and those perceiving it, the archaeological community and American Indian project collaborators viewed the material record of the Carden Bottoms community differently based on their relative positions. Regardless of theoretical perspective, academic archaeologists principally focus on what material remains can tell us (e.g., about subsistence, politics, trade, identity, social relationships and organization, or belief systems). We interrogate material remains to produce knowledge situated within our own disciplinary and personal frames of reference. As archaeologists our relationship to material remains, though often intimate, tends to be fundamentally different from the ways in which American Indians interact with the material remains of past societies. The American Indian CARV project participants continually referenced their relationship to the ancestors as they handled artifacts, visited rock art sites, or worked in excavation blocks. Material remains were therefore a tangible connection to kin relationships of great time depth and breadth. This different conception of material culture provides insight for archaeologists in multiple ways: it allows us to better understand how descendant communities may view our work (and our maintenance of artifact collections), and it offers another viewpoint for understanding the roles material culture played in societies of the past.

CHAPTER 7: CONCLUSIONS

This research project was undertaken in an attempt to consider the distinctive ceramic assemblage of the protohistoric Carden Bottoms phase from a different perspective than the traditional stylistic approaches undertaken to date. While stylistic analyses of these ceramics have yielded important insights into the character of the assemblage in terms of observable differences in ceramic traditions, fundamental questions regarding the origin of these wares remain unanswerable from a strictly stylistic viewpoint. The chemical compositional analyses detailed in this dissertation provide a first glimpse into some possible origins for the wares recovered from recent large-scale excavations of the Carden Bottoms locality in Yell County, Arkansas. Initial findings are viewed in light of the widespread regional instability present throughout southeastern North America during the time of the community's occupation and the possibility that the site represents a strategy of societal coalescence in times of stress.

To assess this possibility, results from INAA were combined with information on site organization, architecture, and comparisons of artifact distributions across households within site 3YE25. In this process, theoretical insights derived from the archaeology of ethnicity and social identity and culture contact studies were employed to investigate processes of social interaction, integration, and identity.

This investigation was undertaken in association with a larger collaborative research project initiated by the Arkansas Archeological Survey and the Caddo, Osage, and Quapaw nations of Oklahoma. As such, I sought to broaden the focus of my research to consider the interaction of these two communities within this collaborative framework and understand the ways in which American Indians perceive the use of technical analyses such as INAA.

Answers to Research Questions

To bring together these lines of research, I first summarize my current answers to the questions guiding this study. I then consider future research directions that could help clarify areas of uncertainty that remain.

Research Question 1: Are the different ceramic traditions present at Carden Bottoms the result of exchange indicative of regional interaction? If so, which regions are involved in the interaction sphere of the Carden Bottoms community?

Compositional analysis of ceramic pastes identified two major compositional groupings among the samples submitted from the Carden Bottoms locality (3YE25) and comparative collections derived from the Central Mississippi Valley, the Lower Arkansas River Valley, and the Middle Ouachita region. The largest of these groups, designated Group 2, contains specimens from all regions of interest and encompasses a wide range of broadly similar clay sources. Following attempts to subdivide this group, a more tightly clustered subset of Group 2 was identified (Group 2 micro; the broader grouping is referred to as Group 2 macro). Unlike Group 2 macro, samples belonging to Group 2 micro are associated with all regions of interest except for the Middle Ouachita region of southwest Arkansas. Additionally, a group of sherds labeled Group 1 exhibits a more defined compositional cluster. Group 1 members consist only of samples submitted from Middle Ouachita region comparative collections.

This patterned distribution suggests that some exchange or population movement from the Lower Arkansas River Valley and possibly Central Mississippi Valley into the Carden Bottoms locality is possible. However, since Group 2 is not a well-defined grouping, these data are somewhat equivocal. To help determine if any of the specimens excavated from Carden

Bottoms were more likely a product of exchange over others, and if so, which source region they were most like, a Euclidean distance search was conducted on each of the specimens submitted for INAA to identify their closest compositional matches within the analyzed assemblage. This search identified a small proportion of the Carden Bottoms samples (8.3%) which had a high number of Euclidean distance matches to comparative collections, particularly the Lower Arkansas River Valley, rather than other excavated sherds from the Carden Bottoms locality. This finding lends more support to the idea that a portion of the analyzed specimens are likely from areas downstream from the Carden Bottoms site in the Lower Arkansas River Valley. Importantly, a specific association with the comparative collection from the Wallace Bottom site cannot be assumed since a tight clustering of sherds is not present.

Ceramics produced in the Caddo tradition in the Carden Bottoms assemblage are the most distinctive in terms of decoration, surface treatment, and vessel form and have traditionally been interpreted as trade wares originating in southwest Arkansas. Yet, chemical analysis of ceramic pastes does not currently support this interpretation. Instead, these very distinctive wares may have been produced on local clays while retaining nearly identical styles most frequently observed on wares found at sites in the Middle Ouachita region. While other interpretations exist, the strong spatial distribution of comparative sherds from the Middle Ouachita region separate from all sherds from the Carden Bottoms excavations serves as support for a local Carden Bottoms origin for these Caddo style ceramics.

Research Question 2: Do macroscopic examinations of ceramics (including a consideration of design, paste, and temper) correspond with chemical compositional data?

The current evidence suggests that macroscopic examinations of ceramics and chemical compositional data do not exhibit correspondence. The most convincing evidence in this regard is the existence of Caddo style ceramics from excavated contexts at Carden Bottoms that exhibit textures and designs indistinguishable from Caddo wares obtained from the Middle Ouachita region, but are not close compositional matches. Additionally, differences between ceramics belonging to Group 2 macro and Group 2 micro are not evident macroscopically. Furthermore, the sherds identified during the Euclidean distance search as likely indicating exchange are indistinguishable on a macroscopic level. This pattern may change with future research and the possible identification of other compositional groupings, but currently it seems as if reliance on one source of information alone (either macroscopic information or chemical analyses) is inadequate. Consideration of both lines of evidence can yield interesting questions about the cultural processes responsible for the presence of singular ceramic traditions on chemically divergent pastes or vice versa.

Research Question 3: Is the protohistoric Carden Bottoms community an example of a coalescent society? What can we infer about social dynamics within the site during its occupation?

A variety of factors, including disruption in the wake of the De Soto entrada, prolonged drought conditions, and internal societal stresses, implicated in the depopulation of northeast Arkansas and subsequent regional instability can be seen as stressors at work in the Central Arkansas River Valley and surrounding regions, prompting a social response. Coalescence, as documented by Kowalewski (2006) is one commonly employed strategy during such times. Evidence for the existence of multiple social or ethnic groups present at the Carden Bottoms community is found in the presence of at least three spatially distinct “neighborhoods” at the site, in the presence of multiple ceramic traditions at the site (some of which may be the product of population movement or exchange with communities downstream and others of which appear to be executed on local ceramic pastes), and in the presence of "hybrid" wares indicative of the transformation of ceramic styles in the context of culture contact.

Similarities in artifact assemblages across Carden Bottoms phase and Menard complex sites in the Arkansas River Valley may represent the periodic reshuffling of populations in a broader regional sense such that general motifs are shared across a large geographic space. This circumstance may characterize many communities across the Southeast throughout Mississippian and protohistoric times (see Hally 2006:37 for an example from northern Georgia). Such an occurrence is consistent with a strategy of coalescence in which interactions with kin networks likely served as the basis for population movements throughout the Arkansas River Valley. As people came together in new formations, they brought with them their artistic traditions, which underwent transformation in a pluralistic setting to produce the nuances present in vessel form, motif distribution, placement, and surface treatment visible in the ceramics attributed to the Dardenne style—a local style of the Central Arkansas River Valley shared across different material classes (i.e., ceramic vessels and rock art).

This local style zone, in which artifact distributions suggest members from across the community participated, can be viewed as an expression of a shared community identity brought together by integrative social tactics such as intra-site reciprocity. Another sign of integration can be seen in the nearly identical house forms across the site, which may the product of communal work activities.

If accurate, the notion of Carden Bottoms as a coalescent society provides an early example of this process prior to the more severe shatter zone shock waves of the eighteenth century. Other protohistoric Arkansas River Valley populations may provide other evidence of this process.

Importantly, however, other possibilities may also apply to the evidence obtained so far from the Carden Bottoms locality. The spatial organization of neighborhoods could correspond to other divisions within the community such as clan or moiety groupings; in fact the striking correspondence of house form across the site could be viewed as evidence that the residents of the site are more culturally homogenous than a coalescent society would imply. While there is a strong likelihood that some residents of the site were of Caddo heritage, it is not clear how many such individuals lived at the site or how long they were there. It is also possible that the makers of the Caddo style pots found at Carden Bottoms lived in a separate settlement near the Carden Bottoms locality. Additional research and the refinement of compositional groupings are needed to more conclusively distinguish among these possibilities.

Research Question 4: What concerns or interest do American Indian descendant communities have regarding destructive analysis techniques, such as INAA?

American Indian CARV project collaborators were very receptive to research plans involving the use of INAA on ceramic artifacts recovered from the Carden Bottoms locality and comparative collections from surrounding regions despite the fact that INAA requires that a portion of the artifact subject to analysis (roughly one square centimeter in size) be destroyed. The context of the artifact was more important. All American Indian project participants voiced reservations about the submission of sherds from mortuary contexts, citing respect for the ancestors as the motivation for their concerns. All sherds from the Carden Bottoms phase assemblage were taken from residential contexts. Similarly, sherds analyzed from comparative collections were not known grave goods.

Many American Indian collaborators expressed interest in the nature of INAA to attempt to clarify artifact provenance. The ability to associate an object with its place of origin was emphasized as being highly desirable. Additionally, some participants were interested in examining exchange relationships in light of the reciprocal ties inherent in such tribal traditions as “giveaway” rather than as a straightforward economic transaction. These perspectives shed some light on American Indian views of certain aspects of archaeological research.

Research Question 5: More broadly, how effective are collaborative research endeavors, such as the CARV project at addressing the different concerns and interests of academic archaeologists and descendant communities?

All project participants, archaeologists and Indians alike, judged the CARV project to be a success. Participants cited the overall approach of the collaborative partnership that was developed from the outset of the project as a positive. Moreover, the fact that American Indians were able to work with archaeologists to produce research was universally acknowledged as beneficial. Archaeologists working on the project were able to experience new perspectives on approaching the past and material cultural remains. American Indians often referenced a connection to the ancestors as being the most important framework for viewing the past and cited the wisdom of the ancestors as passed down through oral traditions as their primary means for understanding the past.

While most American Indian collaborators were receptive to archaeological research, many were unsure of its potential. Thus, there is a need for archaeologists to continually strive to demonstrate the relevance of the discipline. Currently, this lack of clarity makes it hard for American Indians to identify how archaeologists can address their interests. One way to make gains in this respect is for archaeologists to focus on communicating plans, methods, and results in clear, jargon-free language. Overall, project participants voiced a desire to continue collaborative projects.

Future Research Directions

This project should be viewed as a first step toward gauging the potential for compositional analyses in a region previously unexamined. As such, there are several directions that future research could take to address some of the complicated issues of sorting out the chemical variations of clays in large alluvial settings. This study has provided a better idea of the kind of variability that exists across different physiographic regions of Arkansas and offers multiple opportunities for refinement.

More intensive sampling of clays around the Carden Bottoms locality could provide insight into the amount of variability present within local clay sources and provide additional perspective on how best to view the character of compositional Group 2 identified in this study. Examination of comparative samples from protohistoric sites in the Little Rock vicinity would likewise prove useful to assess possible relationships of Menard complex sites to those of the Carden Bottoms phase. Additional sampling from sites in the Middle Ouachita region is also necessary to help confirm the interpretation favored here that Caddo style ceramics found at Carden Bottoms were locally produced. Such work may also be able to associate those several sherds from the Middle Ouachita region that are labeled "Unassigned" here with a compositional grouping.

It is also highly advisable to assess whether compositional studies that focus on identifying groups on the basis of patterned chemical differences in shell tempering materials are more promising. While this study attempted to analyze differences in shell temper using the method outlined by Selden and colleagues (2014), it is apparent that different methods are necessary for work in the Carden Bottoms area. While this work hints at patterned differences in shell temper between the Central Arkansas River Valley and Middle Ouachita region which generally agree with geochemical surveys of the areas, it is clear that the effects of diagenesis are at work and call these results into question. Thus, the employment of LA-ICP-MS as explored by Peacock (2007) combined with the methods developed by Collins (2012) to identify shell particles unaffected by diagenesis may prove more useful.

Finally, the interpretations offered here regarding the coalescent nature of the Carden Bottoms site and the presence of integrative tactics within it, while based on much better data than were available previously, are still provisional. Excavation of a house located within the central neighborhood will provide a better dataset for examining intra-site patterning. Excavation of refuse pits spatially associated with the house would also be desirable to increase the likelihood of obtaining fine wares and assess whether the differential disposal patterns for utilitarian versus ritual wares holds true. Likewise, remote sensing coverage for the portion of the Carden Bottoms community located across the farm road is may yield even more evidence for the existence of houses and neighborhoods and help define the spatial organization of this extensive settlement.

The degree of preservation of residential remains at the Carden Bottoms site despite intensive looting and years of heavy agricultural activity is promising for future investigations of other Carden Bottoms phase sites in the Central Arkansas River Valley. Adding to the sparse database would provide opportunities to examine inter-site patterning that are currently unrealized.

Research Significance

This research begins to address a substantial data gap concerning the nature of social interaction and community formation in the Central Arkansas River Valley during the poorly known protohistoric period. Additionally, progress is made toward improving collaborative relationships between archaeologists and indigenous communities. Yet, the impact of this research can extend beyond these two issues by providing multiple opportunities for future research and partnerships.

The findings from this study provide context for future research throughout the Arkansas River Valley, which may exhibit many of the characteristics present at the Carden Bottoms community. Furthermore, the use of chemical compositional analyses combined with information on ceramic styles may yield surprising—and interesting—results elsewhere. In this case, provenance analyses have questioned some long held assumptions about the ceramic assemblage at the Carden Bottoms locality, and similar situations may occur in other areas. This study underscores the need to question designations of imported artifacts based on style alone.

Additionally, the need for more intensive sampling is apparent in order to clarify some of the issues raised here regarding the character of the ill-defined compositional Group 2. However, the nature of clay sources throughout the Arkansas River Valley may continue to defy such efforts. Thus, exploring other methods of provenance analyses for this region, particularly sourcing of shell temper via LA-ICP-MS and petrographic analyses may be beneficial. Ultimately, this study provides a means of refining our current perceptions of regional dynamics in the Southeast during what appears to be a time of reorganization and community formation. Furthermore, this research project was undertaken in the context of a wider collaborative endeavor between academic archaeologists and American Indian project participants, and its successes should lay the groundwork for continued collaboration.

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APPENDIX A: Descriptive Data for Sherd Samples

ANID	Alternate ID	Excavator	County	Subregion
RWA001	2012-364-104-1-2	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA002	2012-364-19-1-8	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA003	2012-364-41-1-12	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA004	2012-364-41-1-16	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA005	2012-364-76-1-8	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA006	2012-364-76-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA007	2012-364-14-1-12	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA008	2012-364-50-1-4	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA009	2010-380-114-1-8	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA010	2012-364-104-1-7	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA011	2010-380-122-1-8	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA012	2010-380-118-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA013	2010-380-102-1-6	Arkansas Archeological Survey	Yell	Central Arkansas River Valley

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA001	Carden Bottoms locality	3YE25	Pre-cut: 11; Sherd submitted : 3.7	5	bone tempered engraved
RWA002	Carden Bottoms locality	3YE25	Pre-cut: 14.6; Sherd submitted: 6.3	5	shell tempered plain (w/appliqued ridge)
RWA003	Carden Bottoms locality	3YE25	Pre-cut: 17.5; Sherd submitted: 3.2	6	shell tempered incised
RWA004	Carden Bottoms locality	3YE25	Pre-cut: 9.4; Sherd submitted: 3.4	5.5	Military Road Incised?
RWA005	Carden Bottoms locality	3YE25	3.8	6	shell tempered brushed/trailed sherd
RWA006	Carden Bottoms locality	3YE25	Pre-cut: 23; Sherd submitted: 5.4	6 - 7	shell tempered trailed
RWA007	Carden Bottoms locality	3YE25	4.2	5	Carson Red on Buff
RWA008	Carden Bottoms locality	3YE25	Pre-cut: 11.9; Sherd submitted: 3.4	5.5	Hodges Engraved
RWA009	Carden Bottoms locality	3YE25	Pre-cut: 25.4; Sherd submitted: 8.8	6	Keno Trailed
RWA010	Carden Bottoms locality	3YE25	1.95	5.5	bone tempered engraved
RWA011	Carden Bottoms locality	3YE25	4.2	5 @ lip; 7 @ 8 mm below lip	Barton Incised
RWA012	Carden Bottoms locality	3YE25	12.1	5	Barton Incised
RWA013	Carden Bottoms locality	3YE25	3	5.5	Carson Red on Buff

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA001	bottle?	smooth, hard and compact, fine-textured, mica in paste; color 5YR3/4 (ext), 5YR6/4 (int), 5YR7/2 (core)	bone	
RWA002		fine to medium-textured, medium hardness, sparse sand and red pigment inclusions in paste; color 5YR5/8 -5YR7/8 (ext), 5YR6/4 (int), 5YR5/1	shell	
RWA003		fine to medium-textured, medium hardness, sparse sand in paste; color 5YR6/8 (ext), 5YR3/3 (int), 5YR5/1 (core)	shell	
RWA004		fine to medium-textured, soft, sparse mica in paste; color 5YR3/4-5YR7/8 (ext), 5YR5/6 (int), 5YR6/1 (core)	bone	shell
RWA005		fine to medium-textured, soft, some sand in paste, smooth 'soapy' feel; color 5YR4/4-5YR7/8 (ext), 5YR5/8 (int/core)	shell	
RWA006		fine to medium-textured, medium hardness, sparse mica in paste; color 5YR4/4 (ext/int), 5YR4/3 (core)	shell	
RWA007	bottle	fine to medium-textured, medium hardness, some sand in paste; color 10R3/6 (ext paint), 5YR5/2 (int), 5YR3/2 (core)	shell	
RWA008	bowl	smooth, hard and compact, very fine-textured; color 5YR4/4 (ext/int), 5YR6/1 (core)	bone	shell?
RWA009	bottle	fine-textured, medium hardness, some mica or sand in paste; color 5YR4/4 (ext/int), 5YR 6/1 (core)	bone	shell
RWA010		smooth, hard and compact, very fine-textured, sparse mica in paste; color 5YR4/4 (ext/int), 5YR6/4 (core)	bone	
RWA011		medium to coarse-textured, soft and friable, sparse mica in paste; color 5YR5/6 (ext/int), 5YR5/4 (core)	shell	
RWA012		medium to coarse-textured, soft and friable, smooth 'soapy' feel, sparse mica in paste; color 5YR4/3 (ext/core), 5YR5/4 (int)	shell	
RWA013	bowl	fine to medium-textured, soft, grainy feel, sparse mica in paste; color 2.5YR7/8 (ext/int), 10R4/8 (paint), 2.5YR6/4 (core)	bone	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA001	plain	engraved with light burnishing; portions of 2 parallel arcing lines visible on larger sherd
RWA002	plain	polished slip w/asymmetrical appliqued ridge
RWA003	plain	incised and burnished slip with traces of red pigment in designs
RWA004	plain	brushed/trailed with light burnishing
RWA005	plain	brushed/trailed w/light burnishing
RWA006	plain, but lightly burnished	trailed and lightly burnished w/7 parallel lines arranged in concentric arcs visible; lines are ~2 mm wide and spaced 2-3 mm apart
RWA007	plain	red paint w/burnishing
RWA008	polished, but no decoration visible	engraved and polished; curvilinear design visible w/crosshatched infilling; "spacers" between curvilinear design motifs infilled w/ crosshatching
RWA009	plain	burnished; sherd is plain, but comes from trailed vessel
RWA010	burnished, but no decoration visible	engraved and burnished/polished with horizontal line below lip; one angled line meeting horizontal line visible
RWA011	plain	incised with 2 parallel angled lines visible (1mm wide, spaced 6 mm apart)
RWA012	plain	incised with horizontal line at rim/body juncture; 4 other angled lines visible (part of a line-filled triangle motif); lines are 1.5 mm wide
RWA013	red paint	plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA001	House 1, Unit N988 E938	Level 8, 99.31 cmbd (beginning depth), Feature 88	Carden Bottoms phase	330-310 YBP
RWA002	House 1, Unit N986 E940	Feature 87 fill, 99.66-99.52 cmbd	Carden Bottoms phase	330-310 YBP
RWA003	House 1, Unit N986 E940	Level 3	Carden Bottoms phase	330-310 YBP
RWA004	House 1, Unit N986 E940	Level 3	Carden Bottoms phase	330-310 YBP
RWA005	House 1, Unit N988 E938	Level 7, 99.42-99.31 cmbd	Carden Bottoms phase	330-310 YBP
RWA006	House 1, Unit N988 E938	Level 7, 99.42-99.31 cmbd	Carden Bottoms phase	330-310 YBP
RWA007	House 1, Unit N986 E940	Feature 87 fill, 99.75-99.66 cmbd	Carden Bottoms phase	330-310 YBP
RWA008	House 1, Unit N986 E940	Level 4, 99.52 cmbd (beginning depth)	Carden Bottoms phase	330-310 YBP
RWA009	House 1, Unit N986 E938	Level 3, 99.59-99.49 cmbd, Features 87, 88	Carden Bottoms phase	330-310 YBP
RWA010	House 1, Unit N988 E938	Level 8, 99.31 cmbd (beginning depth), Feature 88	Carden Bottoms phase	330-310 YBP
RWA011	House 1, Unit N986 E938	Feature 87 fill, 99.59-99.49 cmbd	Carden Bottoms phase	330-310 YBP
RWA012	House 1, Unit N988 E938	Feature 87 column sample, 99.65-99.57 cmbd	Carden Bottoms phase	330-310 YBP
RWA013	House 1, Unit N988 E938	Level 2, 99.75-99.65 cmbd, Feature 87	Carden Bottoms phase	330-310 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA001	Likely nonlocal (Caddo), body sherd (cut for analysis) from same vessel as 1 other sherd
RWA002	Possibly nonlocal - provenance uncertain, body sherd (cut for analysis)
RWA003	Likely local "hybrid" vessel, possibly nonlocal (Caddo), body sherd (cut for analysis) from same vessel as 2 other sherds, sooting on interior
RWA004	Possibly nonlocal (Caddo), body sherd (cut for analysis), fire clouding on exterior
RWA005	Likely local "hybrid" vessel, possibly nonlocal (Caddo), body sherd, fire clouding on exterior
RWA006	Possibly nonlocal - provenance uncertain, slightly everted rim sherd w/slightly rounded lip (cut for analysis, 32 cm estimated orifice diameter), abundant temper
RWA007	Likely local; possibly nonlocal (Mississippi Valley), body sherd from same vessel as 3 other sherds (refits to 1 of them)
RWA008	Likely nonlocal (Caddo), rim sherd w/slightly rounded lip (cut for analysis, 20 cm estimated orifice diameter) from same vessel as 1 other sherd
RWA009	Likely nonlocal (Caddo), body sherd (cut for analysis) from same vessel as 5 other sherds
RWA010	Likely nonlocal (Caddo), rim sherd w/slightly rounded lip
RWA011	Likely local, rim sherd w/thin, slightly rounded lip, abundant temper
RWA012	Likely local, rim/body sherd w/lip missing, eroded surfaces
RWA013	Likely local, body sherd from same vessel as 1 other sherd

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA014	2010-380-140-1-4	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA015	2010-380-117-1-5	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA016	2010-380-117-1-8	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA017	2010-380-101-1-26	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA018	2010-380-111-1-5	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA019	2010-380-101-1-13	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA020	2010-380-111-1-10	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA021	2011-400-443-1-8	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA022	2011-400-443-1-7	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA023	2011-400-276-1-2	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA024	2011-400-199-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA025	2011-400-443-1-2	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA026	2011-400-313-1-3	Arkansas Archeological Survey	Yell	Central Arkansas River Valley

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA014	Carden Bottoms locality	3YE25	6.8	4 @ lip; 6.5 @ 13 mm below lip	Barton Incised
RWA015	Carden Bottoms locality	3YE25	15.4	7.5	Barton Incised
RWA016	Carden Bottoms locality	3YE25	4.3	5.5	Barton Incised
RWA017	Carden Bottoms locality	3YE25	4.7	5	shell tempered brushed
RWA018	Carden Bottoms locality	3YE25	9.4	7	Carson Red on Buff
RWA019	Carden Bottoms locality	3YE25	5.1	5.5	Carson Red on Buff?
RWA020	Carden Bottoms locality	3YE25	2.3	6	Carson Red on Buff
RWA021	Carden Bottoms locality	3YE25	6.8	6.3	bone tempered plain with burnishing
RWA022	Carden Bottoms locality	3YE25	3	6.2	Carson Red on Buff
RWA023	Carden Bottoms locality	3YE25	2.7	5	shell tempered incised
RWA024	Carden Bottoms locality	3YE25	2.4	3.5 @ lip; 6.8 @ 7.5 mm below	Mississippi Plain
RWA025	Carden Bottoms locality	3YE25	5.2	5 - 7	Barton Incised
RWA026	Carden Bottoms locality	3YE25	7.5	7	Mississippi Plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA014		fine to medium-textured, soft and friable, sparse mica in paste; color 5YR5/6 (ext), 5YR7/8 (int), 5YR3/2 (core)	shell	
RWA015		fine to medium-textured, soft; color 5YR5/3 (ext/int), 5YR4/3 (core)	shell	
RWA016		fine to medium-textured, soft; color 5YR5/4 (ext), 5YR4/4 (int/core)	shell	
RWA017		medium to coarse-textured, soft and friable, sparse mica in paste; color 5YR6/4 (ext/int), 5YR5/2 (core)	shell	
RWA018	bowl	fine-textured, soft, sparse mica in paste; color 5YR4/6-5YR7/8 (ext), 5YR7/8 (int), 10R3/6 (paint), 5YR4/2 (core)	shell	
RWA019	bowl?	fine-textured, soft, sparse mica in paste; color 5YR7/6 (ext/int), 10R4/8 (paint), 5YR7/1 (core)	shell	
RWA020	bowl	fine-textured and compact, mica in paste; color 5YR6/6 (ext), 5YR7/8 (int), 10R4/8 (paint), 5YR3/2 (core)	bone	shell
RWA021		very fine-textured and compact, mica in paste; color 5YR4/4 (ext), 5YR5/4 (int), 5YR3/1 (core)	bone	
RWA022	bowl	fine to medium-textured, soft, grainy surface, sparse mica in paste; color 2.5YR6/8 (ext), 2.5YR7/8 (int), 10R4/8 (paint), 2.5YR4/2 (core)	bone	
RWA023		medium to coarse-textured, soft and friable; color 5YR5/4 (ext), 5YR4/4 (int), 5YR3/1 (core)	shell	
RWA024		fine-textured, soft; color 2.5YR6/8 (ext/int), 2.5YR6/4 (core)	shell	
RWA025		fine-textured, soft, 'soapy' feel; color 5YR7/6 (ext), 5YR7/4 (int), 5YR5/1 (core)	shell	
RWA026		fine-textured, soft, sparse mica in paste; color 5YR6/8 (ext), 5YR5/4 (int), 5YR4/2 (core)	shell	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA014	plain	incised w/portions of 4 angled lines visible (likely part of a line-filled triangle motif); lines are 1-2 mm wide, spaced 7-10 mm apart
RWA015	plain	incised w/portions of 6 angled lines visible (part of line-filled triangle motif); lines are 1-2 mm wide, spaced 5-10 mm apart
RWA016	plain	incised w/horizontal line below lip and 3 parallel angled lines visible (1 mm wide, spaced 9 mm apart)
RWA017	plain	brushed
RWA018	traces of red paint	plain
RWA019	red paint	red paint
RWA020	red painted band	red paint
RWA021	plain	burnished, but no decoration visible
RWA022	red paint	possible trace burnishing, but no decoration visible
RWA023	plain	incised with portion of one line visible (1 mm wide)
RWA024	plain	plain
RWA025	plain	incised w/portions of 6 angled lines visible (part of line-filled triangle motif; lines are 1 mm wide and spaced 3-5 mm apart)
RWA026	plain	plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA014	House 1, Unit N986 E938	N987.844 E938.289, Feature 88 fill, 99.71-99.09 cmbd	Carden Bottoms phase	330-310 YBP
RWA015	House 1, Unit N988 E938	Level 3, 99.65-99.57 cmbd, Feature 87	Carden Bottoms phase	330-310 YBP
RWA016	House 1, Unit N988 E938	Level 3, 99.65-99.57 cmbd, Feature 87	Carden Bottoms phase	330-310 YBP
RWA017	House 1, Unit N986 E938	Level 2, 99.69-99.59 cmbd, Feature 87	Carden Bottoms phase	330-310 YBP
RWA018	House 1, Unit N990 E938	Level 2, 99.74-99.65 cmbd, Feature 87	Carden Bottoms phase	330-310 YBP
RWA019	House 1, Unit N986 E938	Level 2, 99.69-99.59 cmbd, Feature 87	Carden Bottoms phase	330-310 YBP
RWA020	House 1, Unit N990 E938	Level 2, 99.74-99.65 cmbd, Feature 87	Carden Bottoms phase	330-310 YBP
RWA021	House 2, Unit N938 E726	Level 1, 99.709-99.61 cmbd	Carden Bottoms phase	330-310 YBP
RWA022	House 2, Unit N938 E726	Level 1, 99.709-99.61 cmbd	Carden Bottoms phase	330-310 YBP
RWA023	House 2, Unit N938 E724	Level 2, House floor? 99.63-99.52 cmbd	Carden Bottoms phase	330-310 YBP
RWA024	House 2, Unit N938 E722	Level 2, 99.65-99.63 cmbd	Carden Bottoms phase	330-310 YBP
RWA025	House 2, Unit N938 E726	Level 1, 99.709-99.61 cmbd	Carden Bottoms phase	330-310 YBP
RWA026	House 2, Unit N940 E726	Level 2, House floor? 99.64-99.55 cmbd	Carden Bottoms phase	330-310 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA014	Likely local, rim sherd w/portion of lip intact (rolled), eroded surfaces
RWA015	Likely local, rim sherd w/lip eroded, eroded surfaces, abundant temper
RWA016	Likely local, rim sherd w/lip missing, eroded surfaces, abundant (leached) temper
RWA017	Likely local "hybrid" vessel, resembles Pease Brushed-Incised (Caddo), body sherd from same vessel as 7 other sherds
RWA018	Likely local, body sherd, fire clouding on exterior
RWA019	Likely local, rim sherd w/lip missing, eroded surfaces, abundant temper
RWA020	Likely local, body sherd from same vessel as 4 other sherds
RWA021	Likely nonlocal (Caddo), burnished exterior and well smoothed interior, body sherd from same vessel as 1 other sherd
RWA022	Likely local, rim sherd w/lip missing from same vessel as 2 other sherds, abundant temper
RWA023	Likely local, body sherd refits to 1 other sherd, eroded surfaces, abundant temper
RWA024	Likely local, plain rim sherd w/thin, slightly rounded lip, eroded surfaces
RWA025	Likely local, body sherd w/lower part of rim, eroded surfaces, abundant temper
RWA026	Likely local, body sherd, eroded exterior, well smoothed interior

