2013

Manufacturing Ceramics: Ceramic Ecology and Technological Choice in the Upper Cumberland River Valley

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Recommended Citation

Ramsey, Melissa, "Manufacturing Ceramics: Ceramic Ecology and Technological Choice in the Upper Cumberland River Valley" (2013). *Theses and Dissertations--Anthropology*. 10.
https://uknowledge.uky.edu/anthro_etds/10

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MANUFACTURING CERAMICS: CERAMIC ECOLOGY AND TECHNOLOGICAL CHOICE IN THE UPPER CUMBERLAND RIVER VALLEY

THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Arts in the
College of Arts and Sciences
at the University of Kentucky

By

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Lexington, Kentucky

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2013

ABSTRACT OF THESIS

MANUFACTURING CERAMICS: CERAMIC ECOLOGY AND TECHNOLOGICAL CHOICE IN THE UPPER CUMBERLAND RIVER VALLEY

Ceramic material culture recovered from archaeological sites has more to offer the researcher than placing the site or strata into a cultural historic timeline. By examining the characteristics of ceramics manufactured during the Woodland Period in southern Kentucky, this thesis answers questions related to the behavior of the potters who lived and worked there. Using the theoretical basis of ceramic ecology and technological choice, this thesis examines the choices made by the potters of two sites, the Long (15Ru17) and Rowena (15Ru10) sites, located along the Cumberland River in Russell County, Kentucky. The two sites are also compared to one another and similar assemblages in the Upper Cumberland River Valley, in terms of temporal occupation and utilization of tempering resources. Ultimately, the potters who occupied the Long and Rowena sites during the Woodland Period used locally available materials to temper their clay, even as they emulated other ceramic types. In terms of the two sites themselves, it appears that while they were not occupied by the same population of potters, they did employ similar tempering agents and stylistic types. Examining the behavior of potters who occupied these two sites informs the researcher about the behavior of the larger region of the Upper Cumberland Valley.

Key Words: Woodland Archaeology, Prehistoric Ceramics, Ceramic Ecology, Technological Choice, Cumberland River

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July 16, 2013
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Chapter 1

Introduction

Previous ceramic research in the Midwest and Southeast has focused predominately on creating types associated with local cultures. Very little, if any, data were collected on much more than decoration type and obvious tempering agents. While knowing the cultural affiliation of ceramic types yields important information for archaeological investigations, much more information can be gleaned from ceramic sherds recovered during excavation. Data associated with ceramic sherds can generate useful information about potters' behavior.

Using *ceramic ecology* as the basis for study, I look at the technological choices made by Woodland Period potters in the Upper Cumberland River region of southern Kentucky, specifically those who occupied the area inundated by the Wolf Creek Dam Reservoir as represented by materials excavated from the Long (15Ru17) and Rowena (15Ru10) Sites. Located east and upriver from the dam (Figure 1-1), these sites were first excavated by Haag (1947) as a part of larger investigations ahead of the dam's construction in the late 1940's and early 1950's. Few studies have been performed on the material recovered from excavations, and focus primarily on the Mississippian component of both occupations (i.e. Lewellyn 1964, Weinland 1980, Sulham 1993).

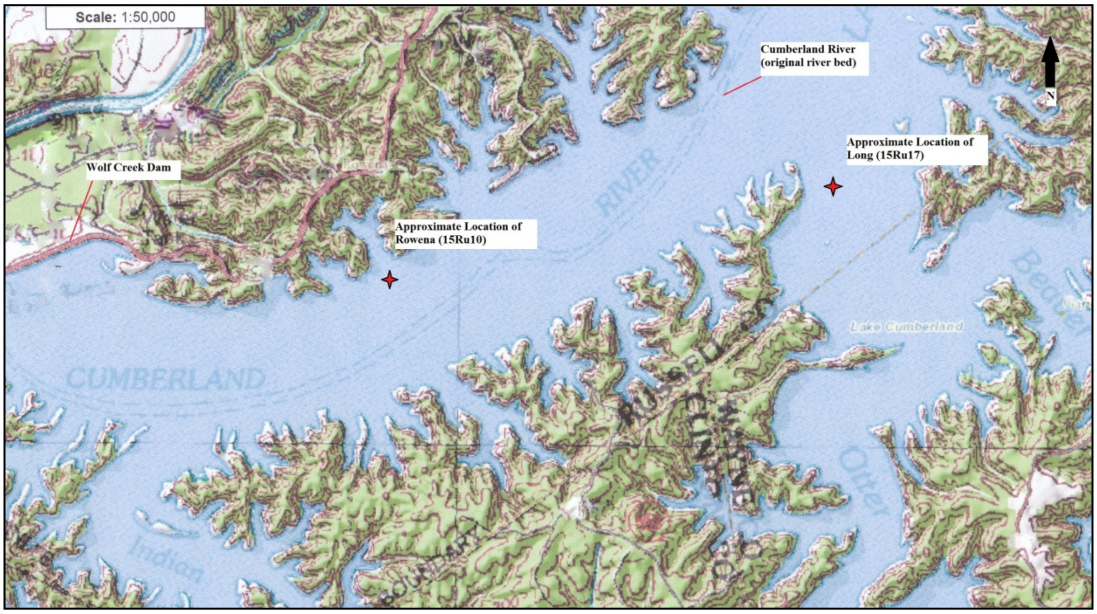


Figure 1-1: Topographic Map with Long (15Ru17) and Rowena (15Ru10) Sites.

Both the Long and Rowena sites were multicomponent, open-habitations and both exhibited evidence of Mississippian period mound construction (Haag 1947; Sulham 1993). Artifacts recovered from both sites indicate that they were occupied throughout the Archaic and Woodland periods, as well as the Late Prehistoric period. Here, I look exclusively at the Woodland components by focusing on the non-shell tempered ceramics.

Following Matson (1965: 203), I will use ceramic ecology to “attempt to relate raw materials and technologies that the local potters [have] available to the functions of his [or her] culture to the functions of the products he [or she] fashions.” The environment of the Upper Cumberland has resources available for the manufacture of ceramic material that may or may not have been used by potters in the Woodland Period. The *technical choices* made by the potters can be understood by comparing the materials in the pottery sherds themselves to the locally available resources to discern if they were being used in the manufacturing process.

Key questions should be asked in order to understand not only the choices made by prehistoric potters but the cultural and environmental contexts under which they made such choices. How are the choices made, in terms of technologies, manifested in the finished vessels? Considering that the conditions under which the potters worked, both environmental and cultural, how can their choices reflect the overall cultural context of the Upper Cumberland River Valley? Were these resource choices and manufacturing techniques merely socially or culturally constructed or are they reflections of what the potters were limited to in their own environment? Answering these questions will provide insight to the behavior of the Woodland Period potters who occupied the Long and Rowena sites as well as those who worked in the Upper Cumberland River region in general.

Ceramic Analysis in the Past and Future

Archaeological method and theory has gone through many phases, from cultural historic to post-processual paradigms. Material culture was, at the beginning, used to place sites within a temporal framework while discounting other aspect of human behavior. Though material culture is still used primarily to place a particular occupation within a cultural and temporal boundary, much more can be garnered from its study. From the beginnings of ceramic recovery on archaeological sites in which collection and storage was the primary objective, to in-depth chemical and molecular analysis, ceramic technology has been an important part of archaeological study.

Modern archaeologists dedicate a great deal of report space to ceramic vessels and their fragments. It is advantageous to do so for a number of reasons: 1) pottery has a long history and is found in virtually all parts of the world; 2) pottery is essentially non-perishable; 3) pottery sherds are not particularly appealing to looters; 4) pottery, in general, is not an exotic good; though there are types used exclusively by higher classes it is not a restricted item; and 5) pottery making is an additive process in which the manufacturing steps are recorded in the final product (Rice 2007: 24-25), though later steps in the manufacturing process may obscure the earlier steps. All of these factors have made ceramics an attractive means of archaeological investigation, past and present.

Archeologically, the appearance of ceramic technology was at one time primarily viewed in terms of progressive evolutionary theory. That is, the adaptation and/or use of ceramic technologies were indicative of a development of human society out of the "Upper Savagery" category into "Lower Barbarism" (Morgan 1877; Rice 2007: 9). Early ceramic classification can be credited to Holmes (1886a, 1886b, 1903). He used large-scale pottery groups modeled on culture areas, with which he provided a great deal of insight into contemporary thinking on classification systems (Dunnell 1986: 161-162). In order to characterize pottery, Holmes used a series of dimensions of variability, which were almost exclusively technological in nature (Dunnell 1986: 162). These were temper, surface treatment, firing atmosphere, and hardness; he did not use vessel form.