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA027	2011-400-396-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA028	2011-400-443-1-5	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA029	2011-400-307-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA030	2011-400-385-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA031	2011-400-189-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA032	2011-400-211-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA033	2011-400-399-1-4	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA034	2011-400-339-1-2	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA035	2011-400-316-1-2	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA036	2011-400-511-1-4	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA037	2011-400-346-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA038	2011-400-446-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA039	2011-400-254-1-3	Arkansas Archeological Survey	Yell	Central Arkansas River Valley

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA027	Carden Bottoms locality	3YE25	2.7	5	Mississippi Plain
RWA028	Carden Bottoms locality	3YE25	2	5	shell tempered trailed
RWA029	Carden Bottoms locality	3YE25	7.1	7	Mississippi Plain
RWA030	Carden Bottoms locality	3YE25	Pre-cut: 35.6; Sherd submitted: 5.5	8	Mississippi Plain
RWA031	Carden Bottoms locality	3YE25	3.8	6	Carson Red on Buff?
RWA032	Carden Bottoms locality	3YE25	7.9	6 @ lip; 7.5 @ 2 cm below lip	Mississippi Plain
RWA033	Carden Bottoms locality	3YE25	3.8	5	Mississippi Plain
RWA034	Carden Bottoms locality	3YE25	2.5	6	Mississippi Plain
RWA035	Carden Bottoms locality	3YE25	5.8	5.5	bone tempered plain
RWA036	Carden Bottoms locality	3YE25	6.9	7	Bell Plain
RWA037	Carden Bottoms locality	3YE25	3	4	Mississippi Plain
RWA038	Carden Bottoms locality	3YE25	6.4	6	Mississippi Plain
RWA039	Carden Bottoms locality	3YE25	4	7.5	bone tempered plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA027		fine to medium-textured, soft and friable, sparse mica in paste; color 5YR6/8 (ext), 5YR6/6 (int), 5YR6/2 (core)	shell	
RWA028		fine to medium-textured, soft and friable, sparse mica in paste; color 5YR6/6 (ext/int), 5YR4/4 (core)	shell	
RWA029		fine to medium-textured, soft, mica in paste; color 5YR5/8 (ext), 5YR5/6 (int), 5YR3/2 (core)	shell	
RWA030		fine-textured, smooth and compact, mica in paste; color 5YR4/4-5YR7/8 (ext), 5YR5/4 (int), 5YR7/1 (core)	shell	
RWA031		fine-textured, compact, medium hardness, grainy feel; color 10R4/8 (ext paint), 5YR5/3 (int), 5YR3/2 (core)	bone	
RWA032		medium to coarse-textured, soft and friable, sparse mica in paste; color 5YR4/4 (ext), 5YR3/4 (int/core)	shell	
RWA033		medium to coarse-textured, soft and friable, sparse mica in paste; color 5YR6/8 (ext), 5YR4/3 (int/core)	shell	
RWA034		fine to medium-textured, soft, 'soapy' feel; color 5YR6/8 (ext), 5YR3/4 (int/core)	shell	
RWA035	bowl?	fine-textured, smooth and compact, sparse mica and sand in paste; color 5YR6/6 (ext), 5YR6/4 (int), 5YR5/2 (core)	bone	
RWA036		fine to medium-textured, medium hardness, mica in paste; color 5YR7/4 (ext/core), 5YR6/4 (int)	shell	
RWA037	bowl?	fine-textured, smooth and compact; color 5YR6/4 (ext), 5YR5/3 (int/core)	shell	
RWA038		fine-textured, soft and friable; color 5YR6/8 (ext), 5YR3/3 (int), 5YR5/3 (core)	shell	
RWA039	bowl?	fine-textured, smooth and compact; color 5YR6/8 (ext), 5YR6/4 (int), 5YR4/4 (core)	bone	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA027	plain	plain
RWA028	plain	trailed w/portions of 2 parallel angled lines visible (3 mm wide, spaced 7 mm apart)
RWA029	plain	plain
RWA030	plain	plain
RWA031	plain	red paint
RWA032	plain	plain
RWA033	plain	plain
RWA034	plain	plain
RWA035	plain	plain
RWA036	plain	lightly burnished, but no decoration visible
RWA037	plain, but lightly burnished	plain, but trace burnishing
RWA038	plain	plain
RWA039	plain	plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA027	House 2, Unit N938 E720	Level 2, 99.70-99.618 cmbd	Carden Bottoms phase	330-310 YBP
RWA028	House 2, Unit N938 E726	Level 1, 99.709-99.61 cmbd	Carden Bottoms phase	330-310 YBP
RWA029	House 2, Unit N942 E720	Level 1, 99.80-99.72 cmbd	Carden Bottoms phase	330-310 YBP
RWA030	House 2, Unit N937 E722	Level 1, 99.767-99.66 cmbd	Carden Bottoms phase	330-310 YBP
RWA031	House 2, Unit N942 E722	Level 1, 99.79-99.69 cmbd	Carden Bottoms phase	330-310 YBP
RWA032	House 2, Unit N944 E722	Level 1, 99.77-99.69 cmbd	Carden Bottoms phase	330-310 YBP
RWA033	House 2, Unit N944 E726	Level 3, House floor, 99.65-99.562 cmbd	Carden Bottoms phase	330-310 YBP
RWA034	House 2, Unit N942 E720	Level 3, House floor, 99.64-99.55 cmbd	Carden Bottoms phase	330-310 YBP
RWA035	House 2, Unit N938 E722	Level 3, House floor, 99.54-99.44 cmbd	Carden Bottoms phase	330-310 YBP
RWA036	House 2, Unit N942 E726	N943.661 E726.096, Feature 197 fill, 99.645-99.232 cmbd	Carden Bottoms phase	330-310 YBP
RWA037	House 2, Unit N940 E726	Level 4, House floor, 99.5-99.4 cmbd	Carden Bottoms phase	330-310 YBP
RWA038	House 2, Unit N938 E720	Level 4, House floor, 99.524-99.40 cmbd	Carden Bottoms phase	330-310 YBP
RWA039	House 2, Unit N940 E724	Level 4, 99.5-99.4 cmbd	Carden Bottoms phase	330-310 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA027	Likely local, body sherd, eroded surfaces, abundant temper
RWA028	Likely local, rim sherdlet w/slightly flattened lip, eroded surfaces, abundant temper
RWA029	Likely local, body sherd, eroded surfaces, abundant (leached) temper
RWA030	Likely local, but possibly nonlocal (Caddo?), body sherd (cut for analysis), fire clouding on exterior
RWA031	Likely local, body sherd
RWA032	Likely local, plain rim sherd w/lip impressions (crenelated, estimated 26 cm orifice diameter), eroded surfaces, abundant temper
RWA033	Likely local, body sherd, eroded surfaces, abundant temper
RWA034	Likely local, body sherd, eroded surfaces, sooting on interior, abundant temper
RWA035	Likely nonlocal (Caddo), body sherd w/very smooth interior and exterior
RWA036	Likely local, body sherd, abundant temper
RWA037	Likely local, body sherd w/well smoothed interior and exterior, eroded exterior
RWA038	Likely local, body sherd, eroded surfaces, sooting on interior, abundant (leached) temper
RWA039	Likely local, body sherd w/very smooth interior and eroded exterior

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA040	2011-400-227-1-9	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA041	2011-400-7-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA042	2011-400-40-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA043	2011-400-163-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA044	2011-400-63-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA045	2011-400-49-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA046	2011-400-2-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA047	2011-400-56-1-2	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA048	2011-400-119-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA049	2011-400-88-1-2	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA050	2011-400-46-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA051	2011-400-167-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA052	2011-400-37-1-3	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA053	2011-400-40-1-5	Arkansas Archeological Survey	Yell	Central Arkansas River Valley

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA040	Carden Bottoms locality	3YE25	2	6.5	shell tempered red painted
RWA041	Carden Bottoms locality	3YE25	Pre-cut: 22.6; Sherd submitted: 9	6.5	bone tempered brushed
RWA042	Carden Bottoms locality	3YE25	3.5	5	bone tempered engraved
RWA043	Carden Bottoms locality	3YE25	3.7	6	shell tempered incised and punctated
RWA044	Carden Bottoms locality	3YE25	1.9	5	Keno Trailed?
RWA045	Carden Bottoms locality	3YE25	6.9	6	Keno Trailed
RWA046	Carden Bottoms locality	3YE25	3.3	3.8	Keno Trailed?
RWA047	Carden Bottoms locality	3YE25	2.6	5	Mississippi Plain
RWA048	Carden Bottoms locality	3YE25	2.7	5	Mississippi Plain
RWA049	Carden Bottoms locality	3YE25	1.7	4 @ lip; 5.5 @ 1 cm below lip	Mississippi Plain
RWA050	Carden Bottoms locality	3YE25	5.5	6	Mississippi Plain
RWA051	Carden Bottoms locality	3YE25	3.3	7.5	Mississippi Plain
RWA052	Carden Bottoms locality	3YE25	9.1	6.5	shell tempered plain
RWA053	Carden Bottoms locality	3YE25	3.2	6	Mississippi Plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA040		fine-textured, soft and friable; color 5YR7/6 (ext/int/core), 10R4/8 (paint)	shell	
RWA041		fine-textured, compact, medium hardness, grainy feel; color 5YR7/8 (ext), 5YR7/3 (int/core)	bone	
RWA042	bowl	fine-textured, smooth and compact, sparse mica in paste; color 5YR5/4 (ext/int), 5YR4/2 (core)	bone	
RWA043	bowl	fine-textured, soft; color 5YR7/6 (ext), 5YR5/6 (int/core)	shell	
RWA044		fine-textured, smooth and compact, 'soapy' feel; color 5YR5/4 (ext/int), 5YR4/2 (core)	shell	
RWA045	bowl	fine-textured, smooth and compact, sparse mica in paste; color 5YR7/8 (ext), 6YR6/4 (int), 5YR5/2 (core)	grog	grit
RWA046		fine-textured and compact, mica in paste; color 5YR4/3-5YR7/4 (ext), 5YR5/4 (int/core)	shell	
RWA047	bowl	fine-textured, soft and friable, sparse mica in paste; color 5YR3/4 (ext/core), 5YR4/4 (int)	shell	
RWA048		fine to medium-textured, soft and friable, sparse mica in paste; color 5YR7/8 (ext), 5YR4/3 (int/core)	shell	
RWA049		fine to medium-textured, soft and friable, sparse mica in paste; color 5YR5/6 (ext/int), 5YR4/3 (core)	shell	
RWA050		fine-textured, soft, sparse mica in paste; color 5YR7/4 (ext/int/core)	shell	
RWA051		fine to medium-textured, soft and friable, sparse mica in paste; color 5YR6/6 (ext), 5YR4/6 (int/core)	shell	
RWA052	bowl?	very fine-textured, hard and compact, sparse mica in paste; color 5YR4/6 (ext/int/core)	shell	
RWA053		fine to medium-textured, soft and friable; color 5YR5/4 (ext), 5YR4/3 (int)	shell	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA040	red paint	red paint
RWA041	plain	band of brushing on larger sherd (from which sample was taken)
RWA042	plain	plain body sherd from engraved carinated bowl with rim design containing 3 or 4 rounded rectangular panels infilled w/crosshatching
RWA043	plain	plain body sherd that refits to rim sherd with 3 deeply incised parallel angled lines and 8 round punctations
RWA044	plain	portions of 2 parallel trailed lines visible, but refits to larger sherd w/8 lines visible; lines are 1.5 mm wide and are spaced 2-3 mm apart
RWA045	plain	trailed w/parallel curved lines; refits to other sherds w/scroll motif; lines are ~1.5 mm wide and are spaced 2-5 mm apart
RWA046	plain	trailed w/arcing line pattern; lines are 1 mm wide and are spaced 3-4 mm apart
RWA047	plain	plain
RWA048	plain	plain
RWA049	plain	plain
RWA050	plain	plain
RWA051	plain	plain
RWA052	plain	plain
RWA053	plain	plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA040	House 2, Unit N944 E722	Level 2, House floor? 99.69-99.58 cmbd	Carden Bottoms phase	330-310 YBP
RWA041	House 3, Unit N958 E760	Level 1, 99.886-99.850 cmbd	Carden Bottoms phase	330-310 YBP
RWA042	House 3, Unit N956 E762	Above floor, 99.826-99.625 cmbd (floor)	Carden Bottoms phase	330-310 YBP
RWA043	House 3, Unit N958 E764	Below floor, 99.57-99.54 cmbd	Carden Bottoms phase	330-310 YBP
RWA044	House 3, Unit N962 E760	Above floor, 99.878-99.679 cmbd (floor)	Carden Bottoms phase	330-310 YBP
RWA045	House 3, Unit N962 E762	N962.858 E762.901, House floor, 99.715 cmbd	Carden Bottoms phase	330-310 YBP
RWA046	House 3, Unit N956 E766	Level 1, 99.803-99.719 cmbd, Feature 91	Carden Bottoms phase	330-310 YBP
RWA047	House 3, Unit N958 E764	Above floor, 99.85-99.649 cmbd (floor)	Carden Bottoms phase	330-310 YBP
RWA048	House 3, Unit N962 E762	House floor, 99.725-99.63 cmbd	Carden Bottoms phase	330-310 YBP
RWA049	House 3, Unit N956 E760	Above floor, 99.811-99.633 cmbd (floor), Feature 111	Carden Bottoms phase	330-310 YBP
RWA050	House 3, Unit N962 E762	House floor, 99.761-99.725 cmbd, Features 96, 97	Carden Bottoms phase	330-310 YBP
RWA051	House 3, Unit N956 E764	Below floor, 99.63-99.54 cmbd	Carden Bottoms phase	330-310 YBP
RWA052	House 3, Unit N960 E760	Level 1, 99.82-99.63 cmbd	Carden Bottoms phase	330-310 YBP
RWA053	House 3, Unit N956 E762	Above floor, 99.826-99.625 cmbd (floor)	Carden Bottoms phase	330-310 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA040	Likely local, body sherdlet, eroded surfaces, abundant (leached) temper
RWA041	Likely local, but possibly nonlocal (Caddo?), body sherd (cut for analysis)
RWA042	Possible local ('hybrid') vessel or nonlocal (Caddo), body sherd from same vessel as 17 other sherds (engraved carinated bowl)
RWA043	Likely local, refits to rim sherd w/deep incising and punctations, rim is outward flaring w/slightly flattened lip, eroded surfaces, sooting (int and ext?), abundant temper
RWA044	Likely nonlocal (Caddo), body sherd that refits to 1 other sherd
RWA045	Likely nonlocal (Caddo), body sherd (surface eroded) that refits to other sherds from same vessel
RWA046	Likely nonlocal (Caddo), body sherd (surface eroded), fire clouding on exterior
RWA047	Likely local, plain crenelated rim sherd from same vessel as 1 other sherd, eroded surfaces, abundant (leached) temper
RWA048	Likely local, body sherd from same vessel as several other sherds, eroded surfaces, abundant (leached) temper
RWA049	Likely local, rim sherdlet w/slightly flattened lip (2 lip impressions visible), eroded surfaces, abundant (leached) temper
RWA050	Likely local, body sherd, eroded surfaces, abundant (leached) temper
RWA051	Likely local, body sherd, eroded surfaces, abundant temper
RWA052	Likely nonlocal (Caddo?), body sherd w/smooth interior and exterior
RWA053	Likely local, body sherd, sooting on interior, eroded surfaces, abundant (leached) temper

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA054	2011-400-22-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA055	2011-400-53-1-3	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA056	2011-400-17-1-2	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA057	2011-400-59-1-3	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA058	2011-400-6-1-5	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA059	2011-400-81-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA060	2011-400-141-1-1	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA061	2012-364-41-1-26	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA062	2010-380-117-1-25	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA063	n/a	Arkansas Archeological Survey	Yell	Central Arkansas River Valley
RWA064	63-52-11-1	Charles McGimsey and Jim Schultz	Crittenden	Central Mississippi Valley
RWA065	63-52-11-2	Charles McGimsey and Jim Schultz	Crittenden	Central Mississippi Valley
RWA066	63-52-8-1A	Charles McGimsey and Jim Schultz	Crittenden	Central Mississippi Valley

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA054	Carden Bottoms locality	3YE25	6.9	6	Mississippi Plain
RWA055	Carden Bottoms locality	3YE25	4.9	5.5	Mississippi Plain
RWA056	Carden Bottoms locality	3YE25	4.6	5	bone tempered plain
RWA057	Carden Bottoms locality	3YE25	1.8	5.5	bone and shell tempered brushed
RWA058	Carden Bottoms locality	3YE25	3.5	8	Mississippi Plain
RWA059	Carden Bottoms locality	3YE25	4.7	6	Mississippi Plain
RWA060	Carden Bottoms locality	3YE25	4.3	9.5	Mississippi Plain
RWA061	Carden Bottoms locality	3YE25	1.6	4 - 6	n/a
RWA062	Carden Bottoms locality	3YE25	2.1	7.5	n/a
RWA063	Carden Bottoms locality	3YE25	70	n/a	n/a
RWA064	Beck Place	3CT8	11.3	6	Barton Incised
RWA065	Beck Place	3CT8	15.6	7	Barton Incised *v* . Kent
RWA066	Beck Place	3CT8	4.3	9	Carson Red on Buff

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA054		fine-textured, soft, sparse mica or sand in paste; color 5YR7/6 (ext), 5YR7/8 (int), 5YR4/6 (core)	shell	
RWA055		very fine-textured, smooth and compact, soft; color 5YR5/3 (ext/core), 5YR6/4 (int)	shell	
RWA056		very fine-textured, smooth and compact, medium hardness, sparse mica or sand in paste; color 5YR6/4 (ext), 5YR5/4 (int/core)	bone	
RWA057		fine to medium-textured, soft and friable; color 5YR7/4 (ext/int), 5YR5/2 (core)	bone	shell
RWA058		fine to medium-textured, soft, grainy feel, sand in paste; color 5YR7/8 (ext), 5YR7/6 (int), 5YR7/3 (core)	shell	
RWA059		fine to medium-textured, soft and friable, sparse mica in paste; color 5YR7/6 (ext/int/core)	shell	
RWA060		fine-textured, soft, sparse mica or sand in paste; color 5YR7/6 (ext), 5YR6/4 (int), 5YR6/4-5YR7/6 (core)	shell	
RWA061	n/a	fine-textured, soft, sparse mica in paste; color 5YR7/6	none visible	
RWA062	n/a	fine-textured, soft, mica in paste; color 5YR7/6-5YR7/8	none visible	
RWA063	n/a	color: 5YR5/4 (dry), 5YR4/4 (moist)	n/a	
RWA064		fine to medium-textured, hard and compact, some sand in paste; color 5YR7/4 (ext/int/core)	shell	
RWA065		fine to medium-textured, medium hardness; color 5YR6/4 (ext), 5YR5/4 (int), 5YR4/4 (core)	shell	
RWA066	bowl	fine-textured, smooth and compact surfaces, but soft and friable paste; color 5YR7/8 (ext), 5YR7/6 (int), 5YR6/3 (core)	shell	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA054	plain	plain
RWA055	plain	plain
RWA056	plain	plain
RWA057	plain	brushed
RWA058	plain	plain
RWA059	plain	plain
RWA060	plain	plain
RWA061	n/a	n/a
RWA062	n/a	n/a
RWA063	n/a	n/a
RWA064	plain	incised triangle motif w/portions of 7 angled lines visible (1 mm wide, spaced 3-6 mm apart)
RWA065	plain	incised w/portions of 3 parallel slightly angled lines visible (1 mm wide, spaced 5-9 mm apart)
RWA066	plain	plain, but from red painted vessel

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA054	House 3, Unit N958 E760	Above floor, 99.723-99.649 cmbd (floor)	Carden Bottoms phase	330-310 YBP
RWA055	House 3, Unit N962 E764	Above floor, 99.85-99.68 cmbd (floor)	Carden Bottoms phase	330-310 YBP
RWA056	House 3, Unit N958 E762	Level 1, 100.085-99.86 cmbd	Carden Bottoms phase	330-310 YBP
RWA057	House 3, Unit N960 E764	Level 1	Carden Bottoms phase	330-310 YBP
RWA058	House 3, Backhoe Trench N966 E752	Stratum 2, 99.72-99.50 cmbd, Feature 92	Carden Bottoms phase	330-310 YBP
RWA059	House 3, Unit N956 E758	Above floor, 99.81-99.61 cmbd (floor)	Carden Bottoms phase	330-310 YBP
RWA060	House 3, Unit N958 E760	House floor, 99.649-99.6 cmbd	Carden Bottoms phase	330-310 YBP
RWA061	House 1, Unit N986 E940	Level 3	Carden Bottoms phase	330-310 YBP
RWA062	House 1, Unit N988 E938	Level 3, 99.65-99.57 cmbd, Feature 87	Carden Bottoms phase	330-310 YBP
RWA063	Pit south of House 1, Units 100, 101	Feature 264	n/a	n/a
RWA064	surface	surface	Belle-Meade phase	ca 550-300 YBP
RWA065	surface	surface	Belle-Meade phase	ca 550-300 YBP
RWA066	surface	surface	Belle-Meade phase	ca 550-300 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA054	Likely local, body sherd, sooting on interior, eroded surfaces, abundant (leached) temper
RWA055	Likely local, but possible nonlocal (provenance uncertain), body sherd, eroded surfaces
RWA056	Likely nonlocal (Caddo?), body sherd from same vessel as 4 other sherds
RWA057	Likely local, but possibly nonlocal (Caddo), body sherd
RWA058	Likely local, but possibly nonlocal (Mississippi Valley?)
RWA059	Likely local, body sherd, eroded surfaces, abundant (leached) temper
RWA060	Likely local, body sherd, eroded surfaces
RWA061	Fired pottery coil (example of local paste)
RWA062	Fired clay coil or "plug" w/reed impression (example of local paste)
RWA063	Raw clay dug from feature (example of local clay); 70 g dry weight
RWA064	Rim sherd w/outflaring/rolled lip (portions of lip eroded)
RWA065	Rim sherd w/everted, slightly rounded lip, surfaces eroded, abundant (leached) temper
RWA066	Body sherd cut from larger vessel for analysis

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA067	63-52-8-2	Charles McGimsey and Jim Schultz	Crittenden	Central Mississippi Valley
RWA068	63-52-7-1	Charles McGimsey and Jim Schultz	Crittenden	Central Mississippi Valley
RWA069	63-52-7-2	Charles McGimsey and Jim Schultz	Crittenden	Central Mississippi Valley
RWA070	63-52-7-3	Charles McGimsey and Jim Schultz	Crittenden	Central Mississippi Valley
RWA071	67-17-2-1A	McPherson	Crittenden	Central Mississippi Valley
RWA072	67-17-2-2A	McPherson	Crittenden	Central Mississippi Valley
RWA073	67-17-2-3A	McPherson	Crittenden	Central Mississippi Valley
RWA074	67-17-2-4A	McPherson	Crittenden	Central Mississippi Valley
RWA075	67-17-2-5A	McPherson	Crittenden	Central Mississippi Valley
RWA076	67-17-2-9A	McPherson	Crittenden	Central Mississippi Valley
RWA077	67-17-1-1	McPherson	Cross	Central Mississippi Valley
RWA078	67-17-1-2	McPherson	Cross	Central Mississippi Valley
RWA079	67-17-1-3	McPherson	Cross	Central Mississippi Valley

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA067	Beck Place	3CT8	8.5	7	Carson Red on Buff
RWA068	Beck Place	3CT8	4.3	4	Parkin Punctated
RWA069	Beck Place	3CT8	5.7	7	Parkin Punctated
RWA070	Beck Place	3CT8	5.7	7	Parkin Punctated
RWA071	Bradley	3CT7	7	7	Mississippi Plain
RWA072	Bradley	3CT7	8.5	9	Bell Plain
RWA073	Bradley	3CT7	8.5	5	Bell Plain
RWA074	Bradley	3CT7	21.2	10	Bell Plain
RWA075	Bradley	3CT7	5.7	8	Bell Plain
RWA076	Bradley	3CT7	2.8	8	Bell Plain
RWA077	Rose Mound	3CS27	11.3	6	shell tempered incised
RWA078	Rose Mound	3CS27	8.5	7	Mississippi Plain
RWA079	Rose Mound	3CS27	11.3	8	Parkin Punctated

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA067		fine-textured, smooth and compact, medium hardness; color 2.5YR7/4 (ext), 10R5/8 (int paint), 2.5YR6/2 (core)	shell	
RWA068		fine-textured, smooth and compact, medium hardness; color 5YR7/6 (ext/int/core)	shell	
RWA069		medium to coarse-textured, medium hardness, 'soapy' feel; color 5YR6/4 (ext/core), 5YR5/4 (int)	shell	
RWA070		fine to medium-textured, medium hardness, 'soapy' feel; color 5YR7/6 (ext), 5YR5/4 (int), 5YR6/4 (core)	shell	
RWA071	bowl	medium-textured, soft, sparse mica or sand in paste; color 5YR5/4-5YR7/4 (ext), 5YR6/4 (int), 5YR7/3 (core)	shell	
RWA072	bowl	fine-textured, smooth and compact surfaces, but soft paste; color 5YR5/4 (ext/int), 5YR5/3 (core)	shell	
RWA073	bowl	fine-textured, smooth, hard and compact; color 5YR5/4 (ext/int), 5YR6/3 (core)	shell	
RWA074	bowl	fine-textured, smooth, hard and compact; color 5YR5/4 (ext/int), 5YR6/3 (core)	shell	
RWA075	bowl	fine-textured, smooth and compact surfaces, medium hardness, sparse mica or sand in paste; color 5YR5/4 (ext/int), 5YR4/3 (core)	shell	
RWA076	bowl	fine-textured, smooth and compact, medium hardness; color 5YR6/4 (ext), 5YR5/4 (int), 5YR5/3 (core)	shell	
RWA077		medium-textured, medium hardness, grainy surface, some sand in paste; color 5YR7/6 (ext/int/core)	shell	
RWA078		medium-textured, medium hardness, sparse sand in paste; color 5YR6/4 (ext), 5YR5/4 (int/core)	shell	
RWA079		medium to coarse-textured, hard and compact, grainy surface, some sand in paste; color 5YR7/4 (ext/int/core)	shell	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA067	red paint	plain
RWA068	plain	fingernail punctations
RWA069	plain	fingernail punctations
RWA070	plain	shallow fingernail punctations
RWA071	plain	plain
RWA072	plain	plain, but burnished
RWA073	plain, but burnished	plain, but burnished
RWA074	plain	plain, but burnished
RWA075	plain	plain, but trace burnishing
RWA076	plain	plain, but trace burnishing on larger vessel
RWA077	plain	portions of 4 parallel incised lines visible (2 mm wide, spaced 7 mm apart)
RWA078	plain	plain, but possible punctation beginning 1 cm below lip
RWA079	plain	fingernail punctations in vertical rows

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA067	surface	surface	Belle-Meade phase	ca 550-300 YBP
RWA068	surface	surface	Belle-Meade phase	ca 550-300 YBP
RWA069	surface	surface	Belle-Meade phase	ca 550-300 YBP
RWA070	surface	surface	Belle-Meade phase	ca 550-300 YBP
RWA071	surface	surface	Nodena phase	ca 550-300 YBP
RWA072	surface	surface	Nodena phase	ca 550-300 YBP
RWA073	surface	surface	Nodena phase	ca 550-300 YBP
RWA074	surface	surface	Nodena phase	ca 550-300 YBP
RWA075	surface	surface	Nodena phase	ca 550-300 YBP
RWA076	surface	surface	Nodena phase	ca 550-300 YBP
RWA077	surface	surface	Parkin phase	ca 550-250 YBP
RWA078	surface	surface	Parkin phase	ca 550-250 YBP
RWA079	surface	surface	Parkin phase	ca 550-250 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA067	Body sherd, well smoothed exterior
RWA068	Body sherd, very thin, fine abundant (leached) temper
RWA069	Body sherd, abundant temper
RWA070	Body sherd, abundant temper
RWA071	Rim sherd, slightly curved w/flat lip (partially eroded), from large bowl, abundant temper, fire clouding on exterior
RWA072	Body sherd from plain bowl w/notched/scalloped lip/rim, well smoothed interior, abundant (finely crushed) temper
RWA073	Body sherd from plain bowl w/slightly rounded lip, abundant (finely crushed) temper
RWA074	Rim/body sherd from plain bowl w/outward curling lip and notched rim, well smoothed interior, abundant (fine to medium) temper
RWA075	Body sherd from plain bowl w/diagonal incising on rim
RWA076	Rim sherd from plain bowl w/flattened, outward curling lip, wide diagonal incising on rim
RWA077	Body sherd, eroded surfaces
RWA078	Rim sherd w/slightly flattened lip, eroded surfaces
RWA079	Strap handle, eroded surfaces

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA080	67-17-1-4	McPherson	Cross	Central Mississippi Valley
RWA081	67-17-1-5	McPherson	Cross	Central Mississippi Valley
RWA082	67-17-1-6A	McPherson	Cross	Central Mississippi Valley
RWA083	67-17-1-7A	McPherson	Cross	Central Mississippi Valley
RWA084	63-54-3-1	Charles McGimsey and Jim Schultz	Mississippi	Central Mississippi Valley
RWA085	63-54-4-1A	Charles McGimsey and Jim Schultz	Mississippi	Central Mississippi Valley
RWA086	63-54-4-2	Charles McGimsey and Jim Schultz	Mississippi	Central Mississippi Valley
RWA087	63-54-6-1	Charles McGimsey and Jim Schultz	Mississippi	Central Mississippi Valley
RWA088	63-54-8-1	Charles McGimsey and Jim Schultz	Mississippi	Central Mississippi Valley
RWA089	63-54-9-1	Charles McGimsey and Jim Schultz	Mississippi	Central Mississippi Valley
RWA090	63-54-2-1	Charles McGimsey and Jim Schultz	Mississippi	Central Mississippi Valley
RWA091	63-56-13-1	John Moselage	Cross	Central Mississippi Valley
RWA092	63-56-13-2	John Moselage	Cross	Central Mississippi Valley

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA080	Rose Mound	3CS27	24.1	12	Barton Incised
RWA081	Rose Mound	3CS27	11.3	6.5	Parkin Punctated
RWA082	Rose Mound	3CS27	12.8	8.5	Barton Incised
RWA083	Rose Mound	3CS27	14.2	7	Parkin Punctated
RWA084	Bell-Catching Place	3MS8	11.3	11	Bell Plain
RWA085	Bell-Catching Place	3MS8	5.7	7.5	Nodena Red and White, var. Nodena or Dumond?
RWA086	Bell-Catching Place	3MS8	2.8	6	Barton Incised
RWA087	Bell-Catching Place	3MS8	2	6	Mississippi Plain
RWA088	Bell-Catching Place	3MS8	5.7	9	Bell Plain
RWA089	Bell-Catching Place	3MS8	2.8	8	Bell Plain
RWA090	Bell-Catching Place	3MS8	4.3	6	Mississippi Plain
RWA091	Parkin	3CS29	14.2	10	Barton Incised
RWA092	Parkin	3CS29	4.3	7	Barton Incised

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA080		fine-textured, hard and compact, some sand in paste; color 5YR7/6 (ext/int/core)	shell	
RWA081	jar	fine to medium textured, hard and compact, some sand in paste; color 5YR7/4 (ext/core), 5YR6/4 (int)	shell	
RWA082		medium-textured, hard; color 5YR5/6 (ext), 5YR4/6 (int/core)	shell	
RWA083		medium to coarse-textured, medium hardness, some sand in paste; color 5YR7/6 (ext), 5YR3/2 (int), 5YR7/4 (core)	shell	
RWA084		fine-textured, medium hardness, sparse mica in paste; color 5YR7/6 (ext), 7/4 (int), 6/3 (core)	shell	
RWA085		fine to medium-textured, medium hardness; color 5YR7/3 (ext/int), 10R4/6 (paint), 5YR5/1 (core)	shell	
RWA086		fine to medium-textured, medium hardness; color 5YR7/6 (ext/int), 5YR7/3 (core)	shell	
RWA087		fine-textured, unconsolidated paste, soft; color 5YR7/4 (ext/int/core)	shell	
RWA088		fine to medium-textured, medium hardness, some mica or sand in paste; color 5YR7/4 (ext/int), 5YR5/1 (core)	shell	
RWA089		fine-textured, medium hardness, some mica or sand in paste; color 5YR7/4 (ext/int), 5YR5/2 (core)	shell	
RWA090		fine to medium-textured, soft and friable, some sand in paste; color 5YR7/6 (ext/int/core)	shell	
RWA091		fine textured, compact, medium hardness; color 5YR7/6 (ext/int/core)	shell	
RWA092		fine textured, medium hardness; color 5YR8/4 (ext/int/core)	shell	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA080	plain	incised triangle motif w/portions of 8 diagonal lines visible (1 mm wide, spaced 6 mm apart)
RWA081	plain	fingernail punctations
RWA082	plain	portions of 5 parallel, angled incised lines visible (1.5 mm wide, spaced 3-8 mm apart), sloppily executed
RWA083	plain	shallow fingernail punctations (especially visible on larger sherd from which sample was taken)
RWA084	plain	plain, but burnished
RWA085	plain	traces of red and white paint
RWA086	plain	part of line-filled triangle motif, portions of 7 lines visible (1.5 mm wide, spaced 3 mm apart)
RWA087	plain	plain w/traces of some pinched impressions (too large to be punctations) below lip
RWA088	plain, but trace burnishing	plain
RWA089	plain	plain
RWA090	plain	plain
RWA091	plain	opposite direction and overlap the lower portions of the 4 lines); lines are 1 mm wide and spaced 2-5 mm apart
RWA092	plain	portions of 4 parallel, angled incised lines visible (lines are 1 mm wide, spaced 7 mm apart)

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA080	surface	surface	Parkin phase	ca 550-250 YBP
RWA081	surface	surface	Parkin phase	ca 550-250 YBP
RWA082	surface	surface	Parkin phase	ca 550-250 YBP
RWA083	surface	surface	Parkin phase	ca 550-250 YBP
RWA084	surface	surface	Nodena phase	ca 550-300 YBP
RWA085	surface	surface	Nodena phase	ca 550-300 YBP
RWA086	surface	surface	Nodena phase	ca 550-300 YBP
RWA087	surface	surface	Nodena phase	ca 550-300 YBP
RWA088	surface	surface	Nodena phase	ca 550-300 YBP
RWA089	surface	surface	Nodena phase	ca 550-300 YBP
RWA090	surface	surface	Nodena phase	ca 550-300 YBP
RWA091	surface	surface	Parkin phase	ca 550-250 YBP
RWA092	surface	surface	Parkin phase	ca 550-250 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA080	Rim sherd, outward flaring w/eroded lip, abundant temper
RWA081	Body sherd (just below rim)
RWA082	Rim sherd curled slightly outward (appears sloppy), abundant temper
RWA083	Body sherd, black carbonization on interior
RWA084	Body sherd
RWA085	Body sherd, sample taken from larger sherd, eroded surfaces
RWA086	Rim sherd w/lip eroded, eroded surfaces
RWA087	Rim sherd w/slightly rounded lip, eroded surfaces
RWA088	Rim sherd w/slightly rounded lip curving inward, eroded surfaces
RWA089	Rim sherd w/incised notches on lip (closely spaced), eroded surfaces
RWA090	Body sherd, eroded surfaces, abundant (leached) temper
RWA091	Rim sherd, outward flaring w/slightly rounded lip, abundant temper
RWA092	Rim sherd w/flattened lip

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA093	63-56-13-3	John Moselage	Cross	Central Mississippi Valley
RWA094	63-56-13-4	John Moselage	Cross	Central Mississippi Valley
RWA095	63-56-11-1	John Moselage	Cross	Central Mississippi Valley
RWA096	63-56-12-1A	John Moselage	Cross	Central Mississippi Valley
RWA097	63-56-12-2	John Moselage	Cross	Central Mississippi Valley
RWA098	63-53-1-1	Charles McGimsey and Jim Schultz	Cross	Central Mississippi Valley
RWA099	63-53-1-2	Charles McGimsey and Jim Schultz	Cross	Central Mississippi Valley
RWA100	63-53-1-3	Charles McGimsey and Jim Schultz	Cross	Central Mississippi Valley
RWA101	63-53-1-4	Charles McGimsey and Jim Schultz	Cross	Central Mississippi Valley
RWA102	63-53-1-5	Charles McGimsey and Jim Schultz	Cross	Central Mississippi Valley
RWA103	63-53-1-6	Charles McGimsey and Jim Schultz	Cross	Central Mississippi Valley
RWA104	2001-392-2-1-1A	John House	Arkansas	Lower Arkansas River Valley
RWA105	2001-392-2-1-1B	John House	Arkansas	Lower Arkansas River Valley
RWA106	2001-392-15-1-2	John House	Arkansas	Lower Arkansas River Valley

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA093	Parkin	3CS29	8.5	8	Barton Incised
RWA094	Parkin	3CS29	7.1	7.5	Barton Incised
RWA095	Parkin	3CS29	7.1	10.5	Parkin Punctated
RWA096	Parkin	3CS29	4.3	7	Bell Plain
RWA097	Parkin	3CS29	12.8	8	Bell Plain
RWA098	Neeley's Ferry	3CS24	5.7	6	Mississippi Plain
RWA099	Neeley's Ferry	3CS24	2.8	6	Mississippi Plain
RWA100	Neeley's Ferry	3CS24	8.5	7.5	Carson Red on Buff?
RWA101	Neeley's Ferry	3CS24	12.8	8	Bell Plain
RWA102	Neeley's Ferry	3CS24	8.5	7.5	Bell Plain
RWA103	Neeley's Ferry	3CS24	5.7	7	Bell Plain
RWA104	Wallace Bottom #2	3AR179	23.5	12	Mississippi Plain
RWA105	Wallace Bottom #2	3AR179	11.5	10.5	Mississippi Plain
RWA106	Wallace Bottom #2	3AR179	5.8	10.5	Mississippi Plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA093		fine textured, medium hardness; color 5YR7/4 (ext/int/core)	shell	
RWA094		fine to medium-textured, medium hardness, red flecks in paste; color 5YR7/6 (ext/int/core)	shell	
RWA095		fine to medium-textured, soft, some mica or sand in paste; color 5YR7/4 (ext/int), 5YR7/2 (core)	shell	
RWA096	bowl?	fine-textured, smooth and compact; color 5YR6/4 (ext/int), 5YR6/3 (core)	shell	
RWA097		fine-textured, smooth and compact; color 5YR7/3 (ext/int/core)	shell	
RWA098		medium to coarse-textured, medium hardness; color 5YR7/4 (ext/int), 5YR6/2 (core)	shell	
RWA099		fine-textured, compact surfaces; color 5YR7/6 (ext/int/core)	shell	
RWA100		fine-textured, medium hardness; color 5YR7/6 (ext), 2.5 YR6/8 (int paint), 5YR7/3 (core)	shell	
RWA101		fine-textured, medium hardness; color 5YR5/4 (ext), 5YR6/4 (int/core)	shell	
RWA102		fine-textured, smooth and compact, sparse mica or sand in paste; color 5YR7/4 (ext), 5YR7/3 (int/core)	shell	
RWA103		fine-textured, smooth and compact; color 5YR5/4 (ext/int/core)	shell	
RWA104		medium to coarse-textured, soft; color 5YR7/4 (ext/int/core)	shell	
RWA105		coarse-textured, soft; color 5YR7/8 (ext), 5YR4/3 (int), 5YR5/2 (core)	shell	
RWA106		medium-textured, soft, 'soapy' feel, sparse mica or sand in paste; color 5YR4/6 (ext), 5YR5/6 (int), 5YR4/4 (core)	shell	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA093	plain	portions 3 parallel, angled incised lines visible (lines are 2 mm wide and spaced 5-9 mm apart)
RWA094	plain	portions of 2 angled incised lines visible (cross over one another); lines are 1.5 mm wide
RWA095	plain	fingernail punctations, beginning ~15 mm below lip
RWA096	plain	plain, but burnished; 2 nodes present in vertical arrangement (like a handle) on larger sherd from which sample was taken
RWA097	plain	paired, angled fingernail punctations (one wide and one narrower) just below lip (pairs spaced ~3mm apart), eroded surface, but trace burnishing
RWA098	plain	plain
RWA099	plain	plain
RWA100	red paint (very faded)	plain
RWA101	plain	plain, but trace burnishing
RWA102	plain	plain, but burnished
RWA103	plain	plain, but burnished
RWA104	plain	plain
RWA105	plain	plain
RWA106	plain	plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA093	surface	surface	Parkin phase	ca 550-250 YBP
RWA094	surface	surface	Parkin phase	ca 550-250 YBP
RWA095	surface	surface	Parkin phase	ca 550-250 YBP
RWA096	surface	surface	Parkin phase	ca 550-250 YBP
RWA097	surface	surface	Parkin phase	ca 550-250 YBP
RWA098	surface	surface	Parkin phase	ca 550-250 YBP
RWA099	surface	surface	Parkin phase	ca 550-250 YBP
RWA100	surface	surface	Parkin phase	ca 550-250 YBP
RWA101	surface	surface	Parkin phase	ca 550-250 YBP
RWA102	surface	surface	Parkin phase	ca 550-250 YBP
RWA103	surface	surface	Parkin phase	ca 550-250 YBP
RWA104	surface	West edge of field	Contact period	ca 270-200 YBP
RWA105	surface	West edge of field	Contact period	ca 270-200 YBP
RWA106	Lake bank, N190 E168	40-50 cm	Contact period	ca 270-200 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA093	Rim sherd w/flattened lip, abundant temper
RWA094	Rim sherd w/slightly rounded, everted lip, eroded surfaces
RWA095	Rim sherd w/slightly flattened lip
RWA096	Body sherd, slightly rounded lip on larger sherd from which sample was taken, abundant (finely crushed) temper
RWA097	Rim sherd w/slightly flattened, everted lip, eroded surfaces
RWA098	Body sherd, eroded surfaces, abundant temper
RWA099	Body sherd, eroded surfaces, abundant (leached) temper
RWA100	Body sherd - possibly rim sherd w/lip eroded - very eroded surfaces
RWA101	Body sherd, eroded surfaces
RWA102	Body sherd
RWA103	Body sherd, well smoothed interior
RWA104	Body sherd, eroded surfaces
RWA105	Body sherd, eroded surfaces, abundant temper
RWA106	Body sherd, eroded surfaces, abundant temper

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA107	2001-392-16-1-2	John House	Arkansas	Lower Arkansas River Valley
RWA108	2001-392-23-1-1	John House	Arkansas	Lower Arkansas River Valley
RWA109	2002-346-4-1-2	John House	Arkansas	Lower Arkansas River Valley
RWA110	2003-378-7-1-1	John House	Arkansas	Lower Arkansas River Valley
RWA111	2003-378-12-1-1	John House	Arkansas	Lower Arkansas River Valley
RWA112	2003-378-34-1-3	John House	Arkansas	Lower Arkansas River Valley
RWA113	2003-378-35-1-3	John House	Arkansas	Lower Arkansas River Valley
RWA114	2003-378-62-1-4	John House	Arkansas	Lower Arkansas River Valley
RWA115	2003-378-72-1-2	John House	Arkansas	Lower Arkansas River Valley
RWA116	2006-319-84-1-5	John House	Arkansas	Lower Arkansas River Valley
RWA117	2006-319-101-1-3	John House	Arkansas	Lower Arkansas River Valley
RWA118	2006-319-102-1-1	John House	Arkansas	Lower Arkansas River Valley
RWA119	1969-9-152	J. Flenniken, S.C. Scholtz, and J.A. Scholtz	Clark	Middle Ouachita Region

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA107	Wallace Bottom #2	3AR179	4.5	7	Mississippi Plain
RWA108	Wallace Bottom #2	3AR179	15.7	7	Mississippi Plain
RWA109	Wallace Bottom #2	3AR179	12.7	9	Mississippi Plain
RWA110	Wallace Bottom #2	3AR179	16.2	8.5	Mississippi Plain
RWA111	Wallace Bottom #2	3AR179	13	9.5	Mississippi Plain
RWA112	Wallace Bottom #2	3AR179	14.7	8	Mississippi Plain
RWA113	Wallace Bottom #2	3AR179	24.6	8.5	Bell Plain
RWA114	Wallace Bottom #2	3AR179	11.8	8	Bell Plain
RWA115	Wallace Bottom #2	3AR179	34.3	10	Mississippi Plain
RWA116	Wallace Bottom #2	3AR179	8.2	11.5	Coarse grog-and-shell-tempered plain
RWA117	Wallace Bottom #2	3AR179	2.2	6.5	Mississippi Plain
RWA118	Wallace Bottom #2	3AR179	4	6	Mississippi Plain
RWA119	Rorie Place	3CL23	7.5	5	Keno Trailed?

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA107		fine to medium-textured, soft; color 5YR7/6 (ext), 5YR6/4 (int/core)	shell	
RWA108		fine to medium-textured, medium hardness, sand in paste; color 5YR7/4 (ext), 5YR4/4 (int/core)	shell	
RWA109		fine to medium-textured, soft; color 5YR7/8 (ext), 5YR5/6 (int), 5YR6/3 (core)	shell	
RWA110		fine to medium-textured, medium hardness, sparse mica or sand in paste; color 5YR7/8 (ext), 5YR5/6 (int), 5YR7/4 (core)	shell	
RWA111		medium-textured, soft; 5YR7/4 (ext), 5YR4/4 (int), 5YR5/3 (core)	shell	
RWA112		coarse-textured, medium hardness; color 5YR7/4 (ext), 5YR6/4 (int/core)	shell	
RWA113		fine-textured, smooth and compact, sparse mica or sand in paste; color 5YR4/4-5YR7/6 (ext), 5YR6/4 (int/core)	shell	
RWA114		fine-textured, smooth and compact, sparse mica or sand in paste; color 5YR7/6 (ext), 5YR4/4 (int/core)	shell	
RWA115		coarse-textured, soft; color 5YR6/4 (ext/int), 5YR5/3 (core)	shell	
RWA116		fine to medium-textured soft and friable, grog in temper is coarse; color 5YR7/8 (ext), 5YR7/6 (int), 5YR5/2 (core)	shell	grog
RWA117		fine to medium-textured, soft and friable, sparse mica or sand in paste; color 5YR7/4 (ext/int), 5YR7/3 (core)	shell	
RWA118		fine to medium-textured, soft and friable, sparse mica or sand in paste; color 5YR7/8 (ext), 5YR7/6 (int/core)	shell	
RWA119	bottle?	fine-textured, smooth and compact, mica in paste; color 5YR5/4 (ext), 5YR6/4 (int/core)	grog	shell

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA107	plain	plain
RWA108	plain	plain
RWA109	plain	plain
RWA110	plain	plain
RWA111	plain	plain
RWA112	plain	plain
RWA113	plain	plain
RWA114	plain	plain, but lightly burnished
RWA115	plain	plain
RWA116	plain	plain
RWA117	plain	plain
RWA118	plain	plain
RWA119	plain	portions of 4 trailed parallel curvilinear lines visible w/burnishing (lines are 2 mm wide, spaced 4-7 mm apart)

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA107	Lake bank, N190 E168	50-60 cm	Contact period	ca 270-200 YBP
RWA108	Lake bank, N190 E220	profile	Contact period	ca 270-200 YBP
RWA109	N244 E222	0-30 cm (plowzone)	Contact period	ca 270-200 YBP
RWA110	Feature 3	From profile clearing	Contact period	ca 270-200 YBP
RWA111	Feature 3	From profile clearing	Contact period	ca 270-200 YBP
RWA112	Feature 12	48.00-47.80 m amsl	Contact period	ca 270-200 YBP
RWA113	Feature 12	48.00-47.80 m amsl	Contact period	ca 270-200 YBP
RWA114	Feature 12	47.80-47.60 m amsl	Contact period	ca 270-200 YBP
RWA115	Feature 12	47.60-47.50 m amsl	Contact period	ca 270-200 YBP
RWA116	Feature 16	Feature 16 clearing, base of plowzone	Contact period	ca 270-200 YBP
RWA117	N144 E220	Bottom of plowzone	Contact period	ca 270-200 YBP
RWA118	Feature 3		Contact period	ca 270-200 YBP
RWA119	surface	Area C	Late Caddo - Social Hill phase?	ca 550-270 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA107	Body sherd, eroded surfaces
RWA108	Body sherd, abundant temper, sooting on interior
RWA109	Body sherd, eroded surfaces, abundant (leached) temper
RWA110	Body sherd, abundant temper
RWA111	Body sherd, abundant temper, sooting on interior
RWA112	Body sherd, eroded surfaces, abundant (leached) temper
RWA113	Body sherd, fire clouding on exterior
RWA114	Body sherd, well smoothed interior
RWA115	Body sherd, eroded surfaces, abundant temper
RWA116	Body sherd, eroded surfaces, abundant temper
RWA117	Body sherd, eroded surfaces, abundant (leached) temper
RWA118	Body sherd, eroded surfaces
RWA119	Body sherd

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA120	1969-9-138	J. Flenniken, S.C. Scholtz, and J.A. Scholtz	Clark	Middle Ouachita Region
RWA121	1969-9-208-1	J. Flenniken, S.C. Scholtz, and J.A. Scholtz	Clark	Middle Ouachita Region
RWA122	1969-9-208-2	J. Flenniken, S.C. Scholtz, and J.A. Scholtz	Clark	Middle Ouachita Region
RWA123	1969-9-208-3	J. Flenniken, S.C. Scholtz, and J.A. Scholtz	Clark	Middle Ouachita Region
RWA124	1969-9-208-4	J. Flenniken, S.C. Scholtz, and J.A. Scholtz	Clark	Middle Ouachita Region
RWA125	1969-396-69	J. Flenniken	Clark	Middle Ouachita Region
RWA126	1969-1-4	F. Schambach and J.A. Scholtz	Clark	Middle Ouachita Region
RWA127	1969-1-27	F. Schambach and J.A. Scholtz	Clark	Middle Ouachita Region
RWA128	1969-1-11-1	F. Schambach and J.A. Scholtz	Clark	Middle Ouachita Region
RWA129	1969-1-11-2	F. Schambach and J.A. Scholtz	Clark	Middle Ouachita Region
RWA130	1969-1-11-3	F. Schambach and J.A. Scholtz	Clark	Middle Ouachita Region
RWA131	1969-1-11-4	F. Schambach and J.A. Scholtz	Clark	Middle Ouachita Region
RWA132	1969-15-13	J. Flenniken	Clark	Middle Ouachita Region

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA120	Rorie Place	3CL23	3.9	5 to 6	Keno Trailed or Foster Trailed-incised?
RWA121	Rorie Place	3CL23	16.8	7	grog tempered plain
RWA122	Rorie Place	3CL23	7.8	5	shell and grog tempered plain
RWA123	Rorie Place	3CL23	9.1	6	grog and shell tempered plain
RWA124	Rorie Place	3CL23	8.5	6	grog and shell tempered plain
RWA125	Rorie Place	3CL23	2.4	3	Bailey or Taylor Engraved?
RWA126	Bayou Sel	3CL27	5.9	6	Hodges Engraved
RWA127	Bayou Sel	3CL27	2.6	4	shell and grog tempered engraved
RWA128	Bayou Sel	3CL27	12.9	5	shell and grog tempered plain
RWA129	Bayou Sel	3CL27	8.3	6	grog and shell tempered plain
RWA130	Bayou Sel	3CL27	7.1	6	grog tempered plain
RWA131	Moore Mound	3CL56	4.6	5	shell and grog tempered plain
RWA132	Moore Mound	3CL56	Pre-cut: 8; Sherd submitted: 2.8	4	Hudson Engraved?

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA120		medium-textured, soft; color 5YR7/3 (ext/int/core)	shell	grog?
RWA121		fine-textured, smooth and compact, some sand in paste; color 5YR5/4 - 5YR7/6 (ext), 5YR7/3 (int/core)	grog	
RWA122		fine-textured, smooth and compact, medium hardness, some mica in paste; color 5YR5/4 (ext/int), 5YR6/3 (int)	shell	grog
RWA123		fine-textured and compact, medium hardness, sparse mica or sand in paste; color 5YR7/3 (ext/int/core)	grog	shell
RWA124		medium-textured and compact, medium hardness, mica in paste; color 5YR7/6 (ext), 5YR7/8 (int), 5YR7/3 (core)	grog	shell
RWA125	bowl?	fine-textured, smooth and compact, 'soapy' feel; color 5YR4/3 (ext/int/core)	shell	grog?
RWA126		fine to medium-textured, soft, mica in paste; color 5YR5/4 (ext/int), 5YR6/4 (core)	shell	grog
RWA127		fine to medium-textured, medium hardness, 'soapy' feel; color 5YR7/8 (ext), 5YR7/4 (int/core)	shell	grog
RWA128	bowl	very-fine-textured, smooth and compact, some mica or sand in paste; color 5YR6/4 (ext/int), 5YR6/2 (core)	shell	grog
RWA129	bottle?	fine-textured, smooth and compact, some mica in paste; color 5YR6/4 (ext/int/core)	grog	shell
RWA130		fine-textured, smooth and compact, medium hardness, sparse mica or sand in paste; color 5YR7/4 (ext), 5YR7/3 (int/core)	grog	
RWA131		fine to medium-textured, medium hardness, sparse mica in paste; color 5YR7/4 (ext), 5YR6/4 (int/core)	shell	grog
RWA132	bottle?	fine-textured, smooth and compact, medium hardness, some mica in paste; color 5YR6/4 (ext), 5YR5/4 (int), 5YR5/3 (core)	shell	grog

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA120	plain	portions of 2 trailed parallel curvilinear lines visible (lines are 2 mm wide, spaced 12 mm apart)
RWA121	plain	plain
RWA122	plain	plain
RWA123	plain	plain
RWA124	plain	plain
RWA125	plain	portions of 5 concentric arcing engraved (or dry paste incised) lines visible w/burnishing (lines are 1 mm wide, spaced 5-6 mm apart)
RWA126	plain	engraved hatching w/curvilinear design
RWA127	plain	portions of engraved line and ticked line visible (spaced 9 mm apart)
RWA128	plain, but burnished	plain, but burnished
RWA129	plain	plain, but burnished
RWA130	plain, but burnished	plain, but burnished
RWA131	plain	plain
RWA132	plain	engraved line and crosshatched bands

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA120	surface	Area C	Late Caddo - Social Hill phase?	ca 550-270 YBP
RWA121	surface	Area C	Late Caddo	ca 550-270 YBP
RWA122	surface	Area C	Late Caddo	ca 550-270 YBP
RWA123	surface	Area C	Late Caddo	ca 550-270 YBP
RWA124	surface	Area C	Late Caddo	ca 550-270 YBP
RWA125	part surface, refuse pit disturbed by plow	Area B	Late Caddo	ca 550-270 YBP
RWA126	surface	surface	Late Caddo - Social Hill or Deceiper?	ca 550-270 YBP
RWA127	surface	surface	Late Caddo	ca 550-270 YBP
RWA128	surface	surface	Late Caddo	ca 550-270 YBP
RWA129	surface	surface	Late Caddo	ca 550-270 YBP
RWA130	surface	surface	Late Caddo	ca 550-270 YBP
RWA131	surface	surface	Late Caddo - Social Hill phase?	ca 550-270 YBP
RWA132	surface	surface	Late Caddo - Social Hill phase?	ca 550-270 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA120	Body sherd, eroded exterior with rougher interior
RWA121	Body sherd, smoothed with fire clouding on exterior
RWA122	Body sherd, smooth exterior, rough interior
RWA123	Body sherd
RWA124	Body sherd
RWA125	Body sherd w/smoothed interior and burnished exterior
RWA126	Body sherd w/smoothed interior (exterior surface eroded)
RWA127	Body sherd w/smoothed interior (exterior surface eroded)
RWA128	Body sherd, fineware
RWA129	Body sherd
RWA130	Body sherd
RWA131	Body sherd, medium temper
RWA132	Body sherd (cut for analysis), medium temper

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA133	1969-15-1	J. Flenniken	Clark	Middle Ouachita Region
RWA134	1969-15-3-1	J. Flenniken	Clark	Middle Ouachita Region
RWA135	1969-15-3-2	J. Flenniken	Clark	Middle Ouachita Region
RWA136	1969-15-3-3	J. Flenniken	Clark	Middle Ouachita Region
RWA137	1987-710-121-6-138	Arkansas Archeological Survey and AHTD	Clark	Middle Ouachita Region
RWA138	1987-710-121-6-4	Arkansas Archeological Survey and AHTD	Clark	Middle Ouachita Region
RWA139	1987-710-121-6-6-1	Arkansas Archeological Survey and AHTD	Clark	Middle Ouachita Region
RWA140	1987-710-121-6-6-2	Arkansas Archeological Survey and AHTD	Clark	Middle Ouachita Region
RWA141	1987-710-121-6-37	Arkansas Archeological Survey and AHTD	Clark	Middle Ouachita Region
RWA142	1969-5-28	J.A. Scholtz and D. Phillips	Hot Spring	Middle Ouachita Region
RWA143	1969-5-10	J.A. Scholtz and D. Phillips	Hot Spring	Middle Ouachita Region
RWA144	1969-5-30	J.A. Scholtz and D. Phillips	Hot Spring	Middle Ouachita Region
RWA145	1969-5-38	J.A. Scholtz and D. Phillips	Hot Spring	Middle Ouachita Region

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA133	Moore Mound	3CL56	6.8	5	shell tempered brushed
RWA134	Moore Mound	3CL56	6.8	6	shell and grog tempered plain
RWA135	Moore Mound	3CL56	5.5	7	grog and bone tempered plain
RWA136	Moore Mound	3CL56	5	5	shell and grog tempered plain
RWA137	Hardman	3CL418	1.4	4	Hodges Engraved?
RWA138	Hardman	3CL418	3.3	7	shell and grog tempered brushed
RWA139	Hardman	3CL418	5.5	7	shell tempered trailed
RWA140	Hardman	3CL418	5.1	6	shell tempered incised
RWA141	Hardman	3CL418	5.1	7	shell tempered brushed
RWA142	Lower Meador	3HS19	3.7	6	Keno Trailed or Foster Trailed-incised?
RWA143	Lower Meador	3HS19	7.5	5	shell and grog tempered engraved
RWA144	Lower Meador	3HS19	20.7	8 to 9	Military Road Incised?
RWA145	Lower Meador	3HS19	9.2	5	shell tempered plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA133		medium-textured, medium hardness; color 5YR7/6 (ext), 5YR5/4 (int/core)	shell	
RWA134		fine-textured, smooth and compact, medium hardness, sparse mica in paste; color 5YR4/4 (ext/int), 5YR5/4 (core)	shell	grog
RWA135		fine-textured, smooth and compact; color 5YR6/4 (ext/int), 5YR5/3 (core)	grog	bone
RWA136		fine-textured, smooth and compact, medium hardness; color 5YR7/8 (ext), 5YR7/6 (int/core)	shell	grog
RWA137	bowl?	very fine-textured, smooth, hard and compact, sparse mica in paste; color 5YR7/4 (ext), 5YR6/3 (int/core)	shell	grog
RWA138		fine to medium-textured, soft, 'soapy' feel; color 5YR7/8 (ext), 5YR6/4 (int/core)	shell	grog
RWA139		fine to medium-textured, soft, 'soapy' feel; color 5YR7/4 (ext/int/core)	shell	
RWA140		medium to coarse-textured, medium hardness; color 5YR6/4 (ext), 5YR4/4 (int), 5YR6/3 (core)	shell	
RWA141		medium to coarse-textured, soft and friable; color 5YR6/4 (ext), 5YR5/4 (int), 5YR4/4 (core)	shell	
RWA142		fine to medium-textured, soft, mica in paste; color 5YR7/4 (ext/int), 5YR7/2 (core)	shell	
RWA143	bowl?	fine-textured, smooth and compact, some mica in paste; color 5YR4/3-5YR7/4 (ext), 5YR6/3 (int), 5YR6/2 (core)	shell	grog
RWA144		medium-textured, soft, some sand in paste; color 5YR7/8 (ext/int), 5YR6/2 (core)	grog	
RWA145		medium to coarse-textured, soft and friable, sparse sand in paste; color 5YR7/6 (ext), 5YR6/4 (int), 5YR6/3 (core)	shell	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA133	plain	brushed
RWA134	plain	plain
RWA135	plain	plain
RWA136	plain	plain
RWA137	plain	engraved crosshatching and ticked line
RWA138	plain	brushed
RWA139	plain	portions of 2 parallel trailed lines visible; lines are 2 mm wide and 10 mm apart
RWA140	plain	portions of 7 parallel incised lines visible; lines are 1 mm wide and spaced 3-4 mm apart
RWA141	plain	brushed or closely spaced incised parallel lines
RWA142	plain	portions of 3 parallel curivlinear trailed lines visible; lines are 1 mm wide and spaced 6-7 mm apart
RWA143	plain	single engraved line visible
RWA144	plain	broad brushed (horizontal?) lines
RWA145	plain	plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA133	surface	surface	Late Caddo - Social Hill phase?	ca 550-270 YBP
RWA134	surface	surface	Late Caddo - Social Hill phase?	ca 550-270 YBP
RWA135	surface	surface	Late Caddo	ca 550-270 YBP
RWA136	surface	surface	Late Caddo	ca 550-270 YBP
RWA137	Unit N492 E524	Stratum 1, 0-10 cm	Late Caddo - Deceiper phase?	ca 550-270 YBP
RWA138	Unit N492 E524	Stratum 1, 0-10 cm	Late Caddo - Deceiper phase?	ca 550-270 YBP
RWA139	Unit N492 E524	Stratum 1, 0-10 cm	Late Caddo - Deceiper phase?	ca 550-270 YBP
RWA140	Unit N492 E524	Stratum 1, 0-10 cm	Late Caddo - Deceiper phase?	ca 550-270 YBP
RWA141	Unit N492 E524	Stratum 1, 0-10 cm	Late Caddo - Deceiper phase?	ca 550-270 YBP
RWA142	surface	surface	Late Caddo	ca 550-270 YBP
RWA143	surface	surface	Late Caddo	ca 550-270 YBP
RWA144	surface	surface	Late Caddo	ca 550-270 YBP
RWA145	surface	surface	Late Caddo	ca 550-270 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA133	Body sherd, medium (abundant) temper, interior smoothed with some sooting
RWA134	Body sherd, smoothed surfaces
RWA135	Body sherd, smoothed interior and exterior
RWA136	Body sherd, very smooth exterior, eroded interior
RWA137	Rim sherd with rolled or thickened lip (from carinated bowl?), smoothed interior, fine temper
RWA138	Body sherd, medium to coarse (abundant) temper, eroded surfaces
RWA139	Body sherd, medium to coarse (abundant) temper
RWA140	Body sherd, medium to coarse (abundant) temper
RWA141	Body sherd, medium to coarse (abundant) temper
RWA142	Body sherd, smoothed eroded surface
RWA143	Body sherd, smoothed interior and exterior, fire clouding on exterior
RWA144	Body sherd, smoothed interior
RWA145	Body sherd, eroded surfaces, abundant temper