Later, when progressive evolutionary theory fell from favor, ceramics were a tool used to classify social affiliation and temporal placement (e.g., Phillips, Ford and Griffin 1951). This system of culture-historic classification is a synthesis of chronology and form that can be linked to, among others, three people – Irving Rouse, Alex Krieger, and

James Ford (Dunnell 1986: 167). Rouse's (1939) approach provides a detailed explanation of artifact classification for the cultural-historic approach (Dunnell 1986: 168). Krieger's (1944) major contributions dealt with the interaction between the artifact and the archaeologist, focusing on procedure and practical issues. But the shortfall of Krieger's cultural-historic typological approach is that it was clearly a device of the archaeologist's construction and not that of the potter's (Dunnell 1986: 171). James Ford's contributions were much more substantial than Rouse or Krieger. Though his methodological mechanisms were lacking, his efforts to construct chronologies through ceramic seriation in the Southeast United States (e.g. Ford 1938) and Peru (Ford 1949) are well developed (Dunnell 1986: 172-173). While this approach is still appropriate, especially when investigations are primarily for cultural resource management purposes, much more information can be gleaned from ceramic artifacts.

A type-variety system was developed in the 1950's and 1960's, used primarily for Mesoamerican ceramic analysis, which employed both taxonomic (type) and analytic (modal) classification (Smith, Willey, and Gifford 1960). Later, Sabloff and Smith stress the importance of using both approaches to get at a more productive system of analysis (1969: 278). Here the ware, type, variety, and group are used to understand both time and spatial affiliation. Modal analysis is used to characterize selected attributes or a cluster of attributes that display significance in their own right (Sabloff and Smith 1969: 279). Over time, more in-depth analysis was employed to answer questions of motive behind ceramic production that went further than merely spatial and temporal classification. Stylistic variation became a term archaeologists used to describe any variation in the appearances of artifacts that was not dictated by mechanical requirements (Braun 1995:

124). Researchers using these criteria posited that stylistic similarities and differences signaled social relationships, whether between or among large groups, small regions, or households (e.g., Wobst 1977; Braun 1995).

More and more research was devoted to the behavior of the potter and his or her motives behind production, whether socially, economically, or environmentally constructed. The symposium in the 1960's that shaped the *Ceramics and Man* volume (Matson 1965) formally introduced the concepts behind and application of ceramic ecology. Technological choice (Schiffer and Skibo 1987; Sillar and Tite 2000) became useful in identifying aspects of the production process and the 'choices' made by the potter. Schiffer and Skibo (1997) use technological choices to offer an explanation of artifact variability; a different concept than stylistic variability discussed above. These concepts can be applied to any number of archaeological evidence and material culture.

In the late twentieth century and now into the twenty-first century, new scientific technology and increasingly sophisticated theoretical ideas make more in-depth analysis possible. Following in the footsteps of radiocarbon dating that took hold decades ago, chemical analysis can now be performed on ceramic materials revealing a slew of information from where the clay was procured to what the vessel may have contained. While not every researcher is eager (or financially able) to take advantage of these advances, so much more information is potentially available and will build on the methods used for ceramic analysis for the foreseeable future.

Ceramic Ecology and Technological Choice

The limitations of merely looking at ceramics as a material to classify by time period and social and temporal affiliation became apparent when archaeologists began to consider material culture not as an artifact but as something resulting from behavior. Pottery sherds were used as the raw data for stratigraphical and chronological studies and (as a result) the “human aspects of this man-made and man-used product have been neglected” (Matson 1965: 216). This behavior and the motive behind the manufacture of ceramic vessels was a product of many different influences and interactions including the natural environment, politics, social structure, cultural setting, and economic system (cf., Matson 1965; Arnold 1975, 1985; Sillar and Tite 2000).

Ceramic ecology is one facet of cultural ecology and, like cultural ecology, seeks to explain the origin of cultural features and patterns that characterize certain environmental areas (Steward 1955). Matson defined ceramic ecology as a way to consider ceramic production within the context of the potter’s ecological setting; by examining the ceramic record of man’s activities as they were influenced by the interaction of his [or her] culture and environmental setting (Matson 1965: 202). Using this criterion, I am able to focus on the *choices* made by the potters of the Wolf Creek sites during ceramic production and compare this to what contemporary potters in the region were using in terms of natural resources to “get at” the behavior and (presumably) the motivation behind ceramic production.

To understand the relationship between the potter’s environmental and cultural setting, one must first look at the resources, and technologies, he or she is utilizing in that environment. By studying these technological choices the analyst can begin to understand that relationship. Within the parameters of ceramic ecology as a theoretical application, technologies can be analyzed as cultural choices; choices which depend as much on the social, economic and ideological setting as any other functioning criteria, such as the potter's relationship with their environment (Sillar and Tite 2000: 2).

While this analysis uses both ceramic ecology and technological choice to understand the cultural behavior of Woodland potters in the Upper Cumberland, both approaches have been used with many types of technologies and to understand different behavior in different cultures around the globe. Matson (1965) looks at different characteristics of pottery vessels manufactured in the Near East and how those characteristics are chosen, or favored, based on ecological factors. Characteristics of vessels constructed for holding/storing water, for example, were dependent on the size of a family/group, needs of the family/group, replacement necessity, and social factors (i.e., additions to family/group and style changes) (Matson 1965: 204). Similarly, vessels were constructed for food storage and presentation. As socially constructed dietary laws changed, so would the number and type of vessels needed to prepare and store various foods, like different types of meat or breads. Vessel size is also dependent on food production and storage needs. Less dependent on socially construed ideas about vessel construction were fuels and clays used during manufacture. The environmental settings of the Near East limited fuel types to what was available in the potter's locale. Dried grasses and desert weeds were easily transportable; dung was available where domesticated animals were abundant; less abundant wood was also used, but to a far lesser degree (Matson 1965: 210).

In terms of clays, the raw materials available – or socially available – to the potters in the Near East appear to have been abundant (Matson 1965: 210). Selection of clay became "more refined" in later times (Matson 1965: 210). Sandy clays, available in stream banks, are seen in earlier contexts, which form coarser wares. Later, fine-textured clay was obtained from the alluvial plain, making finer wares with fewer sand or gravel inclusions (Matson 1965: 210). Craft specialization varies throughout the regions of the Near East. Pre-wheel ancient potters would have been occupied with many other tasks, much like the modern potters of the rural mountain villages. There is a great deal of diversity of clay products made and used in the Near East, due, most likely, to the abundance of clay available (Matson 1965: 212). The ceramic ecology approach relies on three chief elements in a state of "transitory equilibrium." These elements – physical, biological and cultural – easily would alter the equilibrium should there be a slight change in any one of them (Matson 1965: 213).

Using an ethnoarchaeological approach, pottery production in El Porvenir, Honduras, is affected by weather conditions (Mouat and Arnold 1988). Potter behavior is directly affected by agricultural technologies. Women of the village are not only the primary pottery manufacturers but the primary income earners for their household, largely due to the great distance men have to walk to work in agricultural fields. Because the village is located in an ideal place for pottery production (Mouat and Arnold 1988: 252), it is more economically advantageous for the women to produce ceramic vessels while tending to household responsibilities. The repercussions of this dynamic are evident throughout the social and cultural structure in El Porvenir. So, here economic and social dynamics are affected by environmental constraints as are the choices and behavior of the potter.

In Quinua, Peru, agriculture again is the main force driving pottery production (Arnold 1975). Full-time pottery production is hindered by weather conditions. During the rainy season in the Ayacucho Basin, pottery production is nearly impossible when conditions are good for agricultural pursuits. In many of the rural areas topography also plays a significant role in pottery production. In the steeper sloping areas, erosion makes agriculture difficult while making pottery production easier due to exposed clay beds from eroded topsoil (Arnold 1975: 189). These factors, climate and elevation, play an important role in understanding the economics and sociocultural motivations behind pottery production. Here it is also evident how similar climatic conditions can create differing social and economic conditions when another factor (such as topography) is different. Arnold (1975: 183) emphasizes the need for integrating ceramic studies with their environmental context.

Using a ceramic ecology approach also relies on understanding the choices made by the potters. These may or may not be conscious, because social constructs determine what resources are used and how they are used. Environmental availability only constrains the potter to choose as far as social, economic, and ideological criteria allow (Sillar and Tite 2000; Sillar 2000). Like ceramic ecology, technological choice studies can be used in a number of different ways. Sillar and Tite use the concept of “embedded” choices within the context of wider societal practices (2000: 10). Sillar (2000) looks at the technological choices involved in fuel for firing pottery and how that is dependent on wider social and economic practices. Specifically, he uses the procurement of dung as a fuel and how the overall environment and economy affect why and how much dung is used by Andean potters. The choice of using dung as a fuel for pottery production has repercussions on other technologies (Sillar 2000: 57). Because dung is also used in ritual and economic context, its availability may be limited at times, increasing its value or requiring alternate fuel choices.