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA146	1969-5-39	J.A. Scholtz and D. Phillips	Hot Spring	Middle Ouachita Region
RWA147	1972-65-1	J.C. Weber and B. Newberry	Hot Spring	Middle Ouachita Region
RWA148	1972-65-2	J.C. Weber and B. Newberry	Hot Spring	Middle Ouachita Region
RWA149	1972-70-1	B. Newberry donation	Hot Spring	Middle Ouachita Region
RWA150	1972-70-2	B. Newberry donation	Hot Spring	Middle Ouachita Region
RWA151	1992-452	B. Newberry donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA152	1969-394-5	J.A. Scholtz, J. Flenniken, and G. Guise	Hot Spring	Middle Ouachita Region
RWA153	1973-532-1	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA154	1973-532-2	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA155	1973-532-3	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA156	1973-532-4	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA157	1973-532-5	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA146	Lower Meador	3HS19	9.1	7	grog and shell tempered plain
RWA147	Lower Meador	3HS19	3.1	4	shell and grog tempered engraved
RWA148	Lower Meador	3HS19	2.1	4	shell and grog tempered engraved
RWA149	Lower Meador	3HS19	15.6	6	shell tempered engraved
RWA150	Lower Meador	3HS19	Pre-cut: 21.8; Sherd submitted: 3.3	4	Hodges Engraved
RWA151	Lower Meador	3HS19	14.6	5 to 6	shell and grog? tempered engraved
RWA152	Upper Meador	3HS33	7.8	5	Hodges Engraved
RWA153	Upper Meador	3HS33	5.7	4	Keno Trailed?
RWA154	Upper Meador	3HS33	Pre-cut: 10.8; Sherd submitted: 4.5	5	Glassell or Hodges Engraved?
RWA155	Upper Meador	3HS33	Pre-cut: 8.2; Sherd submitted: 2.8	5	Hudson or Means Engraved?
RWA156	Upper Meador	3HS33	12.5	4 to 6	grog tempered plain
RWA157	Upper Meador	3HS33	4.3	6	grit and grog tempered plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA146		fine to medium-textured, grainy surfaces, medium hardness, some sand in paste; color 5YR7/8 (ext), 5YR7/4 (int/core)	grog	shell
RWA147	bottle	fine-textured, smooth, hard and compact, sparse mica in paste; color 5YR4/4 (ext), 5YR5/4 (int/core)	shell	grog
RWA148		fine-textured, smooth and compact surfaces, but soft paste, 'soapy' feel; color 5YR6/4 (ext), 5YR7/4 (int), 5YR6/3 (core)	shell	grog
RWA149	bottle	medium-textured, hard and compact; color 5YR7/4 (ext), 5YR7/3 (int/core)	shell	
RWA150	bowl	very fine-textured, smooth and compact, medium hardness; color 5YR7/4 (ext), 5YR4/3 (int),5YR5/3 (core)	shell	grog
RWA151	bowl	fine-textured and smooth, medium hardness; color 5YR5/4-5YR7/4 (ext), 5YR5/3 (int/core)	shell	grog?
RWA152	bowl	very fine-textured, hard and compact, some mica in paste; color 5YR4/4 (ext/int), 5YR4/3 (core)	shell	grog
RWA153		fine-textured, medium hardness, sparse mica in paste; color 5YR5/3 (ext/core), 5YR6/3 (int)	shell	grog?
RWA154	bowl	very fine-textured, smooth and compact, medium hardness; color 5YR5/3 (ext), 5YR4/3 (int), 5YR7/1 (core)	shell	
RWA155	bottle?	fine-textured, medium hardness; color 5YR7/3 (ext), 5YR6/4 (int), 5YR5/1 (core)	shell	grog
RWA156		fine-textured, medium hardness, sparse mica in paste; color 5YR5/4 (ext/int), 5YR4/4 (core)	grog	
RWA157		fine to medium-textured, soft, grainy surfaces; color 5YR7/8 (ext), 5YR6/3 (int), 5YR6/1 (core)	grit	grog

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA146	plain	plain
RWA147	plain	portions of 2 parallel curvilinear lines visible (one ticked), burnished
RWA148	plain	engraved ticked line, trace burnishing
RWA149	plain	portions of 4 engraved curvilinear plain and ticked lines (alternating)
RWA150	plain, but burnished	engraved ticked rim line and panel w/crosshatching and negative balls, burnished
RWA151	plain	portions of 3 engraved ticked (almost punctated) lines visible, arranged in horizontal arcs, burnished
RWA152	plain, but burnished	engraved crosshatching filling space between portions of 2 negative balls, burnished
RWA153	plain	portions of 8 trailed parallel curvilinear lines (lines are 2 mm wide, spaced 3-5 mm apart), trace burnishing on eroded surface
RWA154	plain, but burnished	engraved diagonal lines w/hatching/crosshatching
RWA155	plain	engraved ticked line and crosshatched band (1 cm wide)
RWA156	plain, but burnished	plain, but trace burnishing
RWA157	plain	plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA146	surface	surface	Late Caddo	ca 550-270 YBP
RWA147	surface	surface	Late Caddo	ca 550-270 YBP
RWA148	surface	surface	Late Caddo	ca 550-270 YBP
RWA149	surface and plowzone	surface and plowzone	Late Caddo	ca 550-270 YBP
RWA150	surface and plowzone	surface and plowzone	Late Caddo - Social Hill or Deceiper?	ca 550-270 YBP
RWA151	surface	surface	Late Caddo	ca 550-270 YBP
RWA152	surface	surface	Late Caddo - Social Hill or Deceiper?	ca 550-270 YBP
RWA153	surface	surface	Late Caddo - Social Hill or Deceiper?	ca 550-270 YBP
RWA154	surface	surface	Late Caddo	ca 550-270 YBP
RWA155	surface	surface	Late Caddo	ca 550-270 YBP
RWA156	surface	surface	Late Caddo	ca 550-270 YBP
RWA157	surface	surface	Late Caddo	ca 550-270 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Comments
RWA146	Body sherd
RWA147	Body sherd, rough interior, smoothed and burnished exterior
RWA148	Body sherd
RWA149	Body sherd, eroded surfaces, abundant temper; attempted to cut for analysis, but sherd too hard
RWA150	Rim sherd w/thickened lip (cut for analysis, estimated 24 cm orifice diameter)
RWA151	Rim sherd w/everted lip (from carinated bowl), abundant shell temper, fire clouding on exterior
RWA152	Rim sherd w/thickened lip (from carinated bowl w/sharp carination)
RWA153	Body sherd, eroded surfaces, but trace burnishing on exterior
RWA154	Rim sherd w/everted lip (from carinated bowl w/sharp carination, estimated 18 cm orifice diameter, cut for analysis)
RWA155	Body sherd (cut for analysis), eroded exterior, rough interior
RWA156	Rim sherd w/vertical to outflaring rim and thin rounded lip, fine temper
RWA157	Body sherd, abundant temper w/sandy feel (grit contains quartz, novaculite, and hematite)

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Alternate ID	Excavator	County	Subregion
RWA158	1974-225	H. Furr donation	Hot Spring	Middle Ouachita Region
RWA159	1974-229-1	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA160	1974-229-2	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA161	1974-229-3	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA162	1974-229-4	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA163	1973-531-1	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA164	1973-531-2	H. Furr donation, A.M. Early	Hot Spring	Middle Ouachita Region
RWA165	1974-240-1	H. Furr	Hot Spring	Middle Ouachita Region
RWA166	1974-240-2	H. Furr	Hot Spring	Middle Ouachita Region

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Site Name	Site Number	Weight (g)	Thickness (mm)	Ceramic Type
RWA158	Upper Meador	3HS33	7.4	5	Cook Engraved?
RWA159	Upper Meador	3HS33	6.4	4 to 5	Hudson Engraved?
RWA160	Upper Meador	3HS33	6.5	5	grog and shell tempered engraved
RWA161	Upper Meador	3HS33	10.1	6 to 7	grog tempered plain
RWA162	Upper Meador	3HS33	6.2	6	shell and grog tempered plain
RWA163	Myers	3HS38	4.2	4	Keno Trailed?
RWA164	Myers	3HS38	7.2	6	shell and grog tempered plain
RWA165	Myers	3HS38	4.2	5	Keno Trailed?
RWA166	Myers	3HS38	8	5	shell tempered plain

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Form	Paste	Major Temper	Minor Temper
RWA158	bowl	fine to medium-textured, medium hardness, sandy paste; color 5YR6/4 (ext), 5YR6/3 (int), 5YR6/1 (core)	shell	grog
RWA159	bottle	fine to medium-textured, medium hardness, sparse sand in paste; color 5YR7/6 (ext), 5YR7/4 (int), 5YR6/3 (core)	shell	grog
RWA160		fine-textured, very smooth and compact, but soft paste; color 5YR7/4 (ext/int), 5YR6/1 (core)	grog	shell
RWA161		fine-textured, compact surfaces, medium hardness, some mica in paste; color 5YR7/8 (ext/core), 5YR4/4 (int)	grog	
RWA162		medium-textured, soft and friable; color 5YR7/4 (ext/int), 5YR7/2 (core)	shell	grog
RWA163	bottle?	fine-textured, smooth and compact, medium hardness, sparse mica in paste; color 5YR4/4 (ext/int/core)	shell	grog
RWA164		fine to medium-textured, medium hardness, mica in paste; color 5YR5/4 (ext/int), 5YR5/3 (core)	shell	grog
RWA165	bottle?	fine-textured, medium hardness, some mica in paste; color 5YR5/3 (ext/core), 5YR6/4 (int)	shell	grog (shell t)
RWA166		medium-textured, medium hardness; color 5YR7/4 (ext/int), 5YR6/1 (core)	shell	

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Interior Decoration	Exterior Decoration
RWA158	plain	portions of 3 engraved parallel horizontal lines (1 along rim/body juncture, others mid-rim) and paired vertical curvilinear lines visible
RWA159	plain	vertical bands of engraved crosshatching (surface eroded)
RWA160	plain, but trace burnishing	engraved 'ladder' decoration ('ladder' band is 8 mm wide), trace burnishing
RWA161	plain, but lightly burnished	plain
RWA162	plain	plain
RWA163	plain	portions of 4 parallel (horizontal) incised curvilinear lines (lines are 2 mm wide, spaced 4-5 mm apart), burnished
RWA164	plain	plain, but trace burnishing
RWA165	plain	portions of 4 broad trailed lines visible (parallel and arcing); lines are 2 mm wide and spaced 3 mm apart, trace burnishing
RWA166	plain	plain, possible trace burnishing

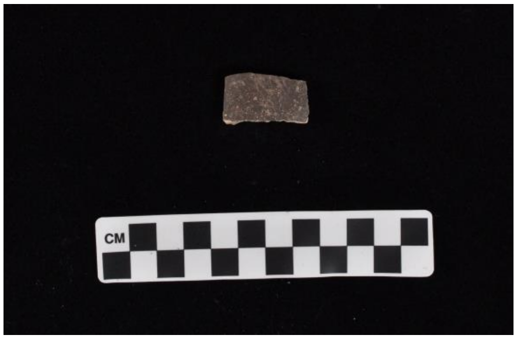
APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

ANID	Context	Provenience	Period	Date
RWA158	surface	surface	Late Caddo	ca 550-270 YBP
RWA159	surface	surface of disturbed mound	Late Caddo	ca 550-270 YBP
RWA160	surface	surface of disturbed mound	Late Caddo	ca 550-270 YBP
RWA161	surface	surface of disturbed mound	Late Caddo	ca 550-270 YBP
RWA162	surface	surface of disturbed mound	Late Caddo	ca 550-270 YBP
RWA163	surface	surface	Late Caddo - Social Hill or Deceiper?	ca 550-270 YBP
RWA164	surface	surface	Late Caddo	ca 550-270 YBP
RWA165	test hole	test hole	Late Caddo - Social Hill or Deceiper?	ca 550-270 YBP
RWA166	test hole	test hole	Late Caddo	ca 550-270 YBP

APPENDIX A: Descriptive Data for Sherd Samples (Cont.)

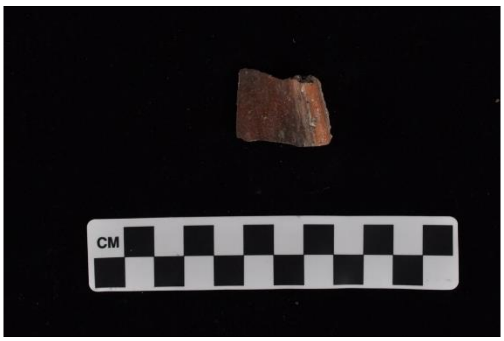
ANID	Comments
RWA158	Rim sherd w/everted lip (from carinated bowl; lip is thin and rounded), eroded surfaces
RWA159	Bottle body/base sherd, rough interior and eroded exterior
RWA160	Body sherd, smoothed interior and exterior
RWA161	Body sherd, some fire clouding on exterior, blackened interior
RWA162	Body sherd, fine to medium temper, eroded surfaces
RWA163	Body sherd, burnished exterior, smoothed interior, possibly below neck of bottle
RWA164	Body sherd, fine to medium temper
RWA165	Body sherd, fine temper, burnished exterior, rough interior
RWA166	Body sherd, medium to coarse (abundant) temper, eroded surfaces

APPENDIX B: Photos of Sherds Submitted for INAA
(“A” denotes exterior; “B” denotes interior; photos taken by the author)



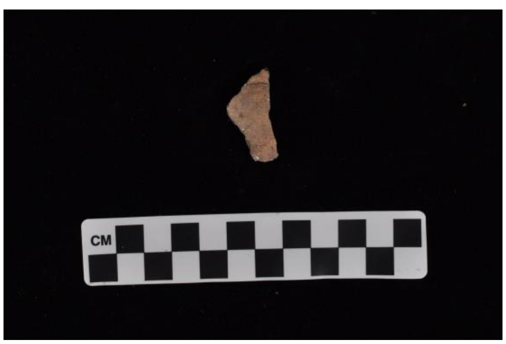
RWA001A

RWA001B



RWA002A

RWA002B



RWA003A

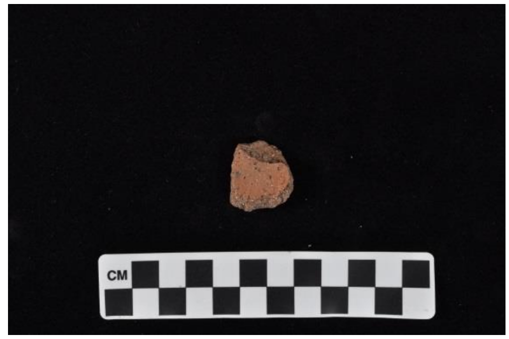
RWA003B

RWA004A

RWA004B

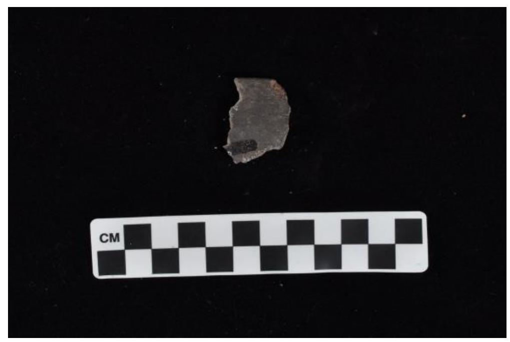
APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA005A



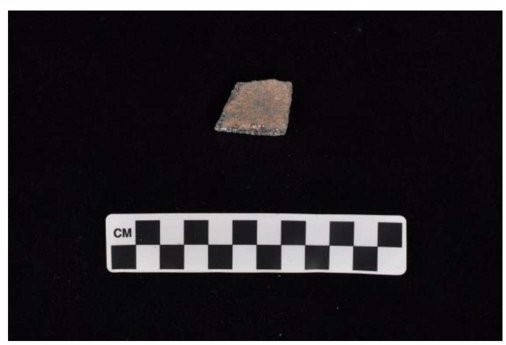
RWA005B

RWA006A



RWA006B

RWA007A



RWA007B

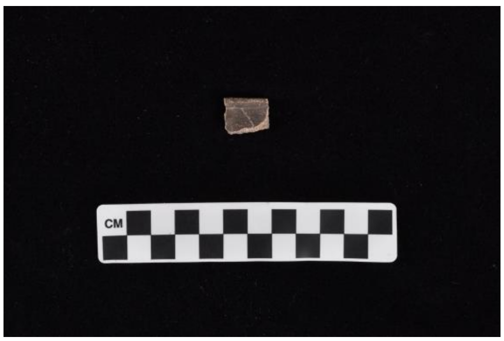
RWA008A

RWA008B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)

RWA009A

RWA009B



RWA010A

RWA010B

RWA011A

RWA011B

RWA012A

RWA012B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA013A

RWA013B

RWA014A

RWA014B

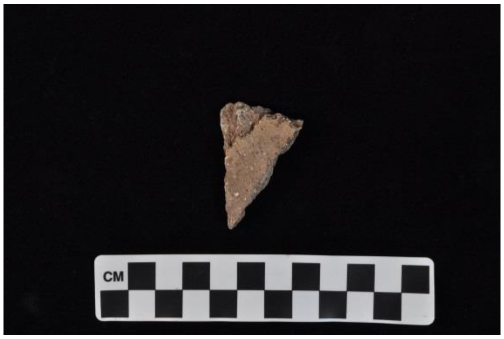
RWA015A

RWA015B

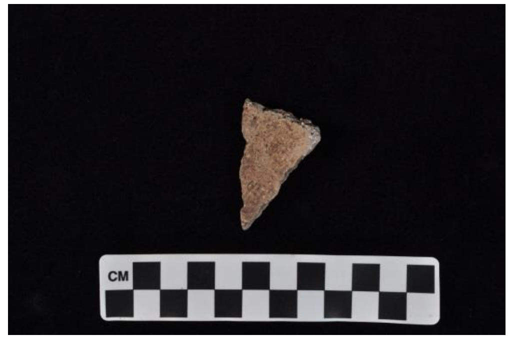
RWA016A

RWA016B

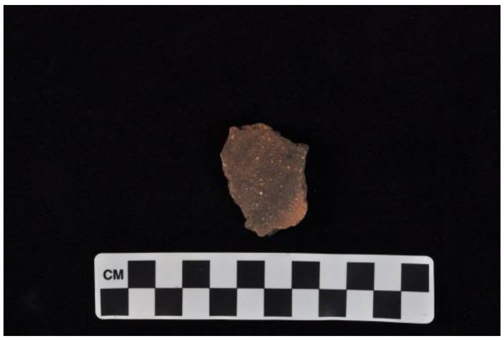
APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)



RWA017A



RWA017B



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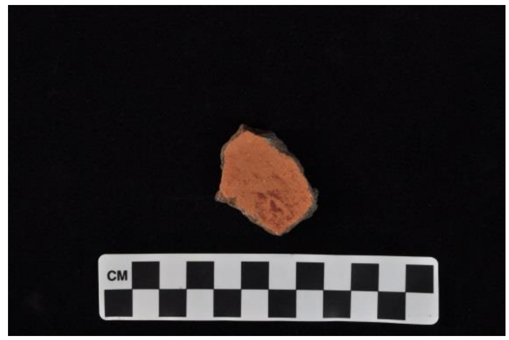
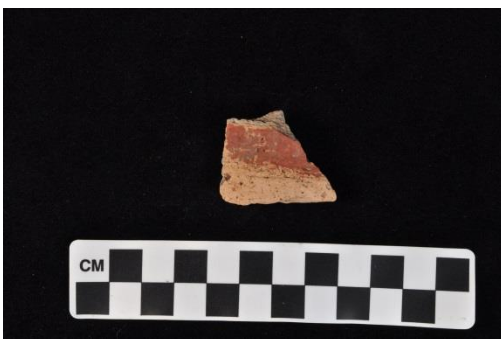


RWA018B



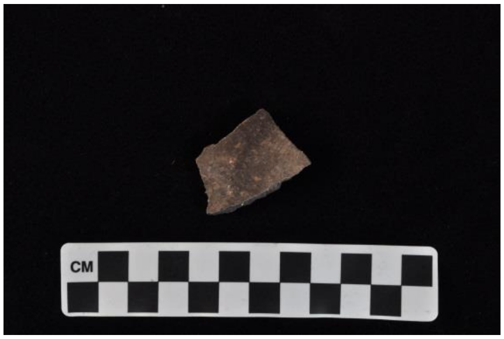
RWA019A

RWA019B

RWA020A

RWA020B

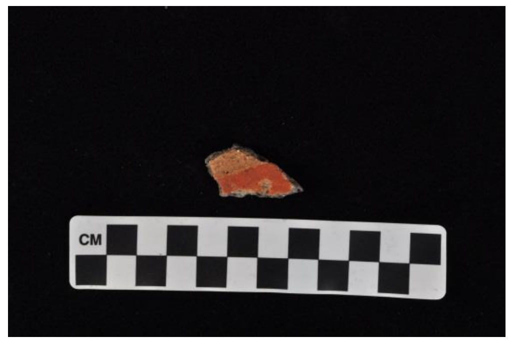
APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)



RWA021A

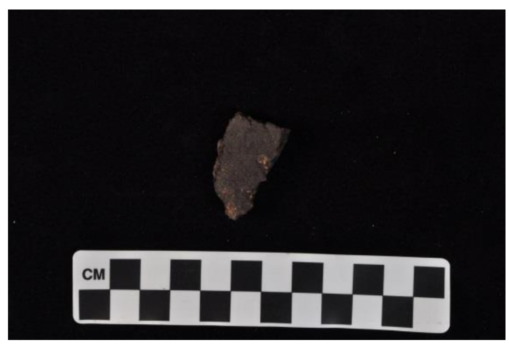
RWA021B

RWA022A



RWA022B

RWA023A



RWA023B

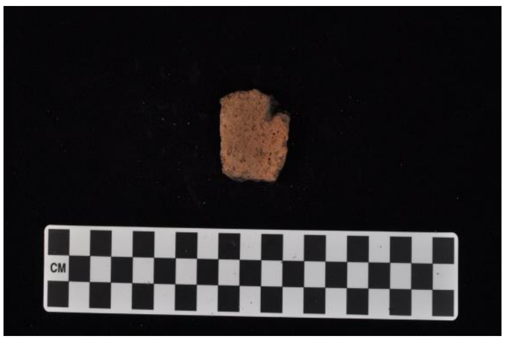
RWA024A

RWA024B

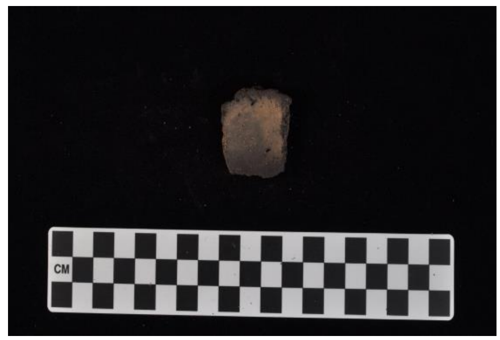
APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA025A

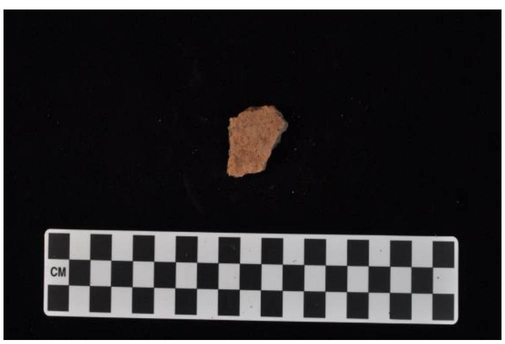
RWA025B



RWA026A



RWA026B



RWA027A

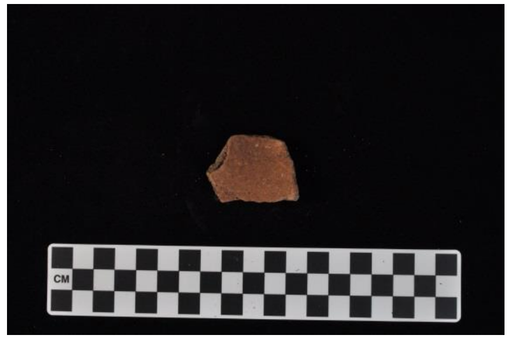
RWA027B

RWA028A

RWA028B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)

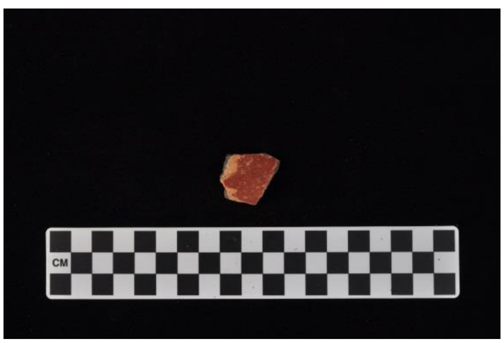
RWA029A



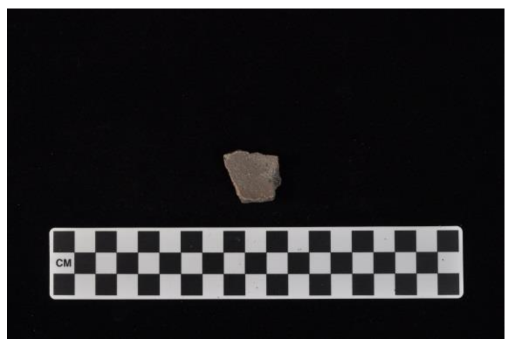
RWA029B

RWA030A

RWA030B



RWA031A

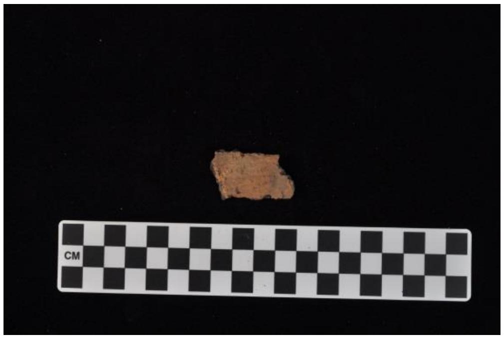


RWA031B

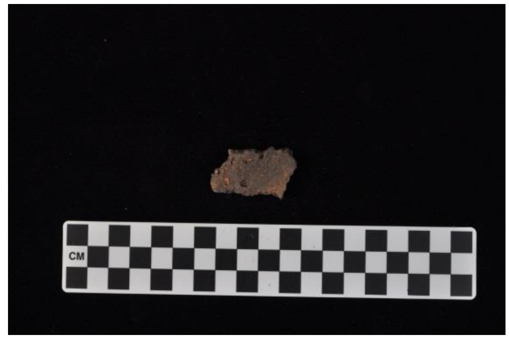
RWA032A

RWA032B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)



RWA033A

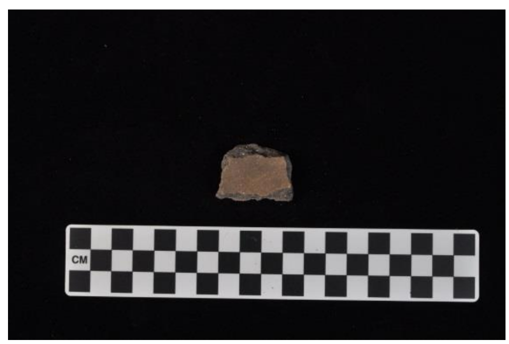


RWA033B

RWA034A

RWA034B

RWA035A



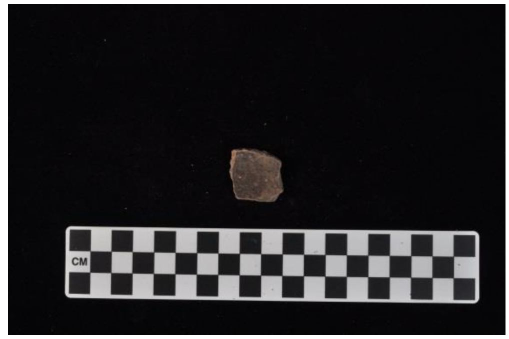
RWA035B

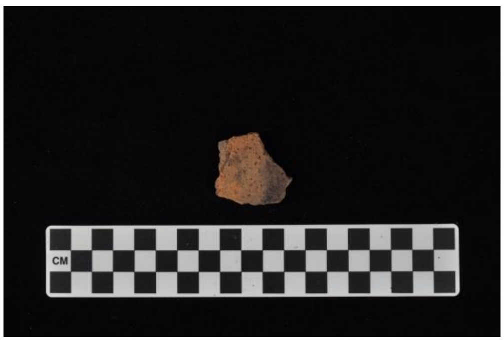
RWA036A

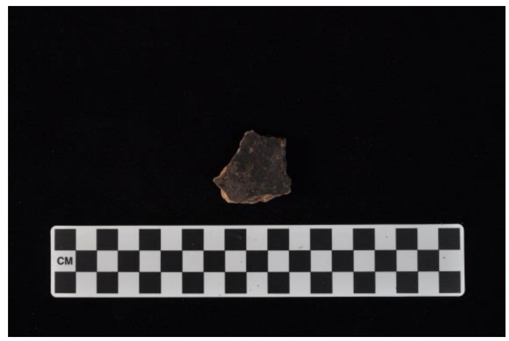
RWA036B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

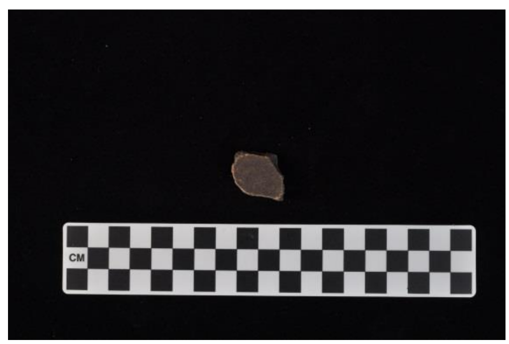

RWA037A


RWA037B

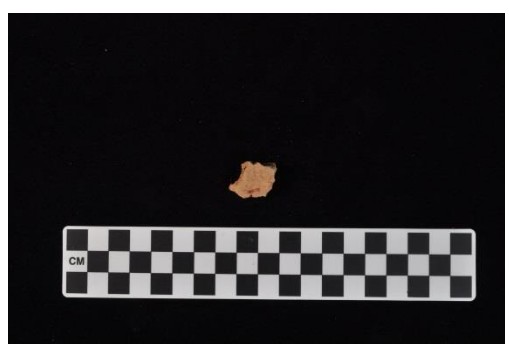

RWA038A


RWA038B


RWA039A


RWA039B

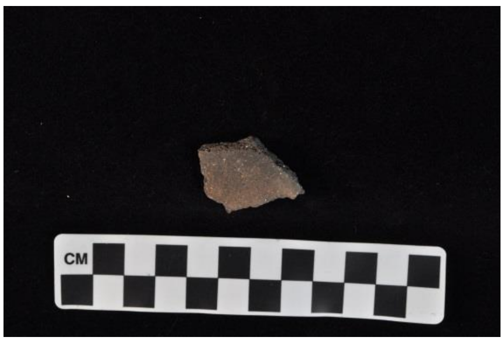

RWA040A


RWA040B

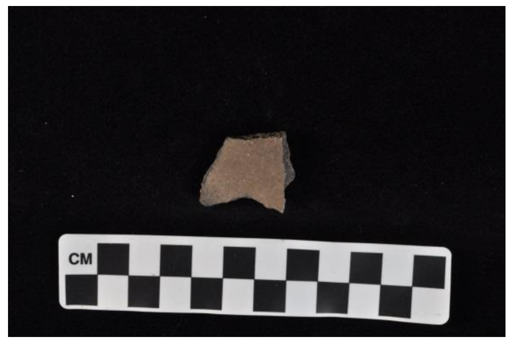
APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA041A

RWA041B



RWA042A



RWA042B

RWA043A

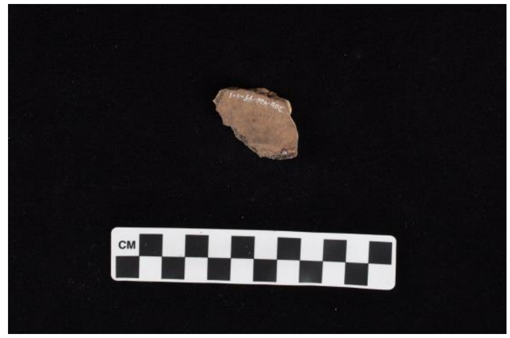
RWA043B

RWA044A

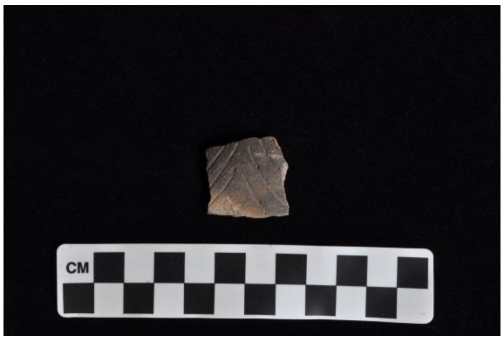
RWA044B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA045A



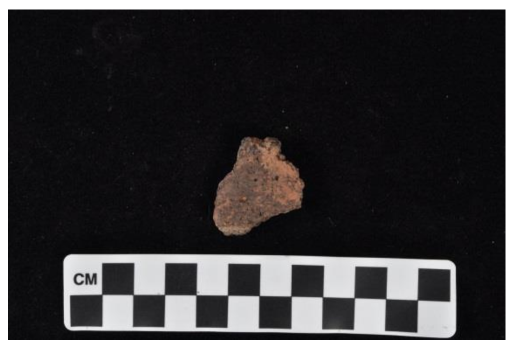
RWA045B



RWA046A

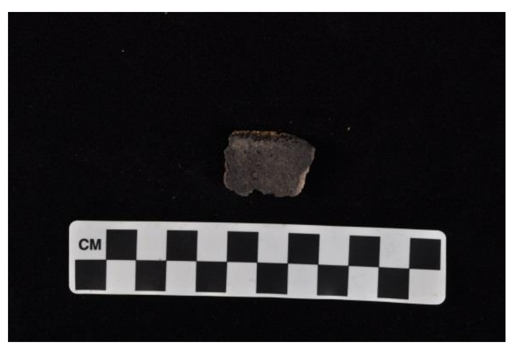
RWA046B

RWA047A



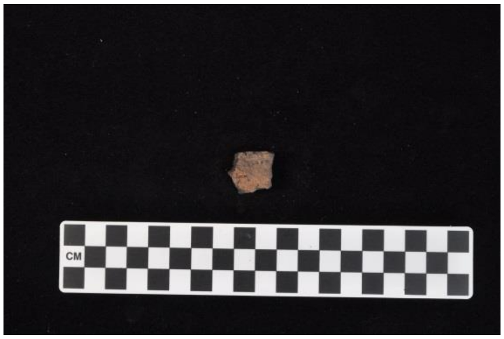
RWA047B

RWA048A



RWA048B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)



RWA049A

RWA049B

RWA050A

RWA050B

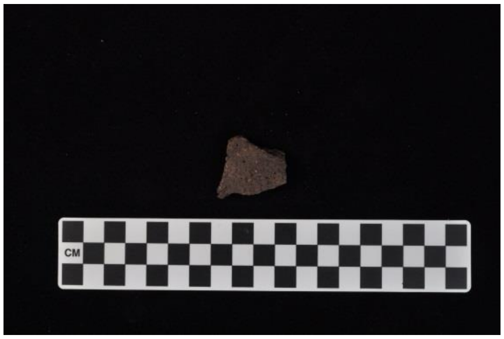
RWA051A

RWA051B

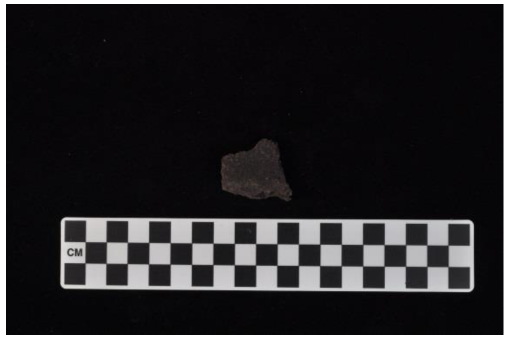
RWA052A

RWA052B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)

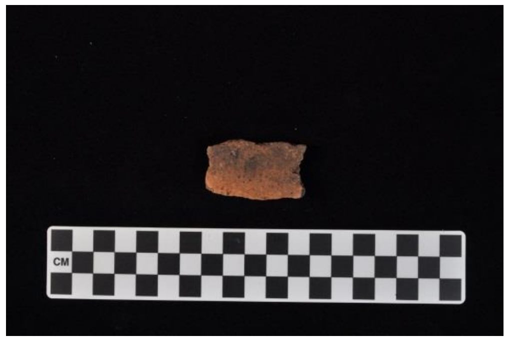


RWA053A



RWA053B

RWA054A

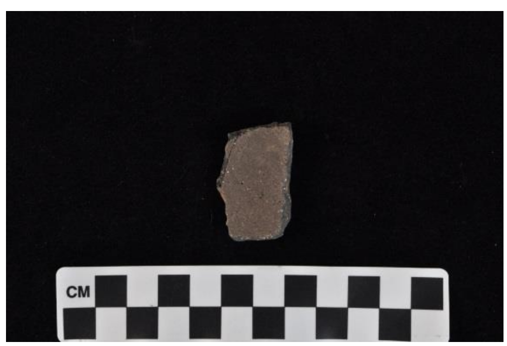


RWA054B

RWA055A

RWA055B

RWA056A



RWA056B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA057A

RWA057B

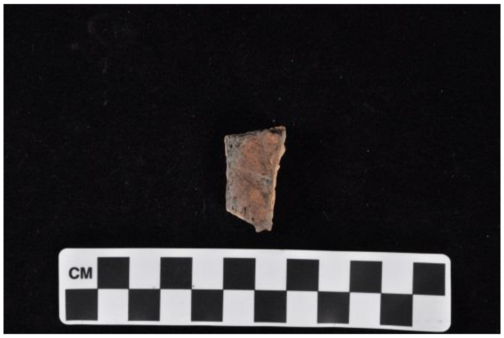
RWA058A

RWA058B

RWA059A

RWA059B

RWA060A



RWA060B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA061A

RWA061B

RWA062A

RWA062B

RWA064A

RWA064B

RWA065A

RWA065B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA066A

RWA066B

RWA067A

RWA067B

RWA068A

RWA068B

RWA069A

RWA069B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

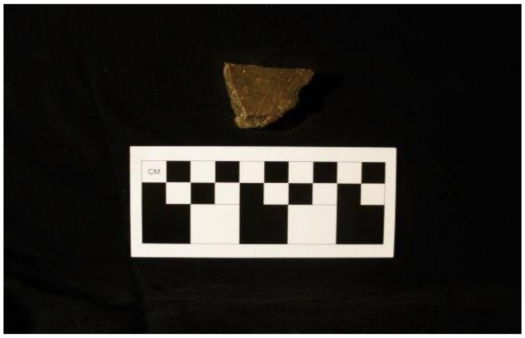

RWA070A


RWA070B

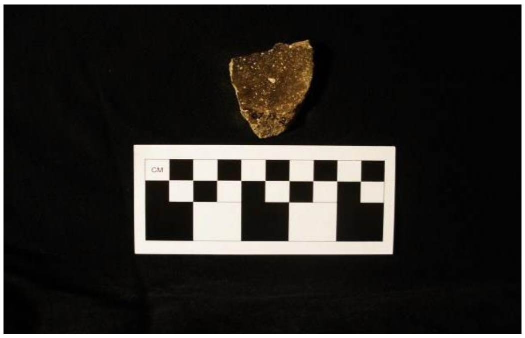

RWA071A


RWA071B


RWA072A

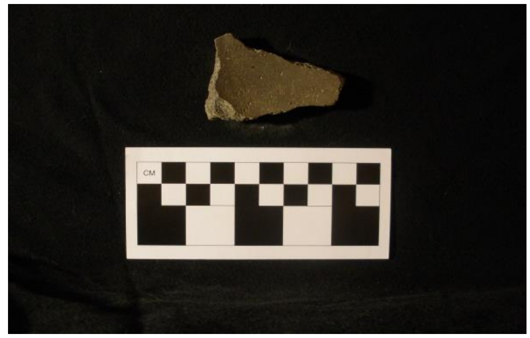

RWA072B


RWA073A

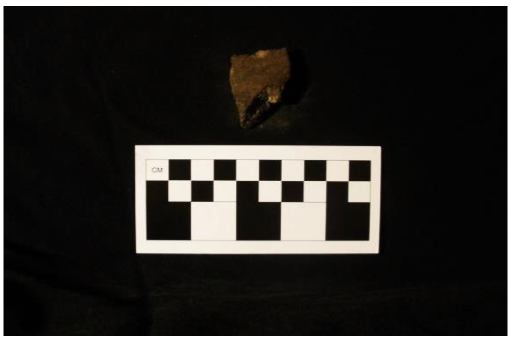

RWA073B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

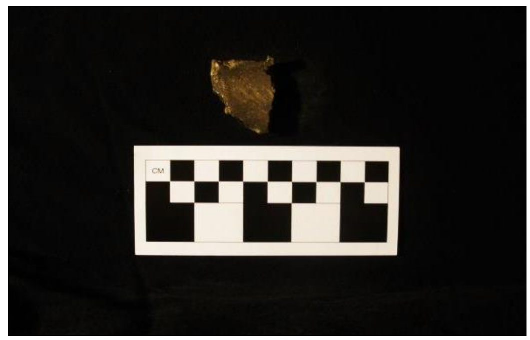
RWA074A



RWA074B

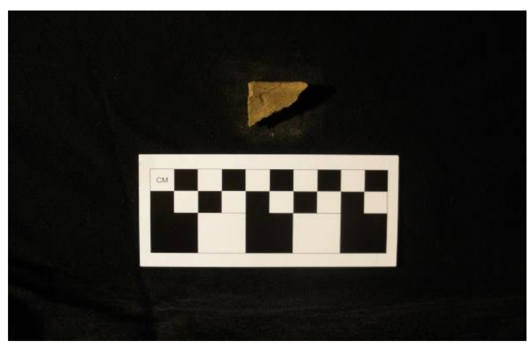


RWA075A



RWA075B

RWA076A



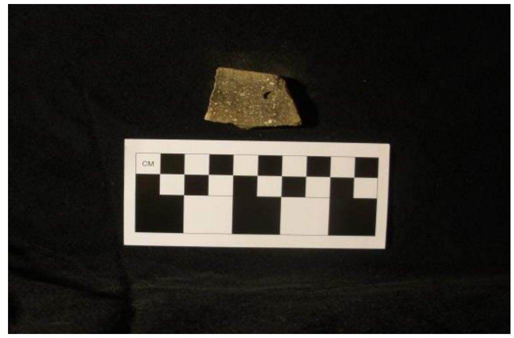
RWA076B

RWA077A

RWA077B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)


RWA078A


RWA078B

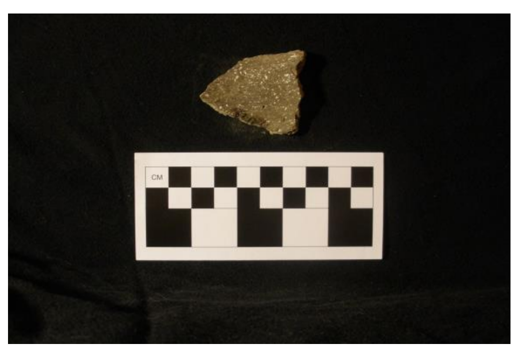

RWA079A


RWA079B


RWA080A


RWA080B


RWA081A

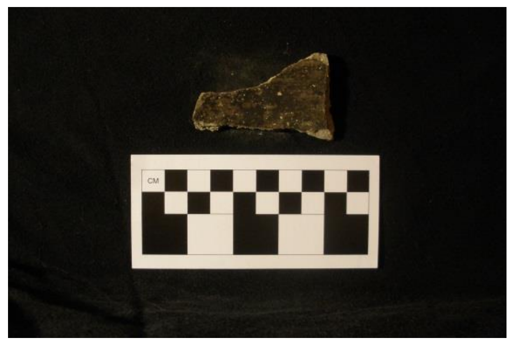

RWA081B

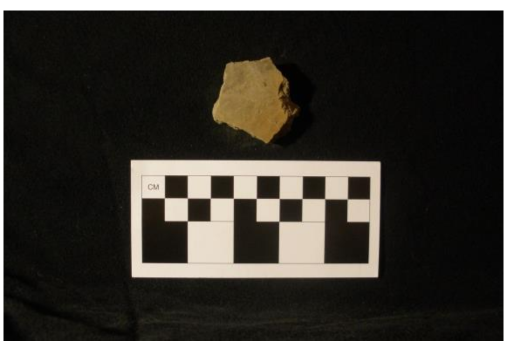
APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)


RWA082A

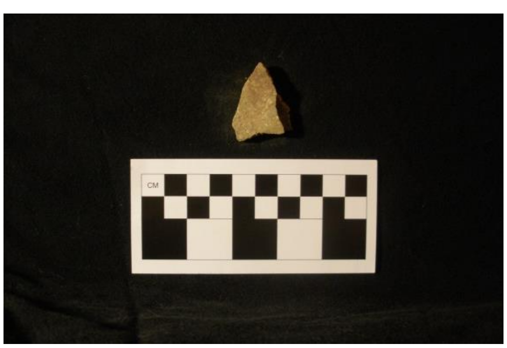

RWA082B


RWA083A


RWA083B


RWA084A


RWA084B


RWA085A

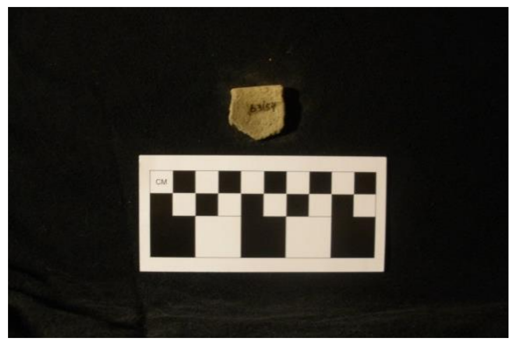

RWA085B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)


RWA086A

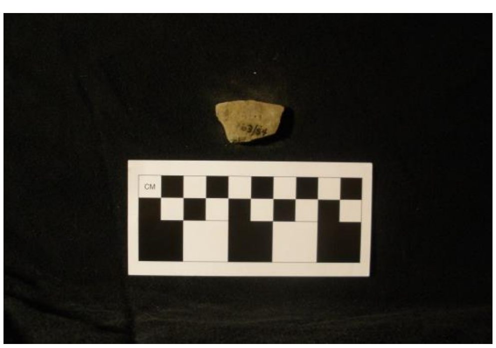

RWA086B


RWA087A


RWA087B

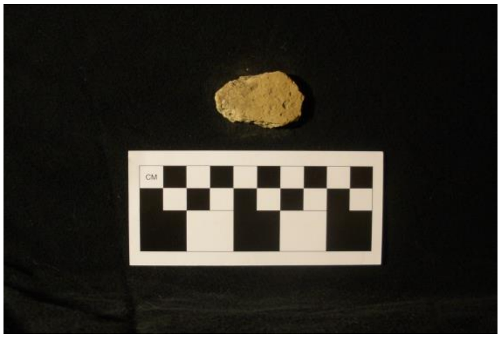

RWA088A


RWA088B


RWA089A


RWA089B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)


RWA090A


RWA090B


RWA091A


RWA091B


RWA092A


RWA092B

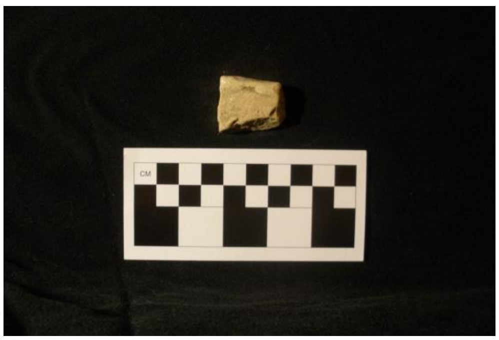

RWA093A


RWA093B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)


RWA094A


RWA094B


RWA095A


RWA095B


RWA096A


RWA096B


RWA097A


RWA097B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA098A

RWA098B

RWA099A

RWA099B

RWA100A

RWA100B

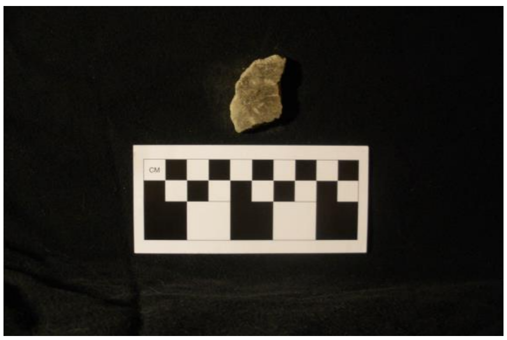
RWA101A

RWA101B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)


RWA102A


RWA102B


RWA103A


RWA103B


RWA104A


RWA104B


RWA105A


RWA105B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA106A

RWA106B

RWA107A

RWA107B

RWA108A

RWA108B

RWA109A

RWA109B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA110A

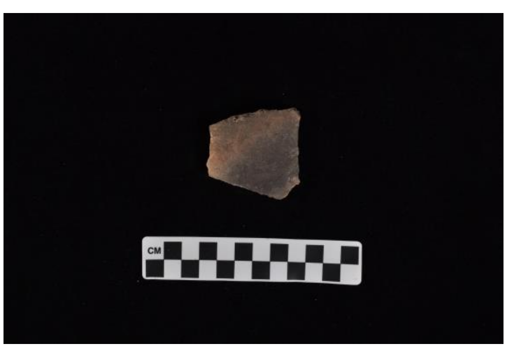
RWA110B

RWA111A

RWA111B

RWA112A

RWA112B



RWA113A

RWA113B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)

RWA114A

RWA114B

RWA115A

RWA115B

RWA116A

RWA116B

RWA117A

RWA117B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA118A

RWA118B

RWA119A

RWA119B

RWA120A

RWA120B

RWA121A

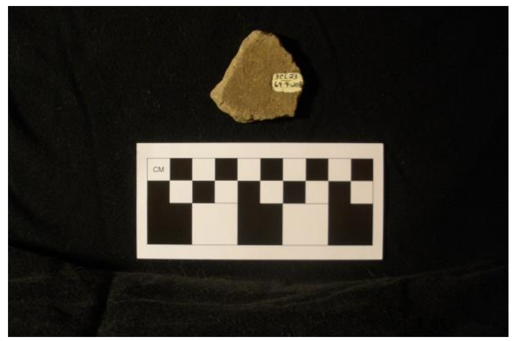
RWA121B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA122A

RWA122B

RWA123A



RWA123B

RWA124A

RWA124B

RWA125A

RWA125B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)

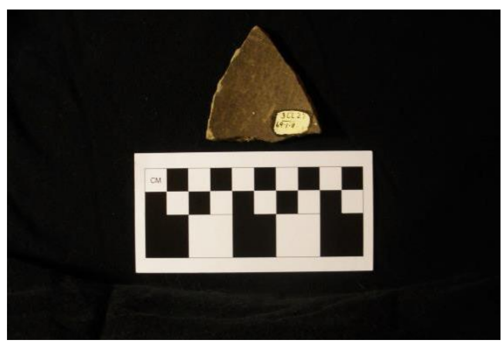

RWA126A


RWA126B


RWA127A


RWA127B


RWA128A


RWA128B


RWA129A

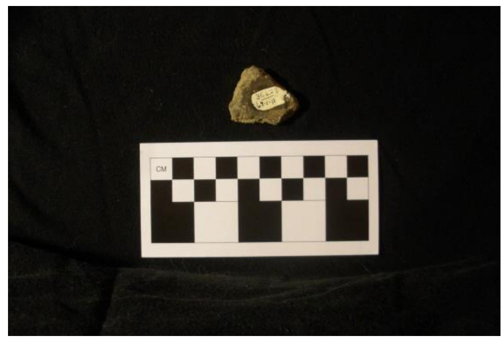

RWA129B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)


RWA130A


RWA130B


RWA131A


RWA131B

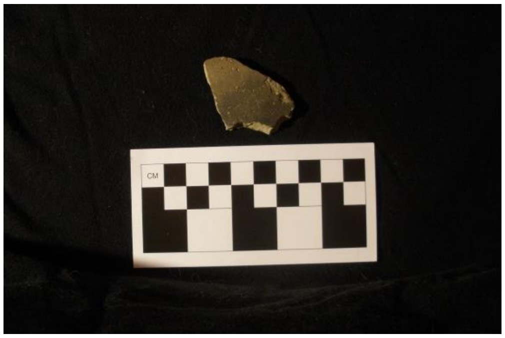
RWA132A

RWA132B


RWA133A


RWA133B

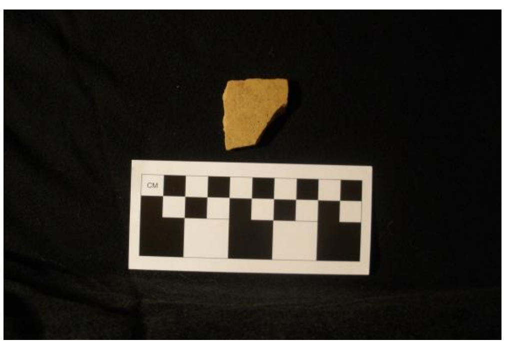
APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)

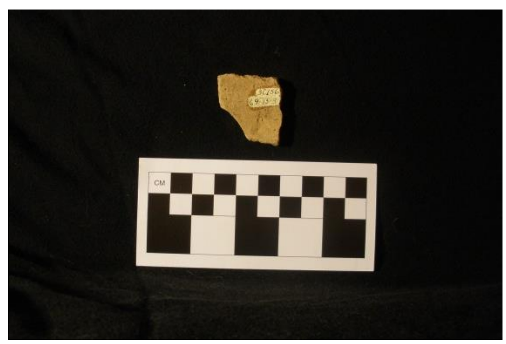

RWA134A


RWA134B


RWA135A


RWA135B


RWA136A


RWA136B


RWA137A


RWA137B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)


RWA138A


RWA138B


RWA139A


RWA139B


RWA140A


RWA140B


RWA141A

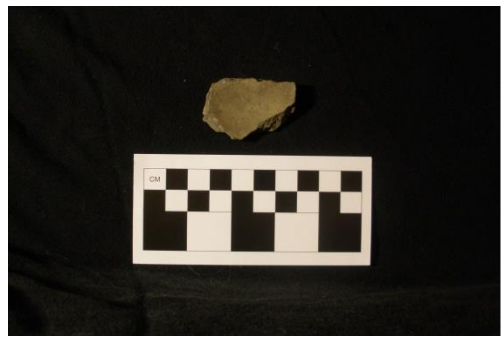

RWA141B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA142A

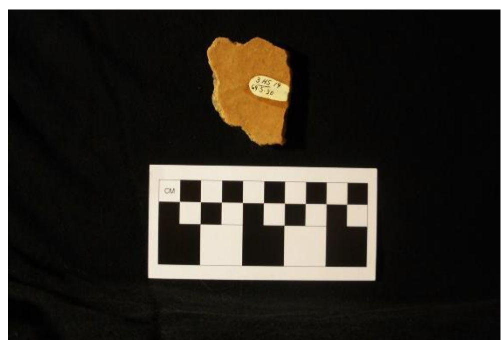
RWA142B

RWA143A



RWA143B

RWA144A



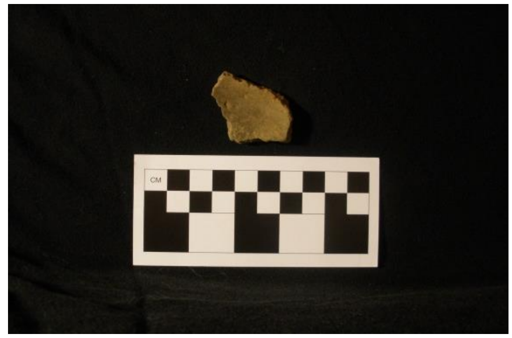
RWA144B

RWA145A

RWA145B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA146A



RWA146B

RWA147A

RWA147B

RWA148A

RWA148B

RWA149A

RWA149B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA150A

RWA150B

RWA151A

RWA151B

RWA152A

RWA152B

RWA153A

RWA153B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

RWA154A

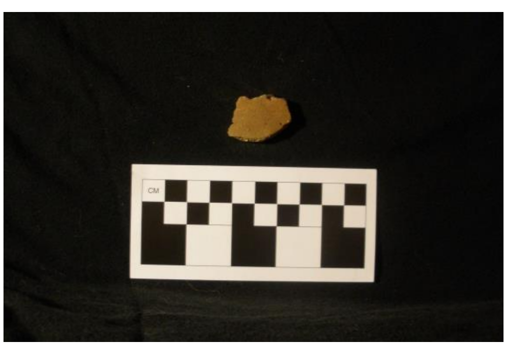
RWA154B

RWA155A

RWA155B

RWA156A

RWA156B

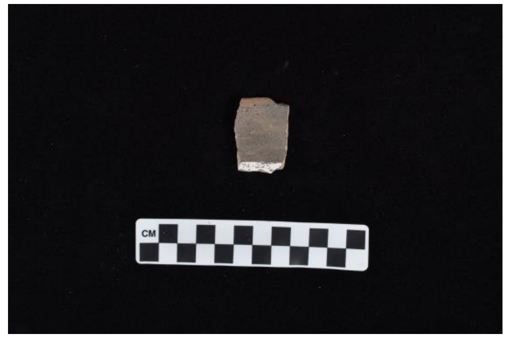


RWA157A

RWA157B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)

RWA158A



RWA158B

RWA159A

RWA159B

RWA160A

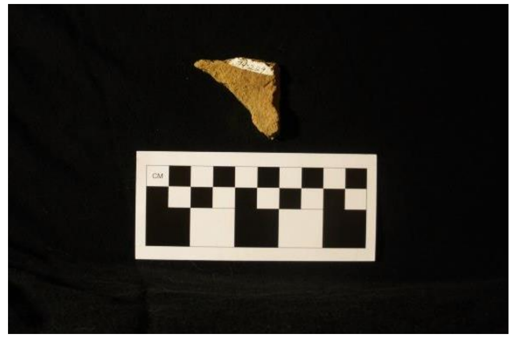
RWA160B

RWA161A

RWA161B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
(“A” denotes exterior; “B” denotes interior; photos taken by the author)