Technological choice is not limited to natural resources when it comes to pottery production. Pool (2000) explores the reasons why potters in the Sierra de los Tuxtlas choose kiln technology to fire their wares, vis-à-vis other technologies. The performance characteristics of both kilns and open firings are considered as they are related to specific natural, social, economic, and historical context of pottery production (Pool 2000: 67). The use of kilns and open firing occur in the same places at the same time, but this coexistence is not a new development. Archaeological studies suggest that the coexistence of these methods occurred over a period of 1700 years, despite potters' affiliation (Pool 2000: 66). Pool uses a behavioral approach defined by Schiffer and Skibo (1997) to understand the co-occurrence of the differing technologies. This approach links technological choices to production and use of vessels – within their social and economic context – through behavioral chains (Pool 2000). The choice of whether to use a kiln to manufacture ceramic vessels may be dependent on the type of finished product that is desired. Even though an updraft kiln may use more fuel than an open fire, the resulting fine-paste vessel with even surface colors may be worth the added trouble and cost of maintaining the kiln. Utilitarian wares, on the other hand, do not necessarily require fine pastes or uniform colors and so the firing process does not entail a kiln. Low fuel requirements for open firing utilitarian wares off-set the costs of vessel loss due to low temperature firing.

Application of Ceramic Ecology and Technological Choice

Though the majority of these approaches use a combination of archaeology and ethnography it is possible to understand (to a more limited degree) the choices made by prehistoric potters without the added benefit of a comparison to their modern counterparts. Using the concept of technological choice for the Long and Rowena site assemblages, I look at tempering types and how they are used within the paste. The tempering types are then compared to natural resources available to the potters who occupied the sites and then to the tempering agents used by potters in different areas. A comparison is also made between the Long and Rowena sites, and the differences between the behaviors of the potters who occupied those sites are examined. Known ceramic types are also examined to gain an understanding of time periods and affiliations of the sites' occupations. With an understanding of what tempering agents were favored and what were available, the ecological, social, and economic reasons behind those selections can be addressed.

In the following chapters, I attempt to answer the questions presented at the beginning of this introduction. The subject of Chapter 2 is the background to the analysis, including the methods used and the cultural history of the region. Chapter 3 lays out the data recovered during the analysis of both the Long and Rowena sites. The comparison of both sites to each other and to a number of sites from the same time period is the subject of the fourth chapter. Finally, Chapter 5 concludes the analysis and reviews the results as well as attempts to lay out the answers to the research questions asked here.

Chapter 2

Background

Kentucky and the Midcontinent: A Culture History

The Woodland Period in Kentucky and in the greater North American Midcontinent is distinguished from the earlier cultural time periods by the introduction of ceramic technology. The Woodland Period is often ambiguous in the archaeological record compared to the preceding Archaic and the later Late Prehistoric periods, which have garnered more attention in research and in scholarly publications. Spanning the millennia from 1000 B.C. to A.D. 1000, the term *Woodland* came into use during the early years of archaeological investigations to describe prehistoric groups who, " made pottery, constructed burial mounds, and lived by hunting, gathering, and gardening" (Stoltman 1978). The Woodland Period, in Kentucky, can be divided into three subperiods: Early Woodland (ca. 1000 – 200 B.C.), Middle Woodland (ca. 200 B.C. – A.D. 500), and Late Woodland (ca. A.D. 500 – 1000) (Applegate 2008; Railey 1996). These dates are not absolute cut-off points, but represent the best representation of changes in cultural characteristics within the broader Woodland time period.

The Early Woodland, in Kentucky and the Midcontinent, is separated from the previous Late or Terminal Archaic time period not only by the use of ceramic technologies but the addition of gardening and the appearance of specialized ritual sites located away from settlements (Railey 1996: 84). The earliest pottery was manufactured in Eastern Kentucky, and was thick, and either cordmarked, fabric impressed, or cord-wrapped dowel-impressed. Commonly referred to as Fayette Thick (Griffin 1943), this early pottery first appeared in eastern and central Kentucky and was tempered with coarse particles of grit and rock. In the northwestern region of Kentucky and in southern Illinois, the Crab Orchard ceramic type was most prevalent during the Early Woodland (Butler and Jefferies 1986). Typically, Crab Orchard ceramics are characterized by deep, thick-walled, conoidal vessels with small, flattened bases. This “flower pot” shape also may have a slightly recurved profile and be tempered with crushed rock (grit) or a mixture of grit and clay, which gave way to clay temper later in the sequence (Butler and Jefferies 1986: 524). Also later in the sequence, about 100 B.C., nodes began to appear on these ceramic vessels; these nodes became common by about A.D. 1.

Crab Orchard is just one local type associated with “flower pot” shaped, conoidal, thick, and predominately fabric-impressed or cordmarked ceramic vessels throughout the Midcontinent during the Early Woodland. The middle portion of the Ohio River Valley was dominated by the Fayette-Adena ceramic sequence (Clay 1980). In the Tennessee Valley, Long Branch ceramics are similar to the Crab Orchard/Baumer ceramics of the Ohio Valley; which have finer limestone tempering and thinner vessel walls (Haag 1939; Butler and Jefferies 1986: 531).

A distinct cultural-historic unit associated with the Early Woodland, and which continued into the Middle Woodland period, is Adena. Material culture, earthwork construction, and mortuary practices define Adena; of which mortuary practices are the most distinct (Applegate 2008: 351). Using chronometric dates, the Adena in Kentucky falls between 500 B.C. and A.D. 250 (Applegate 2008: 352; Anderson and Mainfort 2002; Clay 1980, 1991). Material culture associated with Adena comes almost exclusively from the burial mounds. These distinctive artifacts include stone gorgets, tubular pipes, elbow and platform pipes, celts, hoes, hammerstones, galena and barite artifacts; bones and shell tools and objects, copper bracelets, rings, and beads; Adena and Robbins type projectile points, and textile fragments (Railey 1996: 96-97). The raw materials from which these objects were made were mainly obtained through trade, sometimes from distant regions. Though ceramic vessels are not regularly found in burial contexts, numerous pottery sherds are found within the mound fill; which may be a consequence of graveside ritual such as feasting (Railey 1990: 97; Clay 1983).

The most common pottery was limestone or sandstone tempered jar-shaped Adena Plain (Haag 1940: 75-79). The type known as Montgomery Incised, a decorated Adena Plain variety, is less well known at Adena sites. Spatially, the Adena cultural unit did not extend into the Upper Cumberland region, but was concentrated mainly in the Middle Ohio River Valley. The most prominent Adena feature, burial mounds, are found in a different environmental setting mainly in the north-eastern portion of Kentucky, southern Ohio, and western West Virginia. These Adena burial mounds are found in a number of different environmental settings and are numerous, making it difficult for Adena scholars to identify a settlement model (e.g., Seeman 1985).

The Middle Woodland subperiod (ca. 200 B.C. – A.D. 500), is distinguished from the early subperiod by burial mounds, earthen enclosures, new distinctive types of pottery, and interregional exchange of ritual items (Railey 1996: 88). Because there were many cultural changes that occurred during the Middle Woodland, it is commonly divided into the early Middle Woodland (ca. 200 B.C. – A.D. 250) and the late Middle Woodland (ca. A.D. 250 – 500) (Applegate 2008; Railey 1990). During the early Middle Woodland, cordmarked, cord-wrapped dowel-impressed, and fabric-impressed pottery were most common in western and southern Kentucky (Railey 1990a: 89). Check stamped and simple stamped surface treatments are also found throughout the state during this time period, though late Middle Woodland ceramics are mostly cordmarked. The majority of burial mounds in the Bluegrass and in eastern Kentucky were constructed during the early Middle Woodland; these are associated with small, scattered settlements with ritual spaces serving as focal points of group "ritual and social integration" (Railey 1990: 90). In contrast, groups in the western and southern portions of the state occupied central base camps or villages, often containing thick middens (Railey 1990: 90-91). Few of these encampments or villages seem to have continued into the late Middle Woodland.

Much of the Middle Woodland is characterized by the Hopewell cultural tradition, which is also characterized by earthwork construction, mortuary practices, and material culture (Applegate 2008: 356). The spatial boundaries of Hopewell are less defined than the Adena culture. Two distinct concentrations existed in Ohio and Illinois, and artifacts associated with Hopewell can be found all over the Midcontinent. Though the Hopewell covered such a large geographic area, it did not represent a distinct "Culture" as would a "unitary social organization" (Dancey 2005: 129). Instead, Hopewell is best thought of as a horizon, or a set of contemporaneous phases that encompass a wide geographic area (Applegate 2008: 357; Dancey 2005; Sieg and Hollinger 2005). Despite these interpretations, one universal characteristic of Hopewell cultures is the exchange of exotic materials. This prompted the view of the Hopewell as an "interaction sphere" (e.g. Blosser 1996; Brown 1977; Caldwell 1964; Seeman 1977). Few sites in the Upper Cumberland region have yielded Hopewell diagnostic artifacts (Applegate 2008). Within the Wolf Creek Reservoir area, the Reiny site (15Ru27) has yielded stamped pottery and Copena projectile points (Railey 1990), all of which are Hopewell diagnostics.