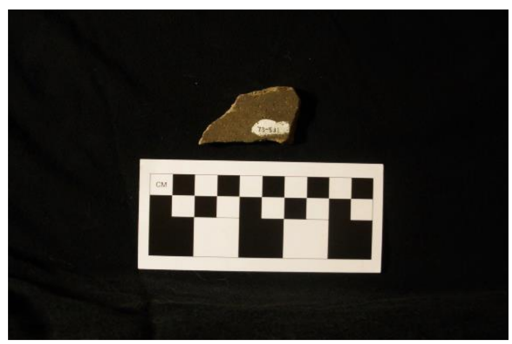

RWA162A


RWA162B


RWA163A


RWA163B

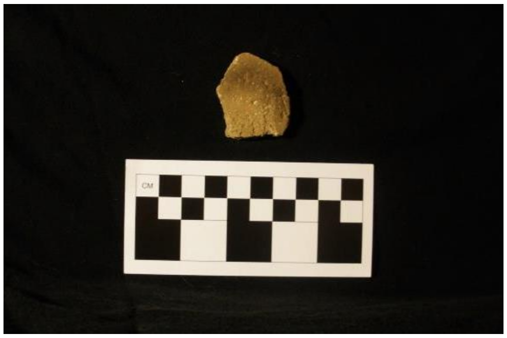

RWA164A


RWA164B


RWA165A


RWA165B

APPENDIX B: Photos of Sherds Submitted for INAA (Cont.)
("A" denotes exterior; "B" denotes interior; photos taken by the author)



RWA166A

RWA166B

APPENDIX C: Raw INAA Data

ANID	As	La	Lu	Nd	Sm	U	Yb	Ce	Co
RWA001	10.1740	44.1551	0.4776	65.5742	8.1586	2.0435	3.3799	88.2001	23.6548
RWA002	4.5669	23.8201	0.2340	15.6552	3.4997	2.2748	1.5292	47.5607	5.2141
RWA003	4.3231	22.5450	0.2001	19.7744	3.3485	2.1740	1.6472	45.9089	4.6110
RWA004	4.5360	36.0886	0.3815	34.6535	6.1298	2.4562	2.8970	73.7908	13.0816
RWA005	5.4907	35.5743	0.3651	28.0853	6.1904	2.5714	2.4259	73.3772	16.3966
RWA006	5.0613	38.7867	0.4067	34.3796	6.7967	2.5123	3.0073	79.0806	11.5899
RWA007	3.9895	21.2156	0.1979	20.4997	3.1447	1.8645	1.3702	42.4246	4.3581
RWA008	2.9224	29.6421	0.3124	21.6068	4.7658	2.9765	2.2209	60.2377	7.7657
RWA009	4.1455	28.3612	0.2987	25.3701	4.9841	2.2681	2.0880	58.2114	9.2799
RWA010	2.7005	30.0388	0.3056	26.4982	4.6714	2.5517	2.0576	60.0983	7.9260
RWA011	6.2470	37.6851	0.3598	35.8541	6.5613	2.8194	2.6835	76.7782	7.3660
RWA012	12.9021	46.9463	0.4676	70.9596	8.9179	3.9051	3.2792	95.2857	19.2765
RWA013	7.3810	28.6648	0.3371	29.0802	4.4673	2.3405	2.2299	59.0188	8.2573
RWA014	9.2585	43.1473	0.4662	56.0467	7.5296	2.6800	3.7735	101.8916	46.3122
RWA015	4.4176	36.5828	0.3394	33.8471	6.1874	2.8596	2.5572	74.1070	6.7442
RWA016	3.9265	29.7073	0.3478	27.3839	5.4326	2.4384	2.2770	59.2340	5.9075
RWA017	7.4284	32.8213	0.3142	31.5404	5.1329	2.5474	2.3700	66.4041	6.8048
RWA018	13.1468	46.2582	0.4684	43.0318	8.1608	3.4278	3.6126	94.6642	15.7106
RWA019	7.5000	38.8592	0.4194	36.7429	6.7567	2.3389	2.9790	79.8620	16.5530
RWA020	8.3091	40.4221	0.4198	32.5806	6.9463	3.4040	2.8716	80.9271	10.2449
RWA021	8.7193	33.3702	0.3378	23.5856	5.4798	2.2359	2.5088	63.5608	6.0756
RWA022	9.3911	35.7664	0.3293	28.9432	5.7575	3.0173	2.4798	66.8748	8.4321
RWA023	13.4704	45.7773	0.4774	43.0313	8.0687	3.8595	3.5639	90.7360	9.8336
RWA024	10.6314	38.1080	0.4956	56.3750	7.3875	3.4415	3.5107	83.2422	11.6469
RWA025	13.2828	48.3180	0.5025	43.0117	8.5439	3.6628	3.7012	98.1590	11.1654
RWA026	11.4853	45.3931	0.4891	63.3329	8.1003	3.2535	3.8208	86.7412	12.2274
RWA027	14.0072	44.6967	0.4911	57.8369	8.0012	2.8049	3.5226	82.5459	8.0927
RWA028	10.9563	42.8426	0.4630	37.7291	7.3474	3.9743	3.6167	84.5956	7.7467

APPENDIX C: Raw INAA Data (Cont.)

ANID	Cr	Cs	Eu	Fe	Hf	Ni	Rb	Sb	Sc
RWA001	93.2702	8.2054	1.6229	43406.7	5.6784	0.00	124.11	0.4409	15.6958
RWA002	47.2344	3.3733	0.6804	21703.9	3.4388	0.00	59.44	0.3596	8.1351
RWA003	43.0713	3.0023	0.6634	17425.2	3.0343	0.00	56.52	0.3231	7.7117
RWA004	58.6208	5.3146	1.2221	31142.8	4.6200	0.00	90.85	0.4624	10.8407
RWA005	59.1164	5.3444	1.2005	43142.4	3.9100	0.00	81.79	0.6111	11.2482
RWA006	70.0915	5.5001	1.3446	34879.5	5.4205	0.00	99.60	0.5809	12.4883
RWA007	39.9413	3.0168	0.6053	16107.9	2.8005	0.00	56.12	0.3347	7.1895
RWA008	58.8804	4.3724	0.9550	23720.7	4.0734	0.00	85.91	0.4501	10.6728
RWA009	50.7211	4.1707	1.0243	27315.0	3.3081	19.80	64.94	0.4208	9.2263
RWA010	59.1076	4.2228	0.9467	23489.1	4.0220	0.00	81.07	0.4576	10.4431
RWA011	73.0479	5.5552	1.2779	29534.1	3.7811	0.00	75.10	0.5135	13.5487
RWA012	84.5771	6.9738	1.7360	71185.0	4.7270	46.94	97.22	0.8183	16.5506
RWA013	58.2348	3.7038	0.8704	27507.5	5.5106	0.00	54.70	0.4984	9.5770
RWA014	73.2666	5.2010	1.4704	38845.7	6.3969	0.00	96.69	0.7256	12.8232
RWA015	69.4037	5.0602	1.1338	29020.2	3.6592	0.00	81.80	0.5048	12.3694
RWA016	58.1494	4.7146	1.0049	27483.5	4.4483	0.00	77.77	0.4579	10.3476
RWA017	63.2244	4.2868	1.0092	28377.4	3.8997	0.00	75.09	0.5469	11.5234
RWA018	87.1769	6.7189	1.6019	45697.4	5.0301	69.35	109.30	0.7108	15.6312
RWA019	62.3947	5.0937	1.3297	33257.2	5.2057	33.32	92.52	0.5715	11.2626
RWA020	71.2568	4.9881	1.3937	33429.2	5.4508	0.00	89.50	0.5359	12.9380
RWA021	57.9243	3.7322	1.1082	28351.8	4.7344	0.00	62.82	0.4955	9.9368
RWA022	58.5392	3.8629	1.1987	29416.0	5.2230	32.12	68.98	0.5131	10.1430
RWA023	86.2720	7.9117	1.5845	46047.7	5.0131	0.00	117.80	0.6426	16.6503
RWA024	72.0190	5.2815	1.3736	36862.4	8.1972	63.59	87.83	0.7353	12.2905
RWA025	98.7228	7.1510	1.6578	49800.0	5.4712	0.00	104.46	0.7980	17.9423
RWA026	73.8070	6.2354	1.4972	40127.1	6.2163	33.19	97.75	0.7225	13.2852
RWA027	78.0900	5.5202	1.5345	40270.0	6.6574	0.00	98.99	0.7763	13.5637
RWA028	84.3122	6.0402	1.4212	40591.8	6.3657	20.64	95.81	0.6704	15.2516

APPENDIX C: Raw INAA Data (Cont.)

ANID	Sr	Ta	Tb	Th	Zn	Zr	Al	Ba	Ca
RWA001	61.47	1.1026	0.9910	12.6014	208.98	132.57	86772.9	1664.2	9641.0
RWA002	389.96	0.7474	0.4138	8.1612	131.86	78.01	50785.3	1432.6	181002.9
RWA003	449.57	0.7109	0.3490	7.7859	117.47	60.82	46078.6	1401.9	195902.8
RWA004	191.89	0.9240	0.7767	10.6339	150.38	118.51	68149.5	1142.3	94371.8
RWA005	205.63	0.9644	0.7034	10.9303	158.03	102.84	71901.2	1216.0	97290.4
RWA006	189.71	1.0295	0.9646	11.7450	137.79	156.39	70859.7	1287.3	67833.1
RWA007	424.75	0.6722	0.3868	7.3613	117.20	69.14	44863.7	1128.3	199620.7
RWA008	331.73	0.8878	0.7045	9.9122	153.01	99.99	64253.0	1306.8	111620.5
RWA009	257.71	0.7338	0.6783	8.4039	152.32	97.19	54418.9	1190.7	153966.1
RWA010	321.72	0.8715	0.6506	9.7420	144.89	119.21	62222.6	1613.8	120163.6
RWA011	342.03	1.0263	0.6851	12.1612	122.74	86.19	82058.2	1720.3	100498.1
RWA012	79.66	1.2350	1.2211	15.1310	166.48	132.11	100652.3	1645.7	17272.7
RWA013	183.34	0.8987	0.6984	9.0557	196.48	143.82	60320.9	1294.9	103462.9
RWA014	193.84	1.1295	0.9581	12.8885	163.31	163.56	85729.0	2109.6	25405.4
RWA015	307.44	0.9694	0.6493	11.1173	128.54	119.47	73637.3	1657.7	119473.2
RWA016	383.80	0.8866	0.6128	9.9705	136.81	109.68	68659.6	1805.7	101742.4
RWA017	260.15	0.9725	0.6096	11.2487	156.82	117.57	71662.8	2059.1	125933.9
RWA018	55.46	1.2946	0.9593	14.2987	149.82	142.41	95590.6	1505.3	26372.2
RWA019	171.28	1.1110	0.8376	11.7830	135.10	162.87	73589.9	1752.6	43471.9
RWA020	192.65	1.0952	1.0315	12.2352	203.39	118.66	75514.9	1420.4	59005.1
RWA021	273.19	0.8828	0.6735	9.9394	148.04	132.25	64603.2	1486.6	112222.1
RWA022	162.24	0.9347	0.6694	10.4658	162.13	137.75	62946.9	1530.9	99369.3
RWA023	60.51	1.3342	1.1058	15.3481	172.38	130.42	96370.7	1378.8	8454.5
RWA024	68.58	1.2195	0.8561	13.5918	132.79	205.74	80926.4	1056.7	6080.3
RWA025	69.50	1.4629	1.1242	17.2723	118.92	145.59	104717.2	1543.3	8246.9
RWA026	78.82	1.2400	1.1819	14.1648	138.26	154.58	87932.3	1332.7	9845.4
RWA027	97.37	1.2723	1.0049	14.0241	95.88	207.35	86922.5	1470.9	10898.8
RWA028	79.46	1.2692	1.0412	14.5665	169.51	156.80	88389.0	1521.0	9314.1

APPENDIX C: Raw INAA Data (Cont.)

ANID	Dy	K	Mn	Na	Ti	V
RWA001	6.0257	24708.3	799.91	679.5	5534.7	114.32
RWA002	2.7914	9925.5	461.96	2889.2	3752.9	65.70
RWA003	2.3246	10288.3	428.55	2735.6	3900.3	67.68
RWA004	4.7965	13964.5	555.08	3719.1	4324.4	90.08
RWA005	4.2141	13841.3	836.90	3424.5	3399.4	116.61
RWA006	5.2162	21189.0	686.84	3859.0	4927.3	95.52
RWA007	2.2118	10133.1	404.07	2936.2	3480.0	60.69
RWA008	4.1423	17719.4	240.78	4042.5	4628.9	83.80
RWA009	3.9778	12203.3	504.63	3407.6	3496.8	71.57
RWA010	3.7300	15245.5	281.87	4217.7	4074.5	83.51
RWA011	4.2126	11443.3	859.29	2397.5	4187.9	118.00
RWA012	6.2485	16239.3	608.64	2482.9	5409.6	144.52
RWA013	4.0612	9769.2	163.22	4079.5	4497.1	83.08
RWA014	5.1028	21578.2	2360.91	5272.7	4817.4	115.68
RWA015	4.1234	13119.2	322.25	3131.4	4230.1	94.65
RWA016	3.7669	14064.4	1139.89	4173.9	3595.9	84.80
RWA017	3.7299	12877.4	464.45	2837.9	4581.5	88.65
RWA018	5.9365	20389.1	882.78	3408.1	5772.6	139.12
RWA019	5.1470	18608.4	778.23	5383.6	5080.2	103.77
RWA020	5.4561	16502.0	444.47	4208.0	4784.2	97.13
RWA021	4.2367	12705.0	318.56	4200.6	4170.2	84.03
RWA022	4.5676	14039.1	293.47	5112.7	4810.8	88.00
RWA023	6.0081	20935.5	479.19	3270.8	5609.8	138.64
RWA024	5.5042	20017.0	753.28	6146.6	5176.0	119.82
RWA025	6.4927	18226.8	617.66	2683.3	6398.4	158.38
RWA026	5.7590	22936.1	741.59	5052.6	5198.6	121.77
RWA027	6.2309	23715.9	892.08	5577.7	5464.0	127.48
RWA028	5.3985	18805.9	387.10	4257.3	5715.2	115.77

APPENDIX C: Raw INAA Data (Cont.)

ANID	As	La	Lu	Nd	Sm	U	Yb	Ce	Co
RWA029	15.4628	46.9835	0.4829	61.9065	8.5296	2.6951	3.5719	91.8625	13.5726
RWA030	12.4251	43.0696	0.5071	65.3619	7.8967	3.1628	3.7518	86.0859	12.8701
RWA031	15.0590	34.0592	0.3457	23.5654	5.3614	3.1005	2.2611	64.0240	4.8489
RWA032	10.3234	42.9377	0.4762	55.4731	7.6135	3.0434	3.5252	106.0647	29.3680
RWA033	9.6877	42.4226	0.4625	39.1802	7.3642	3.2131	3.3231	86.2139	8.2131
RWA034	18.5625	49.3164	0.5548	76.0241	8.9078	4.0424	4.1262	97.4179	8.8428
RWA035	10.8334	42.0435	0.3791	32.4512	7.0248	2.8585	3.1046	82.3228	12.3309
RWA036	7.6770	26.2451	0.2744	24.8283	4.4990	2.0138	1.8768	53.0909	7.0481
RWA037	24.2795	27.8187	0.3342	23.5247	5.4752	2.5210	2.4684	72.4596	6.6603
RWA038	16.1680	50.3958	0.5365	55.5888	8.8738	3.0334	3.9313	110.2734	17.1934
RWA039	13.5413	38.8963	0.4415	44.0223	6.8091	3.1888	3.2497	78.5024	11.5826
RWA040	16.0076	46.2553	0.5240	51.1488	7.8716	2.8361	3.7670	97.0934	12.4106
RWA041	9.5214	33.0103	0.3959	26.7197	5.5193	2.6024	2.5188	64.5717	4.6731
RWA042	12.5713	47.7895	0.4758	35.7728	8.7261	3.4076	3.7878	95.6965	10.6810
RWA043	10.3952	48.1181	0.5272	38.0224	8.0399	3.5164	3.6705	98.1507	10.7245
RWA044	14.8124	48.7944	0.4957	40.9053	8.7907	2.8681	3.8738	97.3107	13.1531
RWA045	10.7878	41.5126	0.4972	31.6484	7.5719	2.8602	3.5155	89.4255	16.5589
RWA046	10.7237	50.9078	0.5081	43.9977	8.3331	2.5905	3.5260	95.8488	15.3744
RWA047	14.3536	50.2725	0.5049	69.2554	8.9851	2.6218	3.9751	86.0491	7.6802
RWA048	12.8117	47.0070	0.5268	47.1856	8.4658	3.3630	4.0526	92.7682	11.7686
RWA049	12.5974	46.5207	0.5153	39.1966	8.0104	3.8879	3.5956	94.0577	8.4926
RWA050	13.2942	48.3923	0.4858	52.7309	8.6816	3.1193	3.3628	98.2960	9.8295
RWA051	10.7658	47.9017	0.4858	70.6495	9.3936	2.6435	3.5045	100.9290	40.3291
RWA052	13.1489	47.3043	0.5219	66.8963	8.4955	3.6680	3.8117	95.7895	14.2268
RWA053	11.9683	45.6569	0.4515	60.2683	8.0922	2.3239	3.4497	76.1062	7.4617
RWA054	11.1258	54.3880	0.5854	82.5950	10.7032	3.3996	4.1779	112.2545	21.2859
RWA055	13.2391	49.3923	0.5110	63.7459	9.0681	3.7189	3.8250	99.7086	13.8468
RWA056	10.1249	48.3990	0.4553	57.4442	8.8490	2.9464	3.5666	95.5109	10.5732

APPENDIX C: Raw INAA Data (Cont.)

ANID	Cr	Cs	Eu	Fe	Hf	Ni	Rb	Sb	Sc
RWA029	79.8885	6.1330	1.6043	42840.3	6.0588	67.93	106.78	0.7744	14.5635
RWA030	78.4415	5.6762	1.5159	38353.3	7.1018	38.91	106.58	0.7788	13.0354
RWA031	59.5141	3.6426	1.0604	25050.6	4.7020	0.00	60.04	0.4944	10.3279
RWA032	74.8916	6.0376	1.4962	38684.0	7.0148	0.00	101.73	0.7165	12.8390
RWA033	81.8985	6.0384	1.4536	40494.0	6.6388	47.14	98.79	0.8245	14.4199
RWA034	94.0640	6.5527	1.6938	45370.9	5.9985	62.96	115.20	0.7140	17.0483
RWA035	74.7735	5.6906	1.4631	42102.7	3.9212	0.00	82.91	0.6095	13.9690
RWA036	49.5613	3.5769	0.8689	27515.6	3.7529	0.00	63.40	0.5182	8.9853
RWA037	68.0790	7.2437	1.0436	34448.4	2.9427	0.00	49.10	0.8369	11.3545
RWA038	84.5299	6.7404	1.6959	45522.2	6.0395	29.70	113.85	0.9930	15.1459
RWA039	69.9756	5.5635	1.3174	33801.9	5.5458	0.00	96.88	0.6344	12.4571
RWA040	84.1186	7.2024	1.6883	48345.6	6.0147	0.00	127.79	0.8751	15.1687
RWA041	58.7452	3.0327	1.1206	26847.0	5.4058	0.00	65.32	0.5121	10.1689
RWA042	85.3550	5.4929	1.7074	37678.5	5.5304	39.02	86.68	0.7013	15.1365
RWA043	80.5426	5.2500	1.6754	35684.9	6.2502	0.00	97.75	0.6963	14.7046
RWA044	87.3480	5.9828	1.7328	44053.0	5.6096	0.00	109.56	0.6510	15.9429
RWA045	78.2307	6.7178	1.4712	39472.9	6.1266	43.20	120.13	0.7317	14.4884
RWA046	86.6021	6.1170	1.7383	45397.8	5.6127	47.88	117.29	0.7121	15.9366
RWA047	85.8897	5.8263	1.7066	46198.5	6.2250	0.00	99.46	0.9315	15.6290
RWA048	86.7770	5.7357	1.6800	45009.6	5.5586	17.82	108.33	0.7254	15.4989
RWA049	95.0694	5.7313	1.5467	43954.4	6.3258	0.00	88.71	0.7210	16.9945
RWA050	96.5934	6.6593	1.6949	51711.3	5.4777	0.00	108.47	0.6920	18.8213
RWA051	93.5784	6.4221	1.8334	45014.9	5.4200	71.60	96.94	0.8129	14.8304
RWA052	78.7763	6.0649	1.6729	40610.7	6.4968	56.01	113.86	0.6629	14.1760
RWA053	77.3579	5.7368	1.5536	41791.7	5.5804	0.00	94.35	0.7307	14.2554
RWA054	98.6219	6.6514	1.9840	48539.3	5.4610	53.20	96.51	0.8577	17.9626
RWA055	88.6065	6.1062	1.7643	42282.4	5.8359	28.12	101.02	0.7269	16.5593
RWA056	82.2551	5.3966	1.7324	35743.3	5.3080	0.00	85.58	0.6286	15.2509

APPENDIX C: Raw INAA Data (Cont.)

ANID	Sr	Ta	Tb	Th	Zn	Zr	Al	Ba	Ca
RWA029	0.00	1.2418	1.1237	14.3725	104.64	157.61	91315.7	1546.4	9106.8
RWA030	64.37	1.2146	0.9066	12.9717	94.46	190.44	84276.2	926.0	13242.5
RWA031	177.44	0.9166	0.6942	10.5846	152.71	108.24	64841.2	1406.5	124126.1
RWA032	0.00	1.2540	0.9191	13.4963	168.86	174.31	81999.1	1071.3	6356.6
RWA033	85.89	1.2601	0.9243	14.2087	195.78	170.80	89490.6	1345.5	10064.7
RWA034	0.00	1.7446	1.2881	17.4262	198.88	159.89	98993.1	1521.0	6158.4
RWA035	121.51	1.0350	0.8494	12.7060	198.78	90.40	81314.9	1607.5	89327.9
RWA036	335.19	0.7786	0.5000	9.0558	114.77	94.43	57529.5	1328.0	166955.2
RWA037	0.00	0.6684	0.5737	10.1448	115.44	96.64	71002.0	975.8	8436.8
RWA038	44.40	2.0952	0.9737	15.7351	139.13	131.54	90420.4	1502.4	8899.4
RWA039	207.09	1.0582	0.8293	12.1916	167.11	145.59	77103.9	1151.2	50171.8
RWA040	77.35	1.2806	0.9373	14.8935	136.69	151.97	87391.1	1475.8	8055.6
RWA041	210.54	0.9958	0.6967	10.7543	108.09	149.10	66744.2	1163.6	92906.9
RWA042	64.57	1.2629	1.0117	14.3640	153.18	139.41	93924.9	1301.2	34178.0
RWA043	133.71	1.4336	1.1507	14.7789	98.47	204.56	87633.3	1439.7	10720.8
RWA044	67.14	1.4066	0.9882	16.3720	149.54	178.51	95377.1	1715.7	7242.0
RWA045	90.73	1.3715	0.9966	15.2696	146.34	167.73	89956.3	1125.2	5914.8
RWA046	67.05	1.2429	0.9615	14.3476	165.39	168.86	96290.3	1900.8	11038.9
RWA047	95.29	1.3675	1.2049	16.2437	99.32	138.74	97395.8	1184.5	8598.1
RWA048	105.66	1.3320	0.9565	14.9123	101.35	166.82	89972.3	1606.1	10447.3
RWA049	83.60	1.4664	0.9243	17.6167	106.59	169.82	96151.5	1286.8	7242.2
RWA050	105.13	1.4466	1.1076	17.0537	141.85	150.21	107421.9	1392.6	7480.8
RWA051	110.78	1.1342	1.2699	13.1025	112.15	166.80	86503.3	1328.4	52075.2
RWA052	76.72	1.4017	0.9512	15.7999	131.20	188.72	84007.7	1366.9	5591.1
RWA053	80.81	1.2767	0.8625	14.8244	164.46	170.95	91573.6	1455.2	10138.6
RWA054	0.00	1.4158	1.4302	17.1999	135.87	168.71	105837.1	1308.2	7233.2
RWA055	0.00	1.3252	1.1613	15.4841	118.46	146.36	98393.8	1566.8	6130.9
RWA056	84.76	1.1737	1.1423	14.1267	189.46	132.60	91340.6	1291.3	34753.3

APPENDIX C: Raw INAA Data (Cont.)

ANID	Dy	K	Mn	Na	Ti	V
RWA029	6.0806	22877.8	1080.90	5410.5	5232.5	140.87
RWA030	6.1440	22664.1	634.21	7213.2	5232.5	106.49
RWA031	4.4230	12956.2	247.58	4153.6	4170.5	99.49
RWA032	5.7947	22235.5	1171.66	5852.0	4982.4	129.97
RWA033	5.0953	23444.8	490.41	5216.3	5191.1	113.89
RWA034	6.5583	18590.9	699.75	3454.3	6228.6	139.59
RWA035	5.2535	13326.5	248.01	2846.4	4637.6	124.42
RWA036	3.3996	18520.4	905.05	3390.6	3758.8	90.51
RWA037	3.9202	6651.0	167.43	1358.0	3038.4	175.58
RWA038	6.1113	20410.8	1629.77	4467.3	5089.5	157.24
RWA039	5.4814	18022.0	494.90	4643.1	4850.8	111.21
RWA040	6.1606	31918.7	474.61	4652.5	4807.9	113.09
RWA041	4.6075	15820.7	225.24	4904.0	4549.3	86.79
RWA042	5.9649	16460.2	315.54	3672.8	5339.6	135.16
RWA043	6.6466	15671.3	656.19	4568.7	5851.9	122.82
RWA044	6.9382	20709.1	738.18	3905.0	5488.4	140.08
RWA045	6.4045	21637.1	912.49	5152.5	5789.4	127.49
RWA046	6.8467	25292.8	980.73	3725.9	6063.4	128.95
RWA047	6.8261	19918.0	569.39	4893.3	5397.7	137.60
RWA048	6.4884	22200.9	1391.70	4460.6	5815.5	119.48
RWA049	6.2422	14705.4	440.52	2752.9	6157.2	148.75
RWA050	6.2292	21509.8	705.56	2768.9	5318.4	155.57
RWA051	6.9518	18471.2	1226.37	3250.1	5024.2	130.55
RWA052	6.4127	23225.4	839.62	5238.8	5655.4	115.17
RWA053	6.2126	21277.4	569.86	4704.6	5134.6	122.75
RWA054	7.7787	16049.0	629.60	2996.7	6262.9	155.51
RWA055	7.1975	20960.0	457.23	3919.6	5669.7	137.56
RWA056	6.6524	16438.3	289.56	3750.5	4627.6	134.08

APPENDIX C: Raw INAA Data (Cont.)

ANID	As	La	Lu	Nd	Sm	U	Yb	Ce	Co
RWA057	7.2773	35.0250	0.3199	31.0663	5.5312	3.5970	2.2961	69.7853	7.2936
RWA058	11.3552	50.0423	0.4760	35.5231	8.7145	2.7534	3.8970	101.8097	13.6747
RWA059	12.5914	47.9416	0.5036	68.0284	8.6251	3.4914	4.0193	94.7876	15.6622
RWA060	12.1939	47.4803	0.5371	62.0148	8.7844	3.2197	3.7608	94.6598	12.8240
RWA061	7.2012	41.4057	0.4490	62.3747	7.8551	2.1716	3.0995	86.2095	16.6666
RWA062	3.9649	42.2574	0.4822	65.0426	7.9525	2.7843	3.6123	86.8904	14.1499
RWA063	6.9808	38.3977	0.4813	33.4407	6.9005	2.5533	3.6285	122.4795	18.5300
RWA064	6.5274	31.2254	0.3430	26.8741	5.5458	2.5118	2.4280	62.6858	12.2397
RWA065	9.2019	35.6837	0.3975	26.0205	6.2882	4.0727	3.0116	67.9384	11.4041
RWA066	6.7928	35.3316	0.3893	24.7594	6.1147	4.8063	2.4219	71.0012	12.0091
RWA067	10.6445	31.9486	0.3356	22.9768	5.4367	3.1857	2.3075	63.3035	12.3145
RWA068	0.9762	3.6470	0.0399	2.8250	0.6494	0.3508	0.2807	7.2085	1.1789
RWA069	5.4657	24.7978	0.2839	15.2695	4.0443	2.6963	1.8496	49.5454	10.4142
RWA070	8.7855	28.6526	0.3229	24.1081	4.4899	3.9856	2.0357	56.6904	11.0225
RWA071	6.4729	22.6159	0.2581	14.6314	3.5993	1.9355	1.7227	43.3863	7.2005
RWA072	7.9932	34.6391	0.3873	31.2051	6.1076	3.0319	2.5708	68.0981	12.4973
RWA073	6.4659	19.4629	0.2125	14.1976	3.2434	2.4626	1.6532	37.9242	10.9122
RWA074	7.5589	34.4076	0.3946	28.4324	6.1207	3.2000	2.8050	69.9800	12.3384
RWA075	8.7279	37.8920	0.3877	31.6372	6.6931	2.9173	3.1959	72.5133	12.9581
RWA076	8.0805	35.8621	0.3888	32.7392	6.4636	3.3877	2.7699	74.1699	15.8623
RWA077	4.1166	26.5052	0.3063	23.6998	4.7782	2.3556	2.2581	51.1592	9.2684
RWA078	3.8425	22.5785	0.2678	17.5952	3.5715	1.5809	1.4676	43.3921	7.3893
RWA079	3.7481	26.5637	0.2977	22.1684	4.6660	2.9860	2.2681	51.0468	16.0904
RWA080	5.6067	22.0364	0.2468	18.8832	3.7627	1.9087	1.8765	42.4858	8.5526
RWA081	5.7817	28.1476	0.3491	22.3699	4.4984	2.3509	2.0991	54.6863	7.3475
RWA082	5.1249	26.4047	0.2757	21.4194	4.1988	2.3804	1.8827	50.4308	7.3490
RWA083	4.2086	28.0128	0.2847	24.0203	4.7883	2.8840	2.2997	53.5534	7.2808
RWA084	8.6363	37.1162	0.4550	32.7723	6.3209	3.5814	2.8171	72.8890	12.5925

APPENDIX C: Raw INAA Data (Cont.)

ANID	Cr	Cs	Eu	Fe	Hf	Ni	Rb	Sb	Sc
RWA057	65.3873	4.3842	1.0797	29660.8	4.1474	0.00	77.91	0.5139	12.3042
RWA058	87.5477	6.6635	1.6650	41428.6	5.6876	0.00	115.08	0.8010	15.4694
RWA059	85.6074	5.9117	1.6639	43326.6	6.7995	34.72	103.87	0.8463	15.3224
RWA060	88.6195	6.3115	1.7109	45007.7	6.2003	37.21	113.85	0.8430	15.8089
RWA061	83.6849	5.8873	1.4732	41968.4	5.0907	25.60	112.65	0.6020	14.3548
RWA062	81.1176	5.0463	1.4870	38362.1	6.7573	26.83	103.16	0.5910	13.4411
RWA063	101.6966	8.4652	2.1291	46081.3	14.2958	0.00	155.26	1.1739	16.8110
RWA064	58.7983	5.0596	1.0298	30845.4	4.0100	29.20	109.79	0.8722	9.9959
RWA065	82.4362	5.6835	1.2306	40671.8	4.6856	0.00	95.80	0.8227	13.9267
RWA066	87.1479	6.9787	1.1664	43528.0	4.4425	0.00	112.40	0.8617	15.2369
RWA067	80.0519	6.7010	1.0344	37688.8	4.1430	0.00	106.81	0.9029	13.7203
RWA068	7.5328	0.5981	0.1258	3609.7	0.4567	0.00	10.92	0.0891	1.2816
RWA069	63.5566	4.9191	0.7700	30346.9	3.4016	0.00	86.69	0.7090	10.7130
RWA070	77.1842	6.0953	0.8544	39076.5	3.9368	0.00	104.69	0.7863	13.3027
RWA071	56.7539	3.9468	0.7150	26959.6	3.3740	0.00	63.31	0.6257	9.4097
RWA072	71.3223	5.9271	1.1767	34593.1	4.6075	0.00	103.54	0.7810	12.1355
RWA073	53.9079	4.1951	0.5747	27917.6	2.7743	0.00	79.64	0.5712	9.3922
RWA074	72.0237	5.7295	1.1929	34589.3	4.6666	32.30	103.63	0.7477	12.1099
RWA075	82.5093	6.8967	1.3014	40643.9	4.5059	0.00	105.26	0.7649	14.8572
RWA076	77.2152	5.6621	1.2363	36659.2	4.8105	0.00	99.77	0.8292	12.6358
RWA077	46.9712	3.9173	0.9346	20702.4	4.4122	0.00	75.99	0.5463	7.3934
RWA078	52.5558	4.3338	0.6803	23476.4	4.0057	27.29	67.79	0.4815	7.8326
RWA079	57.2498	4.5867	0.9435	26037.7	4.2572	0.00	78.12	0.5926	9.5857
RWA080	45.9030	3.1271	0.7553	21069.8	3.2280	17.51	58.08	0.5128	7.4390
RWA081	61.3520	4.4248	0.9042	28315.8	5.0595	20.10	74.45	0.7271	9.5347
RWA082	59.7515	4.6512	0.8308	28693.6	4.2193	27.56	74.02	0.5445	9.3534
RWA083	58.5536	4.4031	0.9727	27314.5	4.1943	0.00	79.30	0.5894	9.7443
RWA084	81.1576	6.8989	1.2616	38722.1	5.0340	41.12	110.41	0.8896	13.8969

APPENDIX C: Raw INAA Data (Cont.)

ANID	Sr	Ta	Tb	Th	Zn	Zr	Al	Ba	Ca
RWA057	294.29	1.0691	0.7839	12.0738	192.55	124.08	74446.3	2532.9	102587.6
RWA058	97.48	1.2865	0.8968	15.0964	112.84	148.67	96771.5	1426.0	18720.6
RWA059	49.03	1.3153	1.1587	15.0380	112.97	178.61	92156.2	1443.3	7086.0
RWA060	0.00	1.3525	0.9765	15.2087	128.52	159.37	93686.6	1475.1	6850.0
RWA061	215.18	1.1755	0.8457	12.9989	210.77	103.57	88388.6	1450.2	26203.3
RWA062	214.02	1.2235	1.0575	13.0079	212.62	162.10	82136.7	1840.1	10618.8
RWA063	159.79	1.8595	1.4239	17.8473	139.87	382.69	68741.7	582.0	6082.3
RWA064	209.46	0.8695	0.6133	10.1742	153.64	101.65	64899.1	1160.3	97918.6
RWA065	171.92	1.0630	0.6346	12.0545	234.00	128.16	86325.9	2022.2	12788.9
RWA066	298.52	1.0397	0.7888	12.5072	187.04	150.70	91953.9	2477.0	24397.4
RWA067	202.44	0.9327	0.5426	11.4876	195.97	106.97	84050.2	1799.5	53073.6
RWA068	14.91	0.1026	0.0754	1.1862	16.68	15.72	77127.9	1030.7	54793.6
RWA069	229.76	0.7630	0.3588	9.0527	150.04	108.52	63912.8	968.0	110699.1
RWA070	227.96	0.9089	0.5902	11.0612	153.03	104.92	73805.1	1153.5	72176.9
RWA071	360.20	0.7172	0.3403	7.8510	125.62	93.70	57658.0	1499.5	140726.5
RWA072	198.70	0.9682	0.6569	10.7949	165.43	137.66	74140.3	931.6	52783.6
RWA073	187.01	0.6098	0.3070	7.8689	129.05	68.13	53282.4	694.2	167269.0
RWA074	493.20	0.9353	0.6595	10.8275	173.14	130.83	75223.3	1146.4	53173.4
RWA075	148.12	1.0118	0.8368	12.2673	230.24	109.75	86879.5	1227.3	10044.7
RWA076	266.85	0.9646	0.8118	11.1544	233.74	135.82	78097.8	1907.3	28253.8
RWA077	236.49	0.6657	0.5259	7.4130	128.99	129.62	49769.6	1325.1	136295.1
RWA078	244.17	0.6649	0.4131	6.8758	116.17	100.55	48789.8	1218.9	148972.3
RWA079	231.42	0.7035	0.5962	8.2972	100.48	102.58	55856.8	910.7	136955.9
RWA080	245.84	0.5681	0.4679	6.6828	76.64	101.61	43438.5	1391.8	195852.9
RWA081	216.80	0.7967	0.5132	8.7251	113.97	132.18	56964.2	1215.0	116240.1
RWA082	225.04	0.7346	0.5658	8.0139	109.82	110.69	58508.6	1135.8	131476.2
RWA083	221.71	0.7300	0.6497	8.5457	135.39	100.26	57288.9	999.5	138655.2
RWA084	214.57	1.0166	0.8007	12.1498	169.86	150.61	76581.9	1307.3	47965.5

296

APPENDIX C: Raw INAA Data (Cont.)

ANID	Dy	K	Mn	Na	Ti	V
RWA057	3.9956	13793.1	551.80	2970.7	4653.8	105.18
RWA058	6.2812	20325.6	603.84	4242.1	5781.8	124.58
RWA059	6.3246	23327.5	911.10	5593.0	6074.7	129.02
RWA060	6.5075	24632.0	713.48	5304.6	5657.8	127.70
RWA061	5.9668	22862.1	972.33	4247.4	5488.2	123.52
RWA062	6.0213	23572.1	762.04	5122.2	5334.8	98.83
RWA063	4.9598	23589.3	643.43	7667.7	5329.2	73.50
RWA064	4.2393	33039.0	1809.96	4133.0	4152.4	107.30
RWA065	4.6865	20940.6	677.25	4065.2	5080.1	165.88
RWA066	4.4473	21276.2	719.96	3351.4	4455.9	161.11
RWA067	4.0549	22317.5	563.67	3332.7	3987.5	155.89
RWA068	4.9895	23863.8	1007.29	4456.9	5541.4	149.16
RWA069	2.8750	18301.9	646.09	2876.0	3305.9	131.30
RWA070	3.0118	18320.6	689.56	2807.9	4007.9	157.33
RWA071	2.5780	11092.3	487.14	2777.4	3471.1	101.13
RWA072	4.5022	19435.8	1059.35	4468.6	4248.8	137.19
RWA073	2.0131	12640.7	667.94	1978.4	2980.1	112.44
RWA074	4.3736	19754.8	1328.78	4462.5	4436.0	137.40
RWA075	5.2175	22727.7	715.29	3690.4	4462.9	160.85
RWA076	4.0060	25418.7	1122.67	4576.4	4283.8	141.66
RWA077	3.5816	17345.0	696.38	4713.9	3056.0	85.80
RWA078	2.4731	14932.2	906.45	3493.0	2827.0	89.11
RWA079	3.2548	12769.0	551.71	3527.4	2881.6	97.24
RWA080	2.5611	12047.9	944.32	3312.3	2797.5	77.54
RWA081	3.1937	15992.2	493.11	4292.3	3040.9	94.64
RWA082	3.2587	13562.3	540.07	3312.2	3033.7	110.98
RWA083	3.4035	12701.9	629.15	3610.8	2887.5	101.77
RWA084	4.3241	25842.3	908.85	4040.6	3491.9	139.24

APPENDIX C: Raw INAA Data (Cont.)

ANID	As	La	Lu	Nd	Sm	U	Yb	Ce	Co
RWA085	7.5324	31.6926	0.3484	26.4614	5.3646	3.1937	2.4557	61.4920	10.4650
RWA086	7.5877	33.7849	0.4321	31.1570	5.8097	2.7828	2.8936	64.0500	10.3990
RWA087	11.8157	31.5136	0.3806	25.5527	5.4371	2.6837	2.3230	61.5825	10.8923
RWA088	11.4382	37.8633	0.4850	31.0106	6.4819	3.5749	3.1448	73.7952	14.2786
RWA089	12.2430	35.4103	0.4442	30.7045	5.8575	3.6176	2.7117	72.0384	16.8746
RWA090	11.8957	38.4307	0.4493	30.0763	6.5412	3.1693	2.9136	74.3166	13.8314
RWA091	8.1931	27.0180	0.2985	22.3264	4.4557	2.6167	2.0393	51.4503	7.6318
RWA092	6.6265	22.9576	0.2553	18.3720	3.8135	2.5555	1.7193	45.5212	10.2961
RWA093	4.6475	21.8604	0.2579	18.2070	3.6110	2.5120	1.6140	43.6372	10.5872
RWA094	6.5125	25.5471	0.2945	21.3255	4.1850	2.0127	1.8986	48.3918	8.4403
RWA095	5.3014	20.4039	0.2462	16.3471	3.2324	1.7356	1.7197	40.3899	5.7061
RWA096	5.5533	25.4671	0.2641	19.7295	4.1010	3.3863	1.7409	48.1399	7.4360
RWA097	5.5834	21.5571	0.2472	17.2796	3.5772	1.4870	1.7137	40.8455	6.3236
RWA098	6.8444	29.6223	0.3245	30.3085	5.0722	2.7315	2.1121	58.8356	13.2158
RWA099	5.1334	16.8391	0.2080	12.0338	2.6003	2.0137	1.3397	30.1723	4.4672
RWA100	4.1390	26.3537	0.2847	21.7904	4.2116	3.1855	2.0574	50.3162	7.3947
RWA101	5.3348	19.7155	0.2339	16.8893	3.1794	2.3953	1.5889	38.0248	5.5017
RWA102	6.1054	29.2777	0.3321	24.6497	4.7135	2.8453	2.3788	56.6241	7.9062
RWA103	4.8819	14.1463	0.1558	13.7743	2.3869	2.4898	1.0832	27.0126	4.5440
RWA104	3.7385	36.4582	0.4159	30.4277	6.2775	2.7873	2.9291	71.0485	5.9437
RWA105	8.6855	27.1226	0.3066	25.4768	5.0430	1.7083	2.1549	53.1333	9.5173
RWA106	8.6634	40.5080	0.4207	33.2219	7.1774	2.2682	2.9493	81.1320	16.0106
RWA107	6.9282	32.1936	0.3538	30.0276	5.7998	1.3726	2.4484	64.2216	12.0223
RWA108	8.8999	39.6292	0.4313	33.9908	7.0130	2.7838	3.2629	80.4930	14.2879
RWA109	11.1767	43.7773	0.4727	35.8519	7.7521	3.1911	3.3207	89.6261	22.9225
RWA110	8.9204	29.7154	0.3464	27.0966	5.1521	2.4373	2.3154	58.1382	8.2462
RWA111	6.0011	37.4256	0.3757	32.1514	6.4864	2.2881	2.7219	73.9318	6.7554
RWA112	6.8736	35.9096	0.3595	32.6445	6.1552	2.9115	2.5077	71.2114	15.5778

APPENDIX C: Raw INAA Data (Cont.)

ANID	Cr	Cs	Eu	Fe	Hf	Ni	Rb	Sb	Sc
RWA085	64.6107	5.3429	1.0631	31283.0	4.8688	20.26	88.49	0.7066	10.9280
RWA086	67.5087	5.6154	1.1876	31961.1	5.1101	22.52	96.70	0.8673	11.2477
RWA087	67.0282	4.8838	1.0975	33007.0	4.5242	34.78	86.05	0.9536	11.1881
RWA088	79.4437	5.3461	1.2907	39334.9	5.7719	24.86	97.06	0.7198	13.0729
RWA089	83.7181	6.5283	1.1288	40445.4	5.2950	22.50	106.16	0.9181	14.0484
RWA090	84.1305	6.4343	1.3071	43379.4	4.9384	43.22	106.96	0.8945	14.2500
RWA091	62.0056	4.6185	0.8628	30647.5	3.9303	0.00	82.13	0.7834	10.7329
RWA092	47.0957	3.4257	0.7314	23371.2	3.3843	25.55	100.80	0.6397	7.8418
RWA093	46.5211	3.4269	0.7017	21857.7	3.3579	0.00	69.62	0.5394	7.5915
RWA094	58.1208	3.8999	0.8259	27812.7	3.5438	23.25	71.38	0.6724	9.7215
RWA095	43.9623	3.0852	0.6380	19545.4	4.4209	0.00	68.84	0.4833	6.5418
RWA096	56.1289	4.5359	0.7903	27344.5	3.4390	0.00	87.38	0.4700	9.4778
RWA097	49.0775	3.4635	0.7056	22783.2	3.0640	0.00	64.07	0.5517	7.8420
RWA098	66.2996	5.8953	1.0208	32669.5	3.6266	27.78	91.27	0.7295	11.2284
RWA099	43.0052	2.9352	0.4767	20004.4	3.2064	7.78	72.77	0.6379	7.0414
RWA100	62.7336	3.1237	0.8130	29371.3	4.8045	0.00	77.85	0.6450	10.2852
RWA101	47.8612	3.4275	0.6030	21562.9	3.7077	20.29	61.22	0.4577	7.5797
RWA102	62.3309	4.1064	0.9145	28702.3	6.2497	0.00	83.94	0.7127	9.9598
RWA103	38.3633	2.9227	0.4368	18733.3	2.1531	0.00	50.90	0.5450	6.7925
RWA104	57.3868	3.4683	1.1732	18692.0	7.6827	0.00	84.04	0.5683	8.8751
RWA105	57.8370	3.8531	0.9639	29339.7	4.0621	28.85	56.14	0.4666	10.0014
RWA106	74.1913	6.4161	1.4020	41378.8	3.8444	44.19	109.29	0.6515	13.8207
RWA107	57.5926	4.4177	1.1866	29663.3	3.2847	31.89	75.89	0.5064	10.0930
RWA108	74.8565	5.5319	1.3939	38229.9	4.9884	45.52	108.19	0.6319	13.0574
RWA109	76.2780	5.5649	1.5203	40569.9	5.0478	34.07	105.69	0.7759	13.4669
RWA110	66.5999	4.8537	0.9593	34716.2	4.7045	36.98	72.88	0.7065	11.7176
RWA111	62.0129	4.2623	1.2820	26776.6	4.7732	0.00	76.17	0.5732	11.2835
RWA112	67.1077	5.1933	1.1740	31286.2	3.9021	36.77	92.80	0.6067	11.9272

APPENDIX C: Raw INAA Data (Cont.)

ANID	Sr	Ta	Tb	Th	Zn	Zr	Al	Ba	Ca
RWA085	228.00	0.8331	0.6282	9.9249	114.04	109.17	65636.7	826.8	109707.8
RWA086	189.64	0.9262	0.7667	10.2021	111.45	141.73	62813.0	934.9	80853.4
RWA087	200.36	0.8882	0.7012	10.0873	142.36	105.50	68941.3	1308.7	80119.1
RWA088	264.56	1.0265	0.8361	11.7870	183.54	150.66	81263.0	2498.3	17515.5
RWA089	134.50	1.0952	0.6948	12.5876	127.88	135.00	84134.4	1538.7	11354.5
RWA090	174.60	1.1041	0.7975	12.3711	160.60	130.50	86179.0	1785.0	18861.7
RWA091	186.81	0.8156	0.5862	9.2148	126.48	94.70	63075.2	872.2	120542.0
RWA092	258.75	0.6743	0.4768	7.6029	133.89	93.98	45476.6	1333.9	156612.3
RWA093	280.52	0.6632	0.3983	7.3039	129.20	86.39	45797.3	940.4	168382.4
RWA094	237.22	0.7225	0.5006	8.3668	111.85	94.39	58774.2	1228.0	143474.2
RWA095	300.69	0.6729	0.4309	6.8173	120.24	110.08	44783.5	1032.9	151937.7
RWA096	202.61	0.6862	0.5096	8.1758	81.18	86.90	56490.8	661.7	147875.5
RWA097	283.56	0.6128	0.4211	6.9639	80.01	75.75	32596.8	781.8	167480.0
RWA098	211.54	0.8319	0.6054	9.5581	141.68	116.90	61924.5	720.4	131055.2
RWA099	373.27	0.5628	0.3072	6.1420	153.59	68.44	42879.8	815.3	181211.0
RWA100	436.26	0.8667	0.4744	9.4654	176.23	106.91	58360.7	1993.9	101822.0
RWA101	253.54	0.6681	0.3788	7.3879	111.32	92.87	46845.9	753.6	155671.8
RWA102	241.07	0.8550	0.5196	9.7085	94.01	149.70	63028.1	865.9	77131.2
RWA103	283.18	0.4980	0.2666	5.5463	102.16	67.98	39053.9	592.2	229239.7
RWA104	163.33	0.9497	0.8457	10.2366	107.03	200.36	52005.9	905.1	94668.1
RWA105	214.32	0.7816	0.5688	8.8439	67.00	102.05	57362.8	1141.6	152279.6
RWA106	80.35	1.0856	0.8442	12.6092	179.17	123.48	77598.1	1197.1	80628.4
RWA107	381.93	0.8036	0.7889	8.7423	80.10	94.10	59956.6	1551.5	163169.8
RWA108	242.60	1.0781	0.8814	12.2352	119.11	108.07	75850.3	1689.2	69263.1
RWA109	109.35	1.2446	0.9396	13.4831	124.85	129.22	82829.4	1145.3	60901.3
RWA110	203.47	0.9241	0.5596	10.4596	97.84	118.36	69801.5	1231.1	117247.3
RWA111	225.75	0.9164	1.0196	10.3099	103.00	125.50	65540.0	1589.5	112260.5
RWA112	252.17	0.9002	0.7143	10.9959	131.91	101.77	67412.9	1486.9	138191.5

APPENDIX C: Raw INAA Data (Cont.)

ANID	Dy	K	Mn	Na	Ti	V
RWA085	3.6740	19486.0	810.55	4174.1	3613.3	111.13
RWA086	4.2036	21287.2	763.81	4806.8	3558.0	119.72
RWA087	3.6783	22466.3	1262.53	4356.8	3901.5	107.64
RWA088	4.2409	22483.2	1102.92	4898.2	3607.3	131.08
RWA089	4.3777	22847.6	777.99	4350.2	4317.6	155.67
RWA090	4.8483	22694.4	1098.60	4836.4	4093.9	138.59
RWA091	3.4540	13610.5	525.81	3478.4	3313.8	116.55
RWA092	2.4261	22522.2	940.56	3727.0	2744.9	79.08
RWA093	2.3398	13941.5	1171.30	3527.8	3096.0	73.83
RWA094	3.0752	18224.9	622.02	2881.3	3245.6	98.95
RWA095	2.5774	13332.6	703.11	4486.8	3176.5	61.99
RWA096	2.8080	16341.4	325.07	3236.8	3024.2	106.99
RWA097	3.3090	17063.6	514.81	2944.0	2978.3	72.69
RWA098	3.1161	15835.7	1053.58	3309.5	2929.0	126.86
RWA099	1.7375	16400.3	427.76	3366.5	2813.2	77.20
RWA100	2.8558	24942.1	370.07	3622.8	3810.4	82.10
RWA101	2.1845	14334.9	403.44	3384.4	2907.9	84.23
RWA102	3.2431	17237.8	592.71	4585.1	3677.4	104.03
RWA103	1.4832	13290.0	573.04	1974.4	1970.8	80.10
RWA104	4.4515	26633.9	551.81	5030.1	4413.2	75.75
RWA105	2.7974	13091.3	657.41	2201.5	3060.3	78.10
RWA106	3.8320	18249.0	2473.93	2425.3	4022.5	109.38
RWA107	4.5537	18337.9	1178.95	3712.3	3690.2	72.71
RWA108	5.2180	21673.3	1021.29	4217.1	4884.5	105.27
RWA109	5.3379	20761.4	2115.86	4012.2	4878.6	122.83
RWA110	3.6526	15026.1	419.27	2698.3	4473.6	95.03
RWA111	4.7637	16249.2	502.12	2449.3	3916.0	87.10
RWA112	4.1789	14717.4	1973.70	3710.7	3949.4	96.55

APPENDIX C: Raw INAA Data (Cont.)

ANID	As	La	Lu	Nd	Sm	U	Yb	Ce	Co
RWA113	9.5914	50.2235	0.5663	50.2721	8.9155	4.2626	3.7619	100.0035	17.4110
RWA114	8.8431	48.0509	0.5149	40.6227	8.3579	3.2763	3.5443	96.2209	18.0878
RWA115	6.8409	32.4442	0.3798	30.4954	5.7436	2.4497	2.6330	64.5288	11.6332
RWA116	11.0986	48.6400	0.5412	46.4597	8.5263	4.0226	3.5065	95.2364	13.5984
RWA117	11.6597	38.3088	0.4358	29.9394	6.6604	3.5215	2.8279	73.8146	12.9839
RWA118	8.4121	31.6440	0.4042	27.0309	5.5941	2.5388	2.4798	61.8128	11.3731
RWA119	7.4377	67.8217	0.6215	58.6598	11.3030	3.9952	4.3170	144.5996	15.8650
RWA120	3.5025	46.3895	0.4578	40.1437	8.3272	3.5545	3.1714	113.6736	14.8297
RWA121	5.0164	49.7188	0.5313	44.2749	8.6382	5.0125	3.6001	109.8707	9.7505
RWA122	7.0396	50.8688	0.4926	42.2547	8.6529	5.1204	3.3778	104.8924	6.5959
RWA123	5.9824	48.9536	0.5074	44.3108	8.8124	5.7774	3.4549	104.6975	12.4240
RWA124	8.5604	48.9125	0.5105	47.6210	7.8167	3.6311	3.5649	104.2419	9.8812
RWA125	7.9875	50.4225	0.4538	49.8939	10.1165	4.3363	3.2518	114.7882	9.9184
RWA126	10.3599	39.7408	0.4421	34.9103	6.1328	3.7317	3.0442	80.4963	6.8444
RWA127	5.5293	45.9958	0.3803	41.5162	7.8094	2.6444	2.6524	114.6366	10.0090
RWA128	2.9504	28.1490	0.3407	19.2595	4.0358	3.1593	2.1574	54.3789	3.8097
RWA129	13.2476	43.9022	0.5696	37.9911	7.8872	4.1832	3.6386	100.2272	11.4188
RWA130	5.2276	32.9269	0.3827	21.9866	5.9362	2.5050	2.4598	67.1838	7.7615
RWA131	12.3259	42.7108	0.4231	30.0093	7.0416	2.9398	2.9044	99.5772	7.8840
RWA132	5.7497	62.1422	0.4861	60.8229	9.7130	4.3856	3.7858	133.9016	8.7709
RWA133	5.3777	27.0073	0.2993	20.9756	4.0846	2.1027	2.1279	54.1129	3.9593
RWA134	5.4618	33.8397	0.3923	26.1117	5.1359	3.4762	2.3342	64.0766	6.5478
RWA135	5.8611	39.5092	0.4808	32.4347	6.7700	3.6488	3.4646	83.1920	5.8448
RWA136	3.8153	28.8096	0.3568	19.7922	4.2448	3.2734	2.6657	51.8654	5.5231
RWA137	5.4173	34.3439	0.3769	26.6794	5.4246	2.6805	2.7827	66.1232	8.8337
RWA138	5.7892	35.7123	0.3292	27.4024	6.4735	2.9692	2.3825	65.4341	6.3496
RWA139	4.0726	36.0742	0.2969	32.4546	5.9638	2.5271	2.2320	78.0010	5.6080
RWA140	2.6157	30.1532	0.2915	26.3944	5.4413	3.5527	1.7729	62.4624	5.9928

APPENDIX C: Raw INAA Data (Cont.)

ANID	Cr	Cs	Eu	Fe	Hf	Ni	Rb	Sb	Sc
RWA113	92.6949	7.6724	1.7468	47196.2	5.6419	0.00	121.94	1.0535	16.6567
RWA114	89.0572	7.0634	1.6569	45215.3	5.4482	61.74	114.46	0.8102	16.0667
RWA115	58.1742	4.6415	1.1128	29031.2	4.3389	25.01	81.53	0.5847	10.2432
RWA116	82.0001	5.3071	1.6823	34739.1	6.3980	22.45	94.18	0.7563	14.3312
RWA117	82.7242	5.6113	1.3197	38478.1	4.8211	59.49	93.66	0.7227	14.0810
RWA118	70.2201	5.2500	1.0914	33447.9	4.6087	31.49	81.54	0.5468	11.4498
RWA119	98.7379	3.8332	2.3269	34955.8	10.4823	36.04	80.90	0.4017	12.8136
RWA120	87.2271	4.7733	1.6558	34980.2	7.0541	43.81	69.89	0.5875	11.2374
RWA121	93.6672	5.4866	1.7457	30765.8	9.7292	0.00	90.08	0.6124	11.0637
RWA122	110.1889	4.9345	1.6312	36327.1	8.5049	47.75	76.76	0.4304	13.7245
RWA123	93.0122	5.7079	1.7515	32181.4	5.3892	39.48	76.92	0.7809	14.5252
RWA124	120.5216	6.0875	1.4596	39344.0	11.9470	27.05	97.45	0.2997	13.4238
RWA125	92.7928	6.0757	2.1113	33940.7	5.4194	45.85	81.53	0.5226	13.3690
RWA126	109.7055	4.9456	1.0972	42206.1	10.8790	0.00	76.54	0.3515	13.0665
RWA127	90.3580	5.0579	1.5708	28365.4	4.7710	25.87	86.81	0.4110	12.0093
RWA128	89.6768	5.4342	0.8146	21523.8	7.1910	0.00	77.64	0.9059	13.1019
RWA129	120.2897	5.4118	1.5427	41733.7	11.9628	47.20	67.07	0.3843	13.9677
RWA130	69.8263	3.7924	1.3012	225379.1	5.3669	0.00	62.78	1.0445	12.6569
RWA131	96.9257	4.6680	1.3460	35067.8	11.2029	0.00	68.79	0.3342	11.4382
RWA132	117.6120	6.0550	2.0447	35274.1	6.5669	39.66	99.34	0.5632	15.7814
RWA133	67.2120	3.3016	0.7793	26304.7	7.3523	0.00	51.97	0.4252	8.5840
RWA134	113.9397	5.2950	1.0221	41510.6	6.3097	27.41	71.06	0.8645	16.8069
RWA135	87.5896	4.4705	1.3471	27563.9	10.0275	59.14	50.89	0.6711	12.6699
RWA136	103.5577	5.4686	0.8190	34129.9	6.5550	30.43	61.93	0.7006	14.2404
RWA137	90.3619	6.6650	1.0587	41178.6	7.5254	0.00	87.11	0.8991	14.5379
RWA138	73.2215	4.4065	1.3825	28443.0	3.8101	0.00	50.56	0.5323	10.4228
RWA139	70.6936	3.8844	1.2086	21368.0	3.9507	0.00	63.74	0.4247	9.7384
RWA140	60.4789	3.7510	1.1344	23358.9	3.5270	0.00	57.69	0.3969	8.4927

APPENDIX C: Raw INAA Data (Cont.)

ANID	Sr	Ta	Tb	Th	Zn	Zr	Al	Ba	Ca
RWA113	126.88	1.2836	1.1456	15.4289	140.52	170.28	94979.4	1241.8	22675.0
RWA114	196.37	1.2769	1.0707	14.7524	162.56	161.03	94709.5	1879.2	18911.4
RWA115	172.71	0.8890	0.7234	9.8219	133.18	102.00	61355.4	1161.2	105312.0
RWA116	145.07	1.2705	1.0822	14.2308	129.18	151.72	88225.1	1938.4	25235.2
RWA117	248.85	1.0270	0.7445	12.1526	130.43	118.56	84202.0	1994.0	47330.4
RWA118	157.18	0.9228	0.6998	10.5110	152.27	106.58	69683.0	1290.2	84464.1
RWA119	260.82	2.9518	1.5560	14.9137	111.27	287.50	69050.8	2415.2	9044.8
RWA120	246.30	1.3677	1.0445	13.6111	128.37	178.26	77853.1	3091.0	17355.7
RWA121	130.83	1.9806	1.0721	13.2035	78.02	263.74	72963.1	1059.1	7259.2
RWA122	96.23	2.0051	1.0564	14.5064	139.84	211.61	87156.2	1499.0	5285.7
RWA123	98.03	1.1970	1.1261	13.6688	210.92	161.77	89892.0	1630.0	5044.5
RWA124	219.59	2.4463	0.9661	14.1735	99.28	300.84	79834.7	976.9	11602.3
RWA125	113.18	1.4213	1.1415	15.1405	116.15	140.22	90861.3	1395.3	7965.6
RWA126	223.54	2.0168	0.7508	14.3777	68.99	258.11	75511.6	1655.6	33230.1
RWA127	440.69	1.5319	0.9470	11.8298	99.74	150.80	75247.3	765.6	80435.2
RWA128	244.83	1.0525	0.5604	10.3005	56.45	162.58	60108.2	1396.2	32536.6
RWA129	66.94	2.4346	1.0427	14.9153	140.19	263.06	79427.6	466.0	1804.6
RWA130	126.14	0.8387	0.8717	8.5654	125.90	130.47	62657.1	1287.3	5178.0
RWA131	370.42	1.8171	0.9006	12.7373	86.56	253.00	65487.3	596.9	53594.1
RWA132	115.19	2.1895	1.1982	15.2084	151.14	183.59	92612.4	1898.9	7138.8
RWA133	330.37	1.0747	0.5197	8.3439	56.36	168.61	53447.3	1625.6	108603.4
RWA134	112.94	1.0755	0.7603	11.7503	115.70	141.96	95027.6	1561.7	5087.3
RWA135	43.46	1.5043	0.9750	13.2067	107.09	217.94	75284.6	473.1	2258.7
RWA136	118.28	1.2795	0.5523	11.3608	153.37	152.44	96527.7	1532.6	8627.1
RWA137	200.46	1.0501	0.6381	11.9330	114.25	177.65	85343.3	1211.3	14109.8
RWA138	473.56	0.9402	0.8190	10.4629	89.60	85.88	77526.9	1639.6	94074.3
RWA139	486.64	1.3382	0.8744	9.1282	89.44	120.44	57433.2	812.8	157304.7
RWA140	406.80	0.8207	0.7181	8.6776	71.89	109.47	54726.4	885.5	124621.6

APPENDIX C: Raw INAA Data (Cont.)