In eastern Tennessee, the Middle Woodland Candy Creek phase was defined by Lewis and Kneberg (1941). This phase is defined by the occurrence of limestone-tempered, checked, complicated and simple stamped pottery. Also occurring in eastern Tennessee during the Middle Woodland are sand-tempered plain; fabric-marked; and complicated, simple, and checked stamped Hamilton Focus sherds (Schroedl and Boyd 1991: 76). Sites yielding these Middle Woodland Hamilton Focus artifacts include Icehouse Bottom (Chapman 1973; Cridlebaugh 1981), the Patrick site (40Mr40) (Schroedl 1978), and the Higgs site (40Ld45) (McCollough and Faulkner 1973). Ceramics comparable to the Middle Woodland Connestee phase in North Carolina found at both the Patrick and Higgs sites suggests that sand-tempered Connestee phase ceramics were temporally later there than the limestone-tempered types. This led to the conclusion that two distinct Middle Woodland phases were represented in East Tennessee – the Candy Creek and Connestee (Schroedl and Boyd 1991: 76).

In Middle and Southern Tennessee, along the Tennessee River and its drainages, two different Middle Woodland phases have been identified. The McFarland phase (ca. 200 B.C. to A.D. 200) was prevalent during the early Middle Woodland Period and the Owl Hollow phase (ca. A.D. 200 to 500) during the late Middle Woodland (Butler 1979: 150; Faulkner and McCollough 1974; Faulkner 1976). The McFarland phase is characterized by limestone tempered fabric-impressed and check stamped pottery, with few other types. While the check stamped pottery dominates most ceramic assemblages in the area, fabric-impressed is more widespread during the early part of the phase (Butler

1979: 150). Settlement patterns associated with the McFarland phase include small encampments of no more than a few structures scattered along the floodplain and other alluvial terraces of the Duck River (Butler 1979: 150). The Owl Hollow phase in this region of Tennessee is characterized by limestone tempered plain and simple stamped pottery. Settlement of the Normandy Reservoir area was much less intense during the Owl Hollow phase than the McFarland, with Owl Hollow sites tending to be nucleated within the floodplain area.

In terms of a Hopewellian influence in southern middle Tennessee, the Yearwood Site (40Ln16) is located along the Elk River, a tributary of the Tennessee River. Though the components found at Yearwood span the entire Woodland Period, it produced a number of exotic materials indicating participation in local and regional exchange systems. Some of these are typical Hopewellian trade goods, though others are representative of other sources, including the South Appalachian area (Butler 1979: 153). Ceramics recovered from Yearwood are mostly made of local clays and are practically all limestone-tempered with cordmarked, plain, and check stamped surface treatments. Ceramics associated with the Hopewell component are locally made with obvious Hopewellian influences (Butler 1979: 154).

The Late Woodland (A.D. 500 – 1000) subperiod is often known as a “good gray period” in the prehistory of the Midcontinent and the greater Midwest. This subperiod is marked by the decline in long-distant exchange items and earthwork construction. Despite the fact that long-distance exchange of exotic goods did not continue much past A.D. 500 (in eastern- and western-most Kentucky and throughout the Midwest), the similarity of material culture and subsistence patterns over very broad regions during the

Late Woodland period suggests that some type of interregional interaction must have been sustained among different groups (Henderson and Pollack 2000: 613). Local continuity also was strong during this transition; throughout most of Kentucky, early Late Woodland cooking pots are cordmarked jars, much like their late Middle Woodland predecessors (Railey 1996: 111).

In the central and northeastern regions of Kentucky as well as the southern regions of Ohio and Indiana, ceramic sherds associated with the early part of the Late Woodland are characterized by thinner walls and smaller vessel size in general, relative to the Middle Woodland period. Here, Late Woodland sites are often associated with the Newtown phase/tradition (Henderson and Pollack 2000: 625; e.g. Griffin 1952; Seeman 1980; Seeman and Dancy 2000). Sites such as Bently (Henderson and Pollack 1985) and Hanson (Henderson 1988) in the Ohio River floodplain and Haystack Rockshelter (Cowen 1979; Henderson and Pollack 1982) in the Eastern Mountains of Kentucky have yielded Newtown ceramics with distinctive angular shoulders (Henderson and Pollack 2000: 625-627; McMichael 1984). Other ceramic characteristics associated with the early Late Woodland Newtown tradition include notched rims (present in sites along the southern and western edge of the Kentucky Bluegrass region) and castellated rims (found in features from the Old Bear [Brooks 1985] and Shelby Lake [Hockensmith et al. 1998] sites).

The latter part of the Late Woodland is often referred to as the terminal Late Woodland. Ceramics associated with terminal Late Woodland sites in the eastern and central regions of Kentucky are similar to those manufactured during the early Late Woodland though with slightly thicker vessel walls and a number of jars with folded rims

(O’Malley 1990; Seeman 1992). Community plans or occupation types associated with the Late Woodland period in eastern and central Kentucky differ from the Early and Middle Woodland and vary more widely than the previous subperiods. Midden rings with central plazas have been documented at sites such as Pyles (Railey 1984) and Gillespie (Railey 1990: 306), which consists of a midden ring that encompasses a central plaza (Henderson and Pollack 2000: 628). Single burial mounds have also been documented in association with some early Late Woodland occupations, which is dissimilar from Middle Woodland mound construction. Late Woodland settlements upstream from the Falls of the Ohio region include not only these midden ring villages, but less intensively occupied, smaller habitation sites, which are most similar to Middle Woodland occupations in this region (Henderson and Pollack 2000: 630; Dancey 1988, 1991, 1992; Schock 1984). Terminal Late Woodland sites upstream from the Falls area (eastern Kentucky) are small habitation sites and suggest more dispersed settlement relative to the early Late Woodland settlement patterns.

In other regions of the Southeast, e.g. southwest Virginia, the Late Woodland period includes all prehistoric cultures dating after A.D. 800 (Hoffman and Foss 1980). different ceramic types are associated with the Late Woodland in southwest Virginia, which possibly represent distinctive cultures. These cultures occur after the Hopewell “decline” and did not directly participate in the subsequent Mississippian development (Schroedl and Boyd 1991: 74). Similarly, in western North Carolina, no formal name has been given to any Late Woodland cultural unit. Several researchers have defined a post-Connestee (Middle Woodland) and pre-Pisgah (South Appalachian Mississippian) chronological unit, usually dating between A.D. 600 and A.D. 1000 (Schroedl and Boyd

1991: 76; Keel 1976; Purrington 1983). During this period, Keel (1976) suggests that sand- and grit-tempered Connestee-like pottery was produced, though with a higher frequency of plain and brushed surfaces (Schroedl and Boyd 1991: 74-76).

The Late Woodland in east Tennessee is associated with the Hamilton culture or Focus. It is defined by the predominance of limestone-tempered pottery with cordmarked, plain, and brushed surfaces. Other features of the Hamilton Focus are conical burial mounds and "individual household" shell middens (Schoedl and Boyd 1991: 78; Kimball 1985; Lewis and Kneberg 1946). The main difference between ceramics associated with the Hamilton Focus (namely Hamilton cordmarked types) and previous Candy Creek cordmarked types (Middle Woodland phase in eastern Tennessee) is that the Candy Creek ceramic vessels have wider, shallower cord impressions than do the later Hamilton vessels. While both types are distinguished by their crushed limestone-tempering and plain and cordmarked surface treatments, it is suggested that the Hamilton cordmarked was a transitional type between the early Candy Creek cordmarked and the later Hamilton plain types (Schroedl and Boyd 1991: 79; Lewis and Kneberg 1946; Rowe 1952).

The last prehistoric cultural period in the Eastern United States is known as the Late Prehistoric Period. In Kentucky, the Late Prehistoric can be divided into two separate periods, or cultural traditions, known as Mississippian (A.D. 900/1000 – A.D. 1700) (Pollack 2008: 605; Lewis 1996: 127) and Fort Ancient (A.D. 1000 – A.D. 1750) (Sharp 1990; Henderson 2008). Though these researchers refer to the Mississippian and Fort Ancient as "periods," I find it less confusing and better serving to refer to the two as cultural traditions within the Late Prehistoric time period. The Mississippian tradition in

Kentucky is found in site concentrated in the southern and western parts of the state (Lewis 1996: 128). Traditionally marked by changes in material culture (see Griffin 1967, 1985), such as non-local goods and shell tempered ceramics, Mississippian can be identified as groups throughout the southeastern United States which shared cultivation practices and a planned hierarchical structure which included planned administrative centers (Lewis 1990: 375; Pollack 2008: 605). Pottery diagnostic of the Mississippian cultural tradition is by far dominated by two types: Mississippian Plain and Bell Plain, though there are several other types of shell tempered Mississippian pottery. Mississippian Plain, as its name may suggest has a plain surface treatment, which is most often well smoothed. Mississippian Plain was used as utilitarian ware. Bell Plain, the finer of the two wares, is characterized by finer ground shell tempering and very well smoothed to almost burnished plain surfaces.

Fort Ancient cultural tradition is similar to Mississippian in that it is marked by an increase in sedentism as well as increased reliance on agriculture; focused on the cultivation of corn and beans (Sharp 1990: 469-470). Fort Ancient sites are found predominately in the middle Ohio River Valley and in Kentucky, the northeastern portion of the state (Henderson 2008: 739). Ceramics are the most common diagnostic artifact class (Sharp 1990: 469), and are tempered with shell as well as grit, sand, and chert (Henderson 2008). Fort Ancient ceramics can be distinguished from Mississippian type pottery by paste texture and morphological characteristics such as shoulder, rim, and handle shape. Fort Ancient pottery also is predominately cordmarked up to the shoulder of the vessel (Henderson 2008: 741-742).

Transitions in site type and material culture throughout the Woodland Period in Kentucky and the Midcontinent are essential to understanding the nuanced cultural changes over time in smaller occupations within the region. Rather than painting the entire Midcontinental region of the United States with the same "cultural brush" it is important to understand that niche occupations may not strictly adhere to the standards set by larger, more prominent archaeological sites in the same region.

The Upper Cumberland Region

Much less is known archaeologically about the Woodland period in the Upper Cumberland Region of Kentucky (Figure 2-1) than is known about the rest of the state and the wider Midcontinent. The culture history of wider regions is assumed to be the same for sub-regions and drainages that fall within the greater area without much regard for the distinctive characteristics of the smaller area.

Figure 2-1: Upper Cumberland River Region.

Documented archaeological sites in the Upper Cumberland region of Kentucky include fewer than 400 Woodland sites. The majority of these are rockshelter sites. There are more Woodland sites documented in the area surrounding Lake Cumberland than there are in the mountainous portion of the Upper Cumberland River to the east. This is most likely an indication of sampling bias. In Kentucky, pottery found at Woodland sites along the Cumberland River has not been studied in much depth and there have been no pottery types defined in this area (Applegate 2008). Similarly, in the Cumberland River Valley area of Tennessee, the earliest excavations focused primarily on burial mounds and left many non-mound sites undocumented, leaving a considerable gap in Woodland period documentation and regional analysis (Dillehay et al. 1984).

Some of the most substantial work performed in the Upper Cumberland River region of Kentucky was in the Big South Fork National River and Recreation Area (BSFNRRA). Wet Ledge Rockshelter (15McY837) is situated in Hunting Camp Hollow of McCreary County, Kentucky, near a number of rockshelter and ridge top sites, is a multicomponent site with an intact midden and a nut-processing feature (Applegate 2008: 443; Des Jean 2004). The Early Woodland component of the Wet Ledge Rockshelter is indicated by Adena Stemmed points and limestone plain and sand-tempered cordmarked sherds (Des Jean 2004).

Further west, in Cumberland County, Site 15Cu27 is located along the Big Renox Creek floodplain and is a multicomponent rockshelter with an 85 cm thick midden deposit, storage pits, hearths and grave features (Applegate 2008; Kerr et al. 2004). Pottery includes Early Woodland shale-tempered, smoothed over cordmarked and fabric impressed, early Middle Woodland grit-tempered cordmarked and fabric impressed, Early to Middle Woodland limestone-tempered cordmarked, and Late Woodland limestone tempered cordmarked sherds (Applegate 2008: 444; Kerr et al. 2004). Site 15Cu110 is a multicomponent open-air site that was most intensively occupied from the late Middle Woodland to early Late Woodland subperiods. A calibrated date of A.D. 540-654 was acquired from the thick Woodland midden deposit at the site. Diagnostic artifacts recovered from 15Cu110 include Lowe Cluster projectile points and pottery tempered with grit, limestone, or sand, which resembles Owl Hollow materials from north-central Tennessee (Applegate 2008: 444; French 2004; Jones 2006). In northeastern Pulaski County, Site 15Pu299 is an open habitation with 8-15 cm midden deposits surrounding an open plaza (Schock 1999). A calibrated radiocarbon date taken from the midden deposit yielded dates of A.D. 428-633 and A.D. 441-662, and suggests a late Middle to early Late Woodland occupation (Schock 1999). The majority of ceramics recovered form Site 15Pu299 was tempered with limestone and had cordmarked or plain surface treatment. Ceramic vessel decoration included notches or punctations associated with the lips of jars (Applegate 2008: 446; Schock 1999).

The Eastern mountainous section of the Upper Cumberland region has many more documented Early and Middle Woodland components than Late Woodland components. The skewed documentation could be a result of sampling bias but may also be a result of shifting settlement patterns as the Woodland period advanced toward the Late Prehistoric. Site 15Bl59, in Bell County, Kentucky, is an Early Woodland component site which yielded Swannanoa-like pottery and various other artifacts that are indicative of the Watts Bar complex (Applegate 2008: 447). The Watts Bar complex and the related Swannanoa phase (Keel 1976) are characterized by thick cordmarked and fabric impressed ceramics which are densely tempered with quartz, quartzite, and coarse sand (Applegate 2008: 447; e.g., Lafferty 1978; Lewis and Kneberg 1857; Smith and Hodges 1968).

Two other sites located in the eastern mountains in the Upper Cumberland River Valley are the Main (15Bl35) and Mills (15Bl80) sites, both located in Bell County, Kentucky. The Main Site (15Bl35) has both Early and Middle Woodland components. Diagnostic Early Woodland artifacts include Pine Mountain series pottery and Ebenezer, Saratoga, and other stemmed and lanceolate points (Applegate 2008: 448; Creasman 1994). Evidence of shifting occupational intensity at Main indicates shifting utilization at Main throughout the Early Woodland and into the Middle Woodland. Middle Woodland diagnostic artifacts include Mills series ceramics and projectile points (i.e., Copena Triangular). Structural remains at Main evidenced by post molds and associated storage pits is one of only two such documented remains in the mountains region of the Upper Cumberland (Applegate 2008: 448). The Mills Site (15Bl80) also contains Early and Middle Woodland components, similar to the occupation of the Mains site, though used for a limited range of activities and for shorter periods of time. Swannanoa pottery is characteristic of the Early Woodland component and is a reflection of an affiliation with groups to the south (i.e., the Ridge and Valley province) (Applegate 2008: 448; Creasman 1995, 1995). Mills Plain and Mills Checked-Stamped pottery types are diagnostic of the site's Middle Woodland component.

Early Woodland occupation of the Cumberland River region in Tennessee was much less intense and experienced less mound building activity compared to other areas with similar Woodland components (Dillehay et al. 1984). Investigations in the Cumberland drainage in Tennessee by Jolley (1979) indicate that there is less cultural debris associated with Early Woodland components than Late Archaic (Dillehay et al. 1984: 33). While the Early Woodland subperiod in this area seems to be less intensively occupied than the previous Late Archaic, the occurrence of exotic items associated with long distance exchange (e.g., steatite) suggests expanding exchange networks as the subperiod progressed. Unlike in the Cumberland drainage in Kentucky, cultural phases have been defined in Tennessee. The Owl Hollow Phase was identified for the Caney Fork River area, evidencing a change in the subsistence strategies of incipient horticulturalists (Dillehay et al. 1984: 35). Owl Hollow has been divided into three sub-phases: Early (A.D. 200-400), Middle (A.D. 400-600), and Late (after A.D. 600). Sites identified as early Owl Hollow Phase occur in both floodplain and upland settings, while those dating to the middle Owl Hollow are found only on floodplains. Conversely, the late sites occurred only in upland settings (Dillehay et al. 1984: 398). Early Owl Hollow ceramics are characterized as limestone tempered and simple stamped with plain and notched rims. Check stamped, cordmarked, and incised surface treatment occur in the early and middle parts of the Owl Hollow Phase, while plain surfaces gradually become more prevalent into the late part of the phase (O'Malley and Gatus 1984: 398).

Late Prehistoric occupation of the Upper Cumberland region was exclusively that of the Mississippian cultural tradition. Long and Rowena are considered two of the most predominate Mississippian components in the region of Kentucky (Pollack 2008: 683).

The Wolf Creek Dam Reservoir

The Wolf Creek Dam Reservoir, or what is now known as Lake Cumberland, was created as a result of Wolf Creek Dam in Russell County in Southeastern Kentucky along the Cumberland River (Figure 2-2). Excavations were performed by William G. Haag and the University of Kentucky's Museum of Anthropology in the late 1940's in advance of the dam's construction. A total of 36 sites were excavated by Haag and his team. Little additional work has been performed on the data and material culture since they were excavated. A dedicated report for the ceramic assemblage from Rowena (15Ru10) was published by Weinland (1980). Unlike the Rowena Site, no dedicated report has been published on the archaeological investigations at Long (15Ru17). A conference paper, presented at the annual Kentucky Heritage Council Conference, by Clifford B. Sulham (1993) focused on the skeletal remains and archival materials.

Figure 2-2: Wolf Creek Dam Reservoir/Lake Cumberland.

Of the other sites excavated during the 1940's by Haag and company, the most notable is the Reiny Site (15Ru27). Reiny is a multicomponent rockshelter located at the base of a bluff line above the Big Renox Creek (Applegate 2008: 443). It contained approximately 85 cm of midden deposits, storage pits, hearths and grave features spanning the entire Woodland period (Kerr et al. 2004; Applegate 2008). The rockshelter site was occupied most intensively during the Early and Middle Woodland subperiods.