ANID	Dy	K	Mn	Na	Ti	V
RWA113	6.1529	24452.4	911.50	4401.1	5753.2	156.09
RWA114	6.3245	24994.1	995.51	4013.2	5209.6	146.21
RWA115	4.3313	17239.1	936.17	3827.7	4182.1	90.57
RWA116	6.0602	24490.1	2085.57	2991.6	4833.8	129.15
RWA117	4.9065	19097.4	983.78	4437.0	4642.6	133.75
RWA118	3.9112	17497.9	857.99	4443.9	3808.9	129.48
RWA119	8.1719	14662.6	1334.04	1691.2	8416.8	137.85
RWA120	5.5917	13711.1	1059.71	1815.3	5172.8	103.02
RWA121	5.8668	11735.7	519.74	2086.6	5581.0	105.46
RWA122	6.0449	14166.1	223.73	1860.0	6585.5	143.75
RWA123	6.5671	15518.4	992.12	2155.0	4924.9	136.00
RWA124	6.1989	23288.2	254.59	6270.4	7611.5	161.93
RWA125	6.3625	12569.8	219.46	1769.8	4919.1	129.41
RWA126	4.4240	11911.0	343.60	1612.5	6822.5	162.44
RWA127	5.2218	9725.4	462.33	2169.2	5090.4	138.14
RWA128	2.7156	13246.4	127.70	1759.9	4704.7	90.84
RWA129	5.5216	15173.6	203.05	1562.6	7123.1	178.61
RWA130	4.0380	11099.9	812.97	1450.2	3855.2	106.30
RWA131	4.8780	12331.8	437.09	2057.7	5934.3	127.44
RWA132	6.9256	15900.5	456.55	1670.5	6853.1	150.00
RWA133	3.3205	8588.6	217.35	1710.5	4374.4	89.89
RWA134	3.7352	15318.8	171.53	1796.2	5583.6	146.15
RWA135	5.3221	7470.9	404.65	1376.7	5606.6	107.67
RWA136	3.0806	13955.2	308.67	1660.1	5249.9	129.51
RWA137	3.8333	18970.2	313.96	1866.3	4824.5	133.55
RWA138	4.7034	14462.0	342.93	3568.1	4262.3	118.28
RWA139	3.8855	9759.9	453.66	1649.6	4828.8	99.44
RWA140	3.2862	9417.7	528.38	2288.7	3754.4	88.29

APPENDIX C: Raw INAA Data (Cont.)

ANID	As	La	Lu	Nd	Sm	U	Yb	Ce	Co
RWA141	2.3806	30.5561	0.2858	29.7773	5.4455	2.4351	1.8834	63.4789	6.3489
RWA142	6.1449	35.6594	0.3179	28.6801	6.0150	2.6841	2.1982	80.6846	7.4530
RWA143	8.8953	45.3460	0.4399	67.0302	7.9968	3.2763	3.1981	97.3111	14.4627
RWA144	5.5067	47.3576	0.4869	35.5162	8.0065	3.8358	3.3600	100.1880	6.5441
RWA145	6.0048	52.2761	0.3935	68.4995	8.9420	3.5557	3.0486	114.6633	8.5559
RWA146	7.8337	62.0047	0.6147	49.0134	10.1743	5.1839	4.3408	148.7495	15.3556
RWA147	7.7055	55.3333	0.4821	45.8588	9.2108	4.0676	3.6260	124.9544	10.2348
RWA148	5.5522	60.5536	0.5107	49.7520	8.7738	4.1272	3.5909	133.2097	10.3445
RWA149	3.2284	28.3278	0.2958	19.6825	4.7631	2.2281	2.2841	54.8661	11.0839
RWA150	5.0292	38.5552	0.3936	24.4893	6.2910	4.2865	2.8014	77.8374	6.5066
RWA151	5.7643	23.9029	0.2753	20.6284	3.8211	2.0471	1.8555	48.1174	4.2289
RWA152	8.2985	42.0587	0.4512	40.4158	7.4024	4.4110	3.1278	91.0331	11.0336
RWA153	7.6883	56.9531	0.5010	77.6972	9.8137	3.8213	3.3205	122.1536	7.8051
RWA154	3.0413	28.8031	0.3190	19.1321	3.9669	2.6270	1.9259	54.7659	7.1540
RWA155	6.2552	44.0364	0.4339	37.9487	7.9109	4.5522	3.3526	89.4057	7.5279
RWA156	4.7557	34.3059	0.3766	24.9689	4.6928	3.2473	2.7842	63.6244	7.4291
RWA157	7.4642	120.2128	0.5319	57.0789	11.2473	9.7871	3.3619	188.5644	10.7563
RWA158	7.0687	56.4120	0.5993	82.1606	10.1266	3.5546	4.0557	137.3349	12.4689
RWA159	7.2670	36.6613	0.4166	32.8293	6.7797	4.9017	2.8229	78.0545	6.9475
RWA160	6.3206	51.8468	0.4695	72.9755	8.9028	3.9326	3.1978	110.6659	8.8152
RWA161	12.1486	54.3960	0.5004	63.7880	8.7376	3.5474	3.4530	113.4086	9.1480
RWA162	5.4608	57.5164	0.4992	76.9814	10.1655	4.4241	3.4870	117.6899	6.6237
RWA163	4.3510	48.8285	0.4497	35.0103	8.4676	3.7184	3.4410	105.7643	8.6270
RWA164	2.1849	34.0739	0.4370	25.7490	5.7337	3.9408	3.0729	66.1750	6.3307
RWA165	8.6852	46.8524	0.4356	33.8412	7.6754	3.6523	3.0644	84.4400	8.4661
RWA166	2.3401	25.0038	0.2773	19.1697	3.3226	2.9922	1.6658	49.2023	5.0254

APPENDIX C: Raw INAA Data (Cont.)

ANID	Cr	Cs	Eu	Fe	Hf	Ni	Rb	Sb	Sc
RWA141	59.1669	3.5210	1.1368	22894.2	3.7940	27.88	51.89	0.3502	8.4240
RWA142	70.3362	3.7485	1.1555	24598.3	7.1415	22.39	54.58	0.2127	8.1496
RWA143	81.1530	5.2836	1.5664	32511.0	6.9675	34.41	84.50	0.6230	10.9981
RWA144	86.4464	3.7130	1.6648	28785.2	9.0714	39.79	66.29	0.5638	9.9752
RWA145	112.2201	6.5051	1.7393	33864.6	5.8335	43.32	98.08	0.4234	14.4798
RWA146	117.8372	3.2093	2.0752	44914.4	12.7235	68.59	64.73	0.4457	13.5669
RWA147	125.1471	7.2368	1.8660	39702.0	6.7352	43.99	90.97	0.5838	16.6334
RWA148	122.6322	6.2767	2.0273	36107.1	6.3012	54.97	95.73	0.5241	16.1770
RWA149	62.2285	5.2802	0.9430	16088.0	3.9178	36.76	73.79	0.4437	10.1198
RWA150	92.8748	5.8530	1.2729	33761.3	5.9865	0.00	99.00	0.6215	13.1059
RWA151	80.7159	3.0854	0.6932	30048.0	6.5799	0.00	68.09	0.1745	8.9565
RWA152	82.9328	5.2890	1.4210	33176.2	7.5934	37.21	81.64	0.4831	11.2685
RWA153	113.2454	5.5955	1.8990	31964.3	6.4024	54.82	81.47	0.5137	14.9822
RWA154	89.3444	4.8542	0.7678	25058.4	5.5727	0.00	68.66	0.8541	13.6814
RWA155	86.2354	5.7027	1.5884	33494.5	6.2881	46.16	86.49	0.5411	12.4511
RWA156	83.2531	5.4090	0.9152	28746.6	8.4021	27.77	73.71	0.6635	11.9050
RWA157	94.8413	4.7126	2.7399	54691.4	9.4860	41.02	139.92	1.3795	11.1547
RWA158	117.2056	4.8494	1.9258	39409.3	11.8397	27.77	70.47	0.3654	13.3028
RWA159	96.9277	6.3594	1.3169	35520.5	6.5949	38.49	85.11	0.7071	13.6592
RWA160	101.9540	6.5000	1.7214	30801.2	6.5803	20.12	95.92	0.6708	13.8933
RWA161	117.0299	4.5203	1.6289	41032.3	12.5083	44.13	68.00	0.3511	13.4778
RWA162	110.3782	5.9516	2.0065	33388.9	6.5247	52.98	90.68	0.5392	14.4231
RWA163	87.0830	5.6874	1.7571	31073.9	6.4778	42.94	95.17	0.4648	11.9522
RWA164	101.9705	4.5191	1.1249	17077.5	6.7453	60.85	43.53	1.2432	18.6912
RWA165	104.5097	4.6202	1.4477	41373.1	9.2415	34.16	88.75	0.4114	13.4015
RWA166	69.8465	4.5821	0.6066	19077.0	6.6913	22.32	45.62	0.3755	8.3536

APPENDIX C: Raw INAA Data (Cont.)

ANID	Sr	Ta	Tb	Th	Zn	Zr	Al	Ba	Ca
RWA141	419.48	0.8060	0.8061	8.4380	67.00	105.61	60320.3	1128.4	113206.7
RWA142	365.84	1.6277	0.8039	9.0989	77.23	181.85	46949.5	1022.9	164832.7
RWA143	140.25	1.2927	0.9586	12.2069	100.85	162.96	72778.0	1526.6	12577.8
RWA144	2370.19	1.5144	1.0689	12.2431	86.57	220.14	69398.9	1537.3	8620.3
RWA145	252.81	2.0323	1.0714	13.4626	127.87	168.71	85312.6	1891.1	39114.6
RWA146	108.16	2.9040	1.4594	15.4093	161.33	325.81	77357.0	1390.3	2760.2
RWA147	55.45	2.2955	1.2268	15.3894	226.14	177.98	94610.4	948.4	4710.8
RWA148	129.92	2.2471	1.2657	15.0492	221.93	177.56	94971.1	2097.8	9058.1
RWA149	444.23	0.8363	0.6835	8.4749	111.47	83.73	65987.8	1751.7	130209.2
RWA150	191.00	1.4187	0.8233	12.8226	93.74	153.15	75139.8	1797.7	34103.0
RWA151	388.99	1.4001	0.5095	8.6324	48.76	154.73	53736.6	1531.8	148022.3
RWA152	77.22	1.5084	0.9754	12.7720	117.92	169.37	53287.6	746.0	5174.8
RWA153	101.82	2.1345	1.3440	14.5439	192.15	176.55	65727.3	694.4	3988.7
RWA154	206.13	1.0060	0.7517	10.7167	95.41	115.72	60620.6	1323.1	38457.3
RWA155	110.70	1.3377	1.0278	13.4050	183.90	173.54	58113.4	1212.0	4056.7
RWA156	109.18	1.5318	0.6463	11.8624	97.13	167.64	61364.1	991.1	2322.9
RWA157	456.34	5.5306	1.3248	11.3300	117.41	376.83	60309.7	1947.4	12277.9
RWA158	135.78	2.4188	1.2841	14.2799	124.58	281.00	58409.6	1010.8	4909.2
RWA159	0.00	1.3745	0.8770	14.0702	151.42	175.46	62688.6	422.6	1261.3
RWA160	130.30	1.8339	1.1162	13.9352	134.18	154.29	58732.5	1062.2	6059.6
RWA161	115.40	2.5465	1.0697	14.7955	128.34	297.74	56337.3	847.3	4565.1
RWA162	125.64	2.0572	1.2241	14.8831	120.30	173.11	66963.1	557.2	6594.9
RWA163	156.64	1.5352	1.1484	13.1190	193.50	172.19	60423.9	2506.4	7445.1
RWA164	76.63	1.3207	0.7231	15.3662	169.76	172.30	75632.5	1099.2	3709.7
RWA165	184.66	1.8625	0.9347	12.4194	102.60	208.96	57660.3	1022.4	32726.9
RWA166	224.28	1.7229	0.4422	7.5607	60.81	169.84	41832.5	720.9	110592.8

APPENDIX C: Raw INAA Data (Cont.)

ANID	Dy	K	Mn	Na	Ti	V
RWA141	3.7551	8334.2	394.24	2461.2	3210.0	90.06
RWA142	3.6694	15011.4	564.75	2622.1	5385.3	108.89
RWA143	5.0019	11591.5	1942.94	2160.2	5440.0	111.02
RWA144	5.8567	10441.5	255.62	2031.5	5569.0	96.66
RWA145	5.6911	15562.1	575.32	1646.8	6664.3	155.97
RWA146	7.7893	15413.5	830.34	1603.2	8438.5	141.69
RWA147	6.3905	13300.4	410.15	1510.9	6936.0	186.93
RWA148	7.2057	15531.2	441.70	1762.1	6822.0	182.69
RWA149	3.4401	12763.1	838.50	1052.3	3685.7	97.63
RWA150	4.5735	14857.3	285.33	1671.9	5467.7	140.70
RWA151	3.1728	8123.5	284.96	1715.8	4339.1	103.65
RWA152	4.2151	9007.5	591.18	1234.6	4270.1	89.54
RWA153	4.8326	10685.9	139.80	1272.6	5227.7	113.80
RWA154	2.3871	9242.2	132.44	964.1	3812.0	95.69
RWA155	4.1320	9189.3	273.82	1221.1	3819.9	94.34
RWA156	2.8092	10033.8	68.85	1549.8	4139.9	95.47
RWA157	4.1057	34888.3	910.28	3220.1	8824.8	350.43
RWA158	5.0930	12210.5	148.83	1751.2	5586.8	119.36
RWA159	3.6376	9024.1	230.40	1178.1	4022.8	105.96
RWA160	4.4725	10549.0	99.01	1647.6	4635.4	109.70
RWA161	4.7853	12780.3	178.12	1628.2	5740.2	116.53
RWA162	5.1048	9902.3	179.64	2121.9	5218.0	115.99
RWA163	4.9198	7492.0	391.17	1461.1	4610.7	91.26
RWA164	3.3918	7381.7	77.87	849.5	5284.2	107.03
RWA165	3.8080	14422.8	302.81	1729.8	4473.9	111.60
RWA166	2.0256	6846.3	259.88	896.0	3934.1	79.83

APPENDIX D: INAA Samples by Group

Table D.1. Samples included in Compositional Group 1.

ANID	*Alternate ID*	*Site*	*Notes*
RWA122	1969-9-208-2	3CL23	Shell and grog tempered plain
RWA124	1969-9-208-4	3CL23	Grog and shell tempered plain
RWA126	1969-1-4	3CL27	Hodges Engraved
RWA127	1969-1-27	3CL27	Shell and grog tempered engraved
RWA129	1969-1-11-2	3CL27	Grog and shell tempered plain, burnished exterior
RWA131	1969-1-11-4	3CL56	Shell and grog tempered plain
RWA132	1969-15-13	3CL56	Hudson Engraved
RWA139	1987-710-121-6-6-1	3CL418	Shell tempered trailed
RWA142	1969-5-28	3HS19	Keno Trailed or Foster Trailed-Incised
RWA145	1969-5-38	3HS19	Shell tempered plain
RWA147	1972-65-1	3HS19	Shell and grog tempered engraved
RWA148	1972-65-2	3HS19	Shell and grog tempered engraved
RWA151	1992-452	3HS19	Shell and grog (?) tempered engraved
RWA158	1974-225	3HS33	Cook Engraved
RWA161	1974-229-3	3HS33	Grog tempered plain
RWA162	1974-229-4	3HS33	Shell and grog tempered plain
RWA165	1974-240-1	3HS38	Keno Trailed

Table D.2. Samples included in Compositional Group 2 (micro). For 3YE25 samples, specific house association is provided along with the hypothesized origin of the sherds based on macroscopic examination.

ANID	*Alternate ID*	*Site/Provenience*	*Notes*
RWA004	2012-364-41-1-16	3YE25, House 1	Military Road Incised (?), possibly nonlocal (Caddo)
RWA006	2012-364-76-1-1	3YE25, House 1	Shell tempered trailed, possibly nonlocal (uncertain provenance)
RWA014	2010-380-140-1-4	3YE25, House 1	Barton Incised, likely local
RWA018	2010-380-111-1-5	3YE25, House 1	Carson Red on Buff, likely local
RWA019	2010-380-101-1-13	3YE25, House 1	Carson Red on Buff, likely local
RWA020	2010-380-111-1-10	3YE25, House 1	Carson Red on Buff, likely local
RWA025	2011-400-443-1-2	3YE25, House 2	Barton Incised, likely local
RWA026	2011-400-313-1-3	3YE25, House 2	Mississippi Plain, likely local
RWA028	2011-400-443-1-5	3YE25, House 2	Shell tempered trailed, likely local
RWA029	2011-400-307-1-1	3YE25, House 2	Mississippi Plain, likely local
RWA032	2011-400-211-1-1	3YE25, House 2	Mississippi Plain, likely local
RWA033	2011-400-399-1-4	3YE25, House 2	Mississippi Plain, likely local
RWA036	2011-400-511-1-4	3YE25, House 2	Bell Plain, likely local
RWA039	2011-400-254-1-3	3YE25, House 2	Bone tempered plain, likely local
RWA040	2011-400-227-1-9	3YE25, House 2	Shell tempered, red painted, likely local

APPENDIX D: INAA Samples by Group (Cont.)

Table D.2 (Cont.). Samples included in Compositional Group 2 (micro). For 3YE25 samples, specific house association is provided along with the hypothesized origin of the sherds based on macroscopic examination.

ANID	*Alternate ID*	*Site/Provenience*	*Notes*
RWA042	2011-400-40-1-1	3YE25, House 3	Bone tempered engraved, possible local "hybrid" or nonlocal (Caddo)
RWA044	2011-400-63-1-1	3YE25, House 3	Keno Trailed (?), likely nonlocal (Caddo)
RWA045	2011-400-49-1-1	3YE25, House 3	Keno Trailed, likely nonlocal (Caddo)
RWA046	2011-400-2-1-1	3YE25, House 3	Keno Trailed, likely nonlocal (Caddo)
RWA048	2011-400-119-1-1	3YE25, House 3	Mississippi Plain, likely local
RWA050	2011-400-46-1-1	3YE25, House 3	Mississippi Plain, likely local
RWA051	2011-400-167-1-1	3YE25, House 3	Mississippi Plain, likely local
RWA052	2011-400-37-1-3	3YE25, House 3	Shell tempered plain, likely nonlocal (Caddo?)
RWA053	2011-400-40-1-5	3YE25, House 3	Mississippi Plain, likely local
RWA054	2011-400-22-1-1	3YE25, House 3	Mississippi Plain, likely local
RWA055	2011-400-53-1-3	3YE25, House 3	Mississippi Plain, likely local – possibly nonlocal (provenance uncertain)
RWA058	2011-400-6-1-5	3YE25, House 3	Mississippi Plain, likely local – possibly nonlocal (Mississippi Valley?)
RWA059	2011-400-81-1-1	3YE25, House 3	Mississippi Plain, likely local
RWA060	2011-400-141-1-1	3YE25, House 3	Mississippi Plain, likely local
RWA062	2010-380-117-1-25	3YE25, House 1	Fired clay coil or "plug" with reed impression, local
RWA065	63-52-11-2	3CT8	Barton Incised, v. Kent
RWA066	63-52-8-1A	3CT8	Carson Red on Buff
RWA069	63-52-7-2	3CT8	Parkin Punctated
RWA070	63-52-7-3	3CT8	Parkin Punctated
RWA071	67-17-2-1A	3CT7	Mississippi Plain
RWA072	67-17-2-2A	3CT7	Bell Plain
RWA074	67-17-2-4A	3CT7	Bell Plain
RWA076	67-17-2-9A	3CT7	Bell Plain
RWA079	67-17-1-3	3CS27	Parkin Punctated
RWA082	67-17-1-6A	3CS27	Barton Incised
RWA083	67-17-1-7A	3CS27	Parkin Punctated
RWA084	63-54-3-1	3MS8	Bell Plain
RWA085	63-54-4-1A	3MS8	Nodena Red on White, v. Nodena or Dumond
RWA086	63-54-4-2	3MS8	Barton Incised

APPENDIX D: INAA Samples by Group (Cont.)

Table D.2 (Cont.). Samples included in Compositional Group 2 (micro). For 3YE25 samples, specific house association is provided along with the hypothesized origin of the sherds based on macroscopic examination.

ANID	*Alternate ID*	*Site/Provenience*	*Notes*
RWA087	63-54-6-1	3MS8	Mississippi Plain
RWA088	63-54-8-1	3MS8	Bell Plain
RWA089	63-54-9-1	3MS8	Bell Plain
RWA090	63-54-2-1	3MS8	Mississippi Plain
RWA091	63-56-13-1	3CS29	Barton Incised
RWA093	63-56-13-3	3CS29	Barton Incised
RWA094	63-56-13-4	3CS29	Barton Incised
RWA108	2001-392-23-1-1	3AR179	Mississippi Plain
RWA109	2002-346-4-1-2	3AR179	Mississippi Plain
RWA110	2003-378-7-1-1	3AR179	Mississippi Plain
RWA114	2003-378-62-1-4	3AR179	Bell Plain
RWA115	2003-378-72-1-2	3AR179	Mississippi Plain
RWA117	2006-319-101-1-3	3AR179	Mississippi Plain
RWA118	2006-319-102-1-1	3AR179	Mississippi Plain

Table D.3. Samples included in Compositional Group 2 (macro). For 3YE25 samples, specific house association is provided along with the hypothesized origin of the sherds based on macroscopic examination.

ANID	*Alternate ID*	*Site/Provenience*	*Notes*
RWA001	2012-364-104-1-2	3YE25, House 1	Bone tempered engraved, likely nonlocal (Caddo)
RWA002	2012-364-19-1-8	3YE25, House 1	Shell tempered plain (with appliquéd ridge), possibly nonlocal (provenance uncertain)
RWA003	2012-364-41-1-12	3YE25, House 1	Shell tempered incised, likely local "hybrid" – possibly nonlocal (Caddo)
RWA005	2012-364-76-1-8	3YE25, House 1	Shell tempered brushed/trailed, likely local "hybrid" – possibly nonlocal (Caddo)
RWA007	2012-364-14-1-12	3YE25, House 1	Carson Red on Buff, likely local – possibly nonlocal (Mississippi Valley)
RWA008	2012-364-50-1-4	3YE25, House 1	Hodges Engraved, likely nonlocal (Caddo)
RWA009	2010-380-114-1-8	3YE25, House 1	Keno Trailed, likely nonlocal (Caddo)
RWA010	2012-364-104-1-7	3YE25, House 1	Bone tempered engraved, likely nonlocal (Caddo)
RWA011	2010-380-122-1-8	3YE25, House 1	Barton Incised, likely local

APPENDIX D: INAA Samples by Group (Cont.)

Table D.3 (Cont.). Samples included in Compositional Group 2 (macro). For 3YE25 samples, specific house association is provided along with the hypothesized origin of the sherds based on macroscopic examination.

ANID	*Alternate ID*	*Site/Provenience*	*Notes*
RWA012	2010-380-118-1-1	3YE25, House 1	Barton Incised, likely local
RWA013	2010-380-102-1-6	3YE25, House 1	Carson Red on Buff, likely local
RWA015	2010-380-117-1-5	3YE25, House 1	Barton Incised, likely local
RWA016	2010-380-117-1-8	3YE25, House 1	Barton Incised, likely local
RWA017	2010-380-101-1-26	3YE25, House 1	Shell tempered brushed, likely local "hybrid" (resembles Pease Brushed Incised)
RWA021	2011-400-443-1-8	3YE25, House 2	Bone tempered plain with burnishing, likely nonlocal (Caddo)
RWA022	2011-400-443-1-7	3YE25, House 2	Carson Red on Buff, likely local
RWA023	2011-400-276-1-2	3YE25, House 2	Shell tempered incised, likely local
RWA024	2011-400-199-1-1	3YE25, House 2	Mississippi Plain, likely local
RWA027	2011-400-396-1-1	3YE25, House 2	Mississippi Plain, likely local
RWA030	2011-400-385-1-1	3YE25, House 2	Mississippi Plain, likely local
RWA031	2011-400-189-1-1	3YE25, House 2	Carson Red on Buff (?), likely local
RWA034	2011-400-339-1-2	3YE25, House 2	Mississippi Plain, likely local
RWA035	2011-400-316-1-2	3YE25, House 2	Bone tempered plain, likely nonlocal (Caddo)
RWA038	2011-400-446-1-1	3YE25, House 2	Mississippi Plain, likely local
RWA041	2011-400-7-1-1	3YE25, House 3	Bone tempered brushed, likely local – possibly nonlocal (Caddo?)
RWA043	2011-400-163-1-1	3YE25, House 3	Shell tempered incised and punctated, likely local
RWA047	2011-400-56-1-2	3YE25, House 3	Mississippi Plain, likely local
RWA049	2011-400-88-1-2	3YE25, House 3	Mississippi Plain, likely local
RWA056	2011-400-17-1-2	3YE25, House 3	Bone tempered plain, likely nonlocal (Caddo?)
RWA057	2011-400-59-1-3	3YE25, House 3	Bone and shell tempered brushed, likely local – possibly nonlocal (Caddo)
RWA061	2012-364-41-1-26	3YE25, House 1	Fired pottery coal, example of local paste
RWA064	63-52-11-1	3CT8	Barton Incised
RWA067	63-52-8-2	3CT8	Carson Red on Buff
RWA073	67-17-2-3A	3CT7	Bell Plain
RWA075	67-17-2-5A	3CT7	Bell Plain
RWA077	67-17-1-1	3CS27	Shell tempered incised
RWA078	67-17-1-2	3CS27	Mississippi Plain
RWA080	67-17-1-4	3CS27	Barton Incised
RWA081	67-17-1-5	3CS27	Parkin Punctated

APPENDIX D: INAA Samples by Group (Cont.)

Table D.3 (Cont.). Samples included in Compositional Group 2 (macro). For 3YE25 samples, specific house association is provided along with the hypothesized origin of the sherds based on macroscopic examination.

ANID	*Alternate ID*	*Site/Provenience*	*Notes*
RWA092	63-56-13-2	3CS29	Barton Incised
RWA095	63-56-11-1	3CS29	Parkin Punctated
RWA096	63-56-12-1A	3CS29	Bell Plain
RWA097	63-56-12-2	3CS29	Bell Plain
RWA098	63-53-1-1	3CS24	Mississippi Plain
RWA099	63-53-1-2	3CS24	Mississippi Plain
RWA100	63-53-1-3	3CS24	Carson Red on Buff (?)
RWA101	63-53-1-4	3CS24	Bell Plain
RWA102	63-53-1-5	3CS24	Bell Plain
RWA103	63-53-1-6	3CS24	Bell Plain
RWA104	2001-392-2-1-1A	3AR179	Mississippi Plain
RWA105	2001-392-2-1-1B	3AR179	Mississippi Plain
RWA106	2001-392-15-1-2	3AR179	Mississippi Plain
RWA107	2001-392-16-1-2	3AR179	Mississippi Plain
RWA111	2003-378-12-1-1	3AR179	Mississippi Plain
RWA112	2003-378-34-1-3	3AR179	Mississippi Plain
RWA113	2003-378-35-1-3	3AR179	Bell Plain
RWA116	2006-319-84-1-5	3AR179	Coarse grog and shell tempered plain
RWA120	1969-9-138	3CL23	Keno Trailed or Foster Trailed-Incised (?)
RWA121	1969-9-208-1	3CL23	Grog tempered plain
RWA123	1969-9-208-3	3CL23	Grog and shell tempered plain
RWA125	1969-396-69	3CL23	Bailey or Taylor Engraved (?)
RWA128	1969-1-11-1	3CL27	Shell and grog tempered plain
RWA133	1969-15-1	3CL56	Shell tempered brushed
RWA137	1987-710-121-6-138	3CL418	Hodges Engraved (?)
RWA138	1987-710-121-6-4	3CL418	Shell and grog tempered brushed
RWA140	1987-710-121-6-6-2	3CL418	Shell tempered incised
RWA141	1987-710-121-6-37	3CL418	Shell tempered brushed
RWA143	1969-5-10	3HS19	Shell and grog tempered engraved
RWA144	1969-5-30	3HS19	Military Road Incised (?)
RWA149	1972-70-1	3HS19	Shell tempered engraved
RWA150	1972-70-2	3HS19	Hodges Engraved
RWA152	1969-394-5	3HS33	Hodges Engraved
RWA154	1973-532-2	3HS33	Glassell or Hodges Engraved
RWA155	1973-532-3	3HS33	Hudson or Means Engraved (?)
RWA160	1974-229-2	3HS33	Grog and shell tempered engraved
RWA163	1973-531-1	3HS38	Keno Trailed (?)

APPENDIX D: INAA Samples by Group (Cont.)

Table D.4. Samples unassigned to a compositional grouping. For 3YE25 samples, specific house association is provided along with the hypothesized origin of the sherds based on macroscopic examination.

ANID	*Alternate ID*	*Site/Provenience*	*Notes*
RWA037	2011-400-346-1-1	3YE25, House 2	Mississippi Plain, likely local
RWA063	n/a	3YE25	Raw clay collected from pit feature on site, presumed local
RWA119	1969-9-152	3CL23	Keno Trailed (?)
RWA130	1969-1-11-3	3CL27	Grog tempered plain
RWA134	1969-15-3-1	3CL56	Shell and grog tempered plain
RWA135	1969-15-3-2	3CL56	Grog and bone tempered plain
RWA136	1969-15-3-3	3CL56	Shell and grog tempered plain
RWA146	1969-5-39	3HS19	Grog and shell tempered plain
RWA153	1973-532-1	3HS33	Keno Trailed (?)
RWA156	1973-532-4	3HS33	Grog tempered plain
RWA157	1973-532-5	3HS33	Grit and grog tempered plain
RWA159	1974-229-1	3HS33	Hudson Engraved
RWA164	1973-531-2	3HS38	Shell and grog tempered plain
RWA166	1974-240-2	3HS38	Shell tempered plain

Table D.5. Outlier separate from all compositional groupings and unassigned samples.

ANID	*Alternate ID*	*Site/Provenience*	*Notes*
RWA068	63-52-7-1	3CT8	Parkin Punctated

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