Pottery from Reiny included Early Woodland shale-tempered, smoothed over cordmarked and fabric-impressed sherds, as well as Early to Middle Woodland limestone-tempered cordmarked, and Late Woodland limestone tempered cordmarked sherds (Applegate 2008: 444; Kerr et al. 2004; Railey 1990).

Geology

The geological setting of the eastern Midcontinental region includes mostly Mississippian age limestones, calcareous shales, shales, siltstones, and sandstones (Figure 2-3). Some Devonian and Ordovician limestone, dolomite, and shale are exposed in stream cuts (Banguilan 2009: 2-1). This includes the Upper Cumberland River region where the Wolf Creek Dam was constructed. The majority of the Reservoir region lies within the Eastern Highland Rim section of the Interior Plateau physiographic region (Woods et al. 2002). The upland areas of the region are underlain by Pennsylvania strata; this includes sandstone and coal deposits that form cliffs.

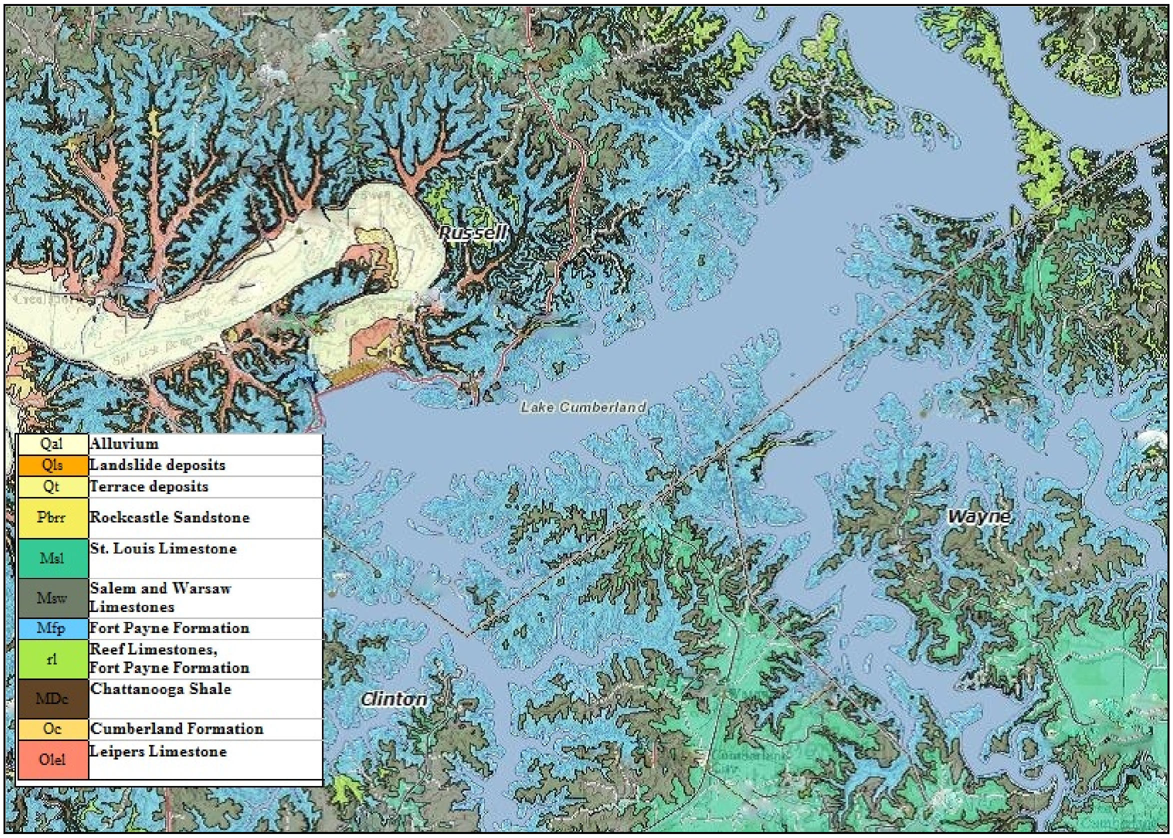


Figure 2-3: Geology of Wolf Creek Dam Reservoir (KGS 2007).

At a more local level, the area east and south of the Wolf Creek Dam (Figure 2-3) includes many different geological features. The most widespread formation below the present-day dam is the Fort Payne Formation (KGS 2007). This formation lies mostly along the banks of modern Lake Cumberland. The Reef Limestone of the Fort Payne Formation also borders the lake, and can be seen outcropping when the water is low, but is much less abundant than the predominant Formation. Other geologic features in the area below the Dam include Salem and Warsaw Limestone, Cumberland Formation limestone, Leipers Limestone, St. Louis Limestone, Chattanooga Shale, and Rockcastle Conglomerate (Figure 2-3).

All of the geological features below the Dam date to the Paleozoic Era. The oldest are the Leipers Limestone and Cumberland Formations. These features formed between

505 and 438 million years ago; and date to the Upper Ordovician, a period within the Paleozoic (Plummer et al. 1999). The Chattanooga Shale outcrop below the Dam was formed during the Devonian period, and dates between 408 and 360 million years ago. Most of the formations seemed to have formed during the Mississippian period of the Paleozoic. The Fort Payne Formation, Salem and Warsaw Limestone, the reef limestone of Fort Payne Formation, and the St. Louis Limestone features date to 360-320 million years ago (Plummer et al. 1999: 182-183). The most recent formation, Rockcastle Conglomerate, dates to the Pennsylvanian period (320-286 million years ago). Alluvium and terrace deposits formed upstream from the present day dam location, approximately 1.6 to 0.1 million years ago, and date from the Tertiary to the Quaternary periods of the Cenozoic geologic Era (KGS 2007; Plummer et al. 1999).

In terms of the wider region, the Pennsylvanian strata overly the Mississippian formation system throughout the majority of the Appalachian Mountains region in eastern Kentucky (McDowell 1986: H32). These systems occur parallel to each other in the Appalachians, but split from one another at the Cumberland Escarpment, which lies along the western edge of the Appalachian Mountains. This unconformity is discernible as a series of paleo-channels and by paleo-karst topography (McDowell 1986: H32). Pennsylvanian strata outcrop in this area. The lower part of the strata is characterized by a thick sequence of pebbly, locally conglomeratic quartzose (quartz) sandstone (McDowell 1986: H33). Where this stratum is in contact with the underlying Mississippian (i.e., outside of the paleo-channels) this lower portion is characterized by coal and dark-gray shale (McDowell 1986: H33). The middle and upper portions of the Pennsylvanian are characterized by intermittent layers of siltstone, shale, and subgraywacke (i.e., micaceous, feldspathic, and lithic sandstone with a clayey matrix) (McDowell 1986: H33).

The underlying lithology and geology in the Wolf Creek Dam basin and greater Upper Cumberland River region is an important part of recognizing the resources available to the prehistoric occupants. It is also vital to recognizing what resources were not available locally. As will be presented in subsequent chapters, the geological resources used as tempering agents may differ through time periods and over distances.

Chapter 3

Ceramic Analysis

Methods

For the current analysis of ceramic materials, only the non-shell tempered sherds are sampled. It is widely accepted that shell tempered ceramic vessels are indicative of Late Prehistoric (including Mississippian) pottery manufacturing. Though it is entirely possible that sherds without the revealing shell tempering were manufactured during the Late Prehistoric time period, without reliable provenience or carbon dating to establish its occurrence, it is impossible to know with any degree of certainty. For the purposes of this analysis, a lack of shell tempering is identified as having been manufactured during the Woodland period. Of these, only sherds greater than 4 square centimeters are included. The sherds which meet these criteria were arbitrarily assigned artifact numbers and appropriate attributes observed for each.

A number of variables were identified for each sherd in the sample. These included sherd size, texture, temper, inclusions (other aplastics), color, thickness, and general comments about the sherd. To determine size, the sherds were placed on a centimeter grid and the number of squares they covered where counted. All non-shell tempered rim sherds were included in the analysis regardless of size. Knowing the size of the ceramic vessel fragment is indicative of the dependability of the information about vessel morphology: the larger the sherd, the more reliable the information. Paste texture is evaluated based on visual inspection of the sherd and comparing the particle-size of fragments of the clay material with the other sherds in the sample. The proportion, size, and shape characteristic of the particles in the clay material are responsible for the texture of the paste of the fired sherd (Rice 2007: 72).

According to Rice (2007: 411), an *aplastic* is particulate matter in a clay body that does not contribute to plasticity or that reduces the plasticity of the clay…but lacking implications of either natural occurrence or deliberate addition by the potter. Temper is defined as the most common and/or largest aplastic in the paste. It is understood that these aplastics have been added to the paste, while inclusions, or other aplastics, are most likely included in the paste incidentally during manufacture. Any aplastic that could reasonably occur in the paste naturally but is much larger and denser by volume, or more frequently occurring, in the paste may also be considered temper, particularly if no other aplastics present in the paste are considered to be additives (e.g., grog). Five main categories of aplastics are identified for the sample using a 10x hand lens and a 20x magnification microscope. These are grit, quartz, limestone, hematite, and grog. Grit temper is identified by its relative size and angularity, and that which could not be identified as a specific rock or mineral generally is lumped into this category. Some specific particles were also characterized as a generic "grit" tempering. These include crinoids, fragmented shell, calcareous tufa, gypsum variety *satin spar*, and river pebble; all of which may or may not occur together. The crinoids and fragmented shell are most likely the detritus of limestone which eroded before being used as a tempering agent. Other "grit" aplastics identified in the sample are quartzite, shale, siltstone, sandstone, conglomerate rock, and mica.

Quartzite is similar in structure to sandstone, with the one notable exception being that the quartzite particles are not cemented together into a "cluster." For the purposes of this study, quartzite is identified as multi-colored (clear, opaque, reddish-orange), clastic, medium- to coarse-grained particles, and generally rounded (Chesterman 1978: 715). Shale and siltstone are very similar in that they are both made up of the same source materials. Shale is a fine-grained sedimentary rock notable for its splitting capabilities (called *fissility*); which takes place along surfaces of very thin layers (called *laminations*) (Plummer et al. 1999: 128). This fissility is the main distinction between shale tempering and siltstone tempering. Siltstone also consists mostly of silt grains, though they are coarser than shales. Sandstone is identified as even, medium-sized clastic quartzite particles which are cemented together. In essence, sandstone is characterized as a tempering agent by looking for particles that look exactly as the name implies - *sand-stone*. The conglomerate rock identified in this study was mainly a chalky white color, and consisted of uneven-granular, coarse-grained, clastic, with well-rounded fragments of various rocks (Chesterman 1978: 717). Mica was characterized by the platy, fine-grained particles that reflected a dark, lustrous color under the light.

Quartz is generally sand-sized particles that range from very fine- to medium-grained and in sphericity from very rounded to sub-rounded. It was distinguished in this analysis from quartzite by its relative size, very fine to fine grained particles. Because it is rare to find unleached limestone temper within the paste of prehistoric ceramics, here it is identified by the sub-angular to angular voids in the paste where the limestone has leached away over time. As noted above, though, there is evidence in the assemblages that shell and crinoidal limestone occurred in the paste. Hematite, a ferric oxide, is identified by naturally occurring reddish-brown inclusions and can appear as rounded particles or flecks within the paste. Grog is defined as crushed pieces of fired clay, possibly from fragmented vessels, added as a tempering agent. When grog is identified within the paste of a sherd, it is considered the temper, or primary aplastic for that pottery sherd.

In addition to the type of aplastic material identified in the sherd, the size (based on the Wentworth scale), angularity, sphericity, and percentage of both temper and inclusions within the paste was recorded. Generally, grain size of temper is expressed as either very fine, fine, medium, coarse, or very coarse. But, for the purposes of this analysis, primary temper grain size was additionally evaluated as fine to medium or medium to coarse grain sand. This was necessary because many tempering agents tend to vary broadly in their grain size and it was most important to capture the range of grain size for the primary temper.

Exterior and interior surface colors were recorded using the Munsell soil color chart in order to maintain consistency in the assessment of color. The color and type of core, based on Rye's (1980) classification, of each sherd were also identified. Both the color of the sherd surface and core can yield information about both the firing method and the chemical structure of the materials used in manufacture (Rye 1980). The firing technology used by prehistoric potters in the Upper Cumberland region of Kentucky did not have the capability to fire above about 1000ºC (Rice 2007). Therefore, effects on the ceramic core below this temperature are due largely to removal of carbon by oxidization or deposition of carbon from a reducing atmosphere (Rye 1980: 115). The reactions seen in the cross sections of ceramic sherds are markers of the atmosphere and temperature of firing.

Four firing conditions account for the different core types observed in sherd cross sections. Firing with an oxidizing atmosphere, when the clay material does not contain organic materials results in the ceramic vessel wall exhibits no core. According to the data collected for core effects on the Rowena Site sample, a total of 104 or 37.8% of these exhibited no core in cross section. Similarly, no core was observed for 104 sherds or 30.3% of the Long Site sample. Ceramic sherds which contain up to 20% organic materials fired in an oxidizing atmosphere exhibit sharp core margins which are gray or black in color (Rye 1980; Rice 2007: 334). Sherds with the core effect of reddish colors with diffuse margins were most likely fired in a reducing atmosphere, but containing no organic materials. The exteriors of these sherd types are black or very dark and the core effect is most often a “reverse core” in which the core is lighter than the surface or subsurface of the sherd (Rice 2007: 334-335). These cores are present in sherds with fine grained clays, so that the carbon deposit used in the reducing atmosphere does not extend to the core of the vessel wall. This may not occur in coarse grained clays, in which case a core effect is not observed. Vessels fired in reducing atmospheres, but with organic materials present in the clay will have a gray or black core in cross section and will generally have diffuse margins.

A core effect can also occur as a result of the cooling process. Because the atmosphere can be different during cooling, the rate of cooling can contribute to the removal or deposition of oxygen (Rye 1980: 117). If a vessel is removed from the firing area and allowed to cool in the open-air, the atmosphere becomes oxidizing. This has no effect if the atmosphere during firing was already oxidizing, but if the atmosphere had been reducing, the core will appear “reversed” in color and display sharp margins.

Because thickness of the vessel wall may yield information about the type of sherd, as well information about the morphology of the overall vessel, the thickest point of each sherd was measured, in millimeters, using a set of digital calipers. Lip thickness was also measured for rim sherds at the thickest point where the rim just begins to curve in to form the lip. Additional variables observed for rim sherds were lip orientation, orifice diameter (using a centimeters circular scale), and lip shape. Categories of lip orientation were recorded as direct, everted, or inverted. These are determined by holding the lip of the rim sherd flush with a flat surface to observe the direction of the rim. Lip orientation is an important variable to observe when ascertaining the shape and type of vessel from which the sherd originated. Flat, beveled, rounded, and thickened are the lip shapes identified for the sample of rims. These were verified using examples of established lip shapes in order to maintain consistency during analysis.

Rowena Site (15Ru10)

The ceramic assemblage which I analyzed from the Rowena Site was also previously reported by Weinland (1980). Her analysis was not comprehensive and served only as a typological description to identify and confirm cultural components. Weinland identified a total of 8,744 ceramic objects comprise the assemblage. Of these, 6,414 were analyzable for the purposes of her report. Sherds identified as Mississippian or Late Prehistoric equaled 5,895, or 92 percent of the analyzed assemblage. Non-shell tempered or Woodland ceramic sherds equaled 519, or 8 percent of the analyzed assemblage.

In 1960, Lee Hanson performed a more inclusive analysis on the ceramic sherds collected during the 1947 survey of the Rowena Site. Along with several other ceramic assemblages from site impacted by the Wolf Creek Reservoir, Hanson included this analysis in an unpublished report for the University of Kentucky (Hanson 1960).

For the present analysis, a total of 275 non-shell tempered ceramic sherds I analyzed from the Rowena Site and coded for a number of variables relevant to questions of potter choice and manufacture of ceramic vessels. Four distinct sherd types were identified based on morphological characteristics. These are body, shoulder, rim, and base sherds (Table 3-1). Typically, and in the case of the Rowena assemblage, the vast majority of types are body sherds (n = 238; 86.5%). Only two sherds could not be confidently identified as belonging to any of these groups.

Table 3-1: Rowena Site (15Ru10) Sherd Types.

	Frequency	**Percent**
Body	238	86.5
Shoulder	4	1.5
Rim	14	5.1
Base	17	6.2
Undetermined	2	0.7
Total	275	100.0

Other morphological characteristics measured during analysis included thickness of the sherd wall and total size of each sherd (in square centimeters). Although there are several of the analyzed sherds that were less than the average sherd size (see mode, Table 3-2), the average sherd size was 9.09 square centimeters.

Table 3-2: 15Ru10 Sample Statistics for Sherd Size and Thickness.

		Sherd Size cm²	**Wall Thick mm**
N	Valid	275	261
	Missing	0	14
Mean		9.09	8.8681
Median		8.00	8.6000
Mode		6	7.38
Std. Deviation		5.358	2.15261

On average, I was able to sample about 9 square centimeters of most ceramic vessels that were manufactured during the Woodland period in this region. This is, of course, assuming that each sherd was from a different vessel. However, it is more likely that multiple sherds could have been from the same ceramic vessel.

A total of 11 different types of aplastics were identified within the paste of the sample sherds. Temper is the most important attribute observed in the sample. The most common temper type observed is quartzite (n = 84: 30.5%), while grog (n = 64; 23.3%), shale (n = 49; 17.8%) and limestone (n = 33; 12%) make up the other most commonly occurring temper type (Table 3-3).

Table 3-3: 15Ru10 Temper Frequency.

	Frequency	Percent
Quartzite	84	30.5
Grog	64	23.3
Shale	49	17.8
Limestone	33	12.0
Conglomerate	18	6.5
Grit	13	4.7
Siltstone	8	2.9
Sandstone	2	0.7
Quartz	2	0.7
Hematite	2	0.7
Total	275	100.0

As to other aplastic inclusions, all of the analyzed sherds contain at least one other aplastic type within the paste (Table 3-4). Quartz, by and large, comprises the majority of Aplastic 1 inclusions (n = 115; 41.8%). Quartzite (n = 76; 27.6%), shale (n = 40; 14.5%), and grit (n = 18; 6.5%) are the other most frequently occurring Aplastic 1 inclusions in the paste of the sampled sherds. Quartz is ubiquitous in the surrounding soils of the river floodplain, and may have been included in the paste whether the potter intended it to be or not. This trend of vastly more quartz continues with the remaining second, third and fourth aplastics observed in the sample, though there are far fewer sherds with third and fourth aplastics observed in the paste (see Appendix Figures 1-4).

Table 3-4: 15Ru10 Aplastic 1 Frequency.

	Frequency	Percent
Quartz	115	41.8
Quartzite	76	27.6
Shale	40	14.5
Grit	18	6.5
Siltstone	8	2.9
Conglomerate	5	1.8
Hematite	5	1.8
Mica	5	1.8
Sandstone	2	0.7
Limestone	1	0.4
Total	275	100.0

The presence or absence of surface treatment and type were observed for the Rowena assemblage. More sherds have some kind of surface treatment (n = 155), the vast majority of which is cordmarking (n = 150; 54.5%). Other types of surface treatment observed are incising (n = 3; 1.1%), check stamping (n = 1; 0.4%), and fabric impression (n = 1; 0.4%) (Table 3-5).

Table 3-5: 15Ru10 Surface Treatment Type Frequency.

Surface Treat Type	Frequency	Percent
plain	120	43.6
cordmarking	150	54.5
incising	3	1.1
check stamping	1	0.4
fabric impressed	1	0.4
Total	275	100.0

Assessments of core types were established following the work done by Rye (1980) and include those with diffuse margins, sharp margins, double cores, and those with either no core present or an undetermined type of core. The largest number of sherds had diffuse margins (41.8%) followed by those with no or an undetermined core (37.8%) while fewer have sharp margins (20.4%) (see Appendix Table 1). The most common core color is black (n=47; 17.1%). Other prominent core colors, for the overall assemblage, are very dark gray (n = 35; 12.7), dark gray (n = 27; 9.8%), dark reddish brown (n = 18; 6.5%), and red (n = 10; 3.6%) (Table 3-5). Of those cores characterized as having diffuse margins, very dark gray and dark gray color accounts for 36.6 percent (n = 42); dark reddish brown, reddish brown, and red account for 20 percent (n = 23). Twenty seven percent of cores with diffuse margins are black in color (Table 3-6). Dark reddish brown, reddish brown, and red comprise 34 percent (n = 19) of those cores with sharp margins; the same number of black, brown, and dark brown cores (Table 3-6).

Table 3-6: 15Ru10 Core Type by Core Color.

Core Color	Diffuse Margins	Sharp Margins	No Core	**Total**
very dark gray	24	11	0	35
dark brown	2	1	0	3
dark gray	18	8	0	27
gray	2	4	0	6
dusky red	1	1	0	2
dark reddish brown	11	7	0	18
dark red	5	0	0	5
reddish brown	3	3	0	6
red	9	1	0	10
brown	2	2	0	4
black	31	16	0	47
dark reddish gray	1	0	0	1
yellowish red	2	0	0	2
reddish gray	1	1	0	2
light reddish brown	1	0	0	1
strong brown	2	0	0	2
not applicable	0	0	104	104
Total	115	56	104	275

Rims account for 5.1 percent or 14 of the analyzed sherds. Numerous additional attributes were observed for rim sherds. Rims are tempered mainly with grog (21.4%) or shale (21.4%) and average approximately 7.7mm in wall thickness (see Appendix Table 2). Lip shape is divided into different categories ranging from rounded to rounded with appendages (Table 3-7). The orientation of the rim also was observed, most of which are direct (42.9%), the others are everted (35.7%) and inverted (21.4%). More rims that have a flat lip shape have a direct orientation, but because of the small sample size of rims (n=14) this equals only 2 rims, while the other cross-tabulations of lip shape to rim orientation comparisons are equal to one rim sherd.

Table 3-7: 15Ru10 Lip Shape by Lip Orientation.

Shape of the Lip	Lip Orientation			**Total**
	Direct	Everted	Inverted	
Rounded	1	1	0	2
Tapered	1	0	1	2
Flat	2	1	1	4
Bolstered	1	1	0	2
Thickened	1	0	0	1
Flat w/ Appendages	0	0	1	1
Rounded w/ Appendage	0	2	0	2
Total	6	5	3	14

Orifice diameter was measured for only 12 of the 14 rim sherds because fragmentation of the lip made an accurate measurement difficult. The majority of rim sherds have an orifice diameter between 13 cm and 18 cm (Figure 3-1). The one outlier was found to be a true outlier and is larger than the other rim sherds, which could mean that this sherd has the most accurate orifice diameter measurement, while the other rim sherds were similar in size and have less accurate measurements. Excluding the outlier, there also appears to be a weak, positive correlation ($R^2 = 0.094$) between orifice diameter and the wall thickness of the rim sherds (Figure 3-2).

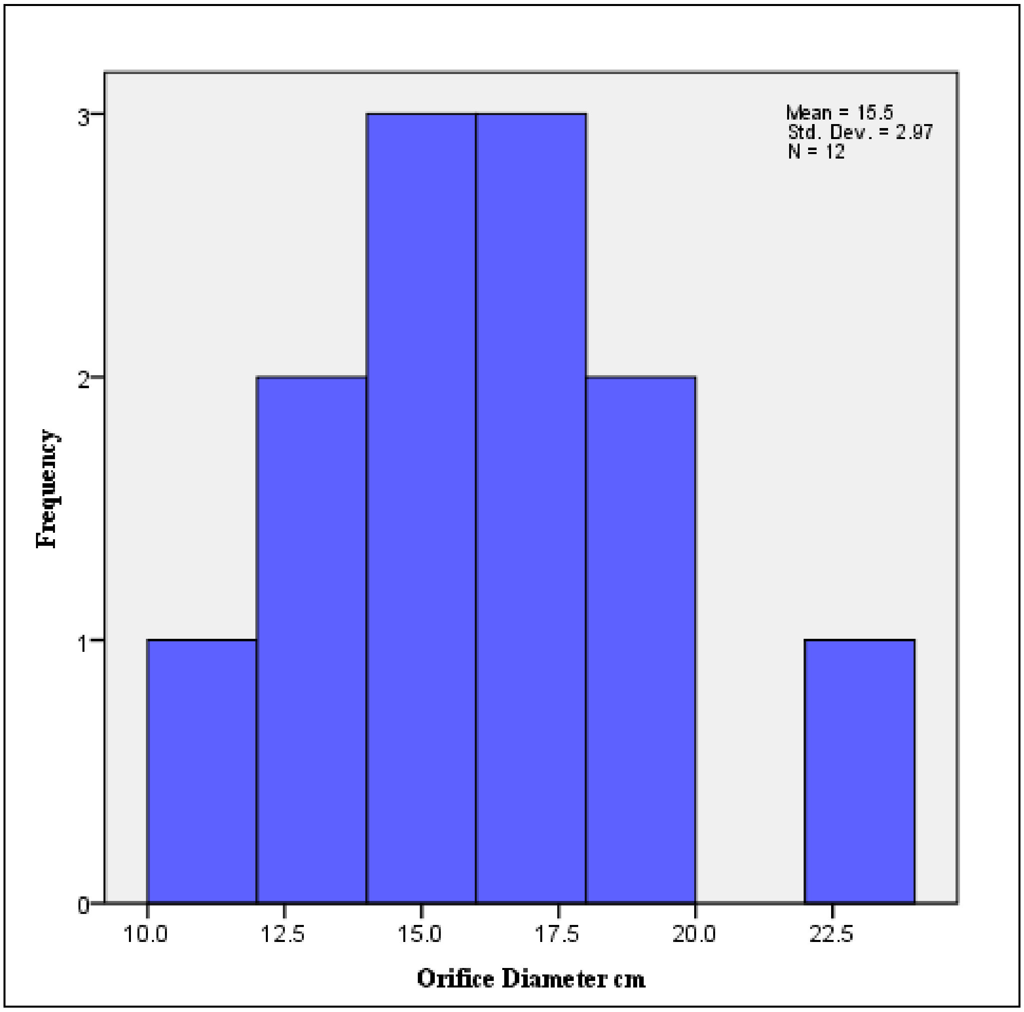


Figure 3-1: 15Ru10 Rim Orifice Diameter by Frequency.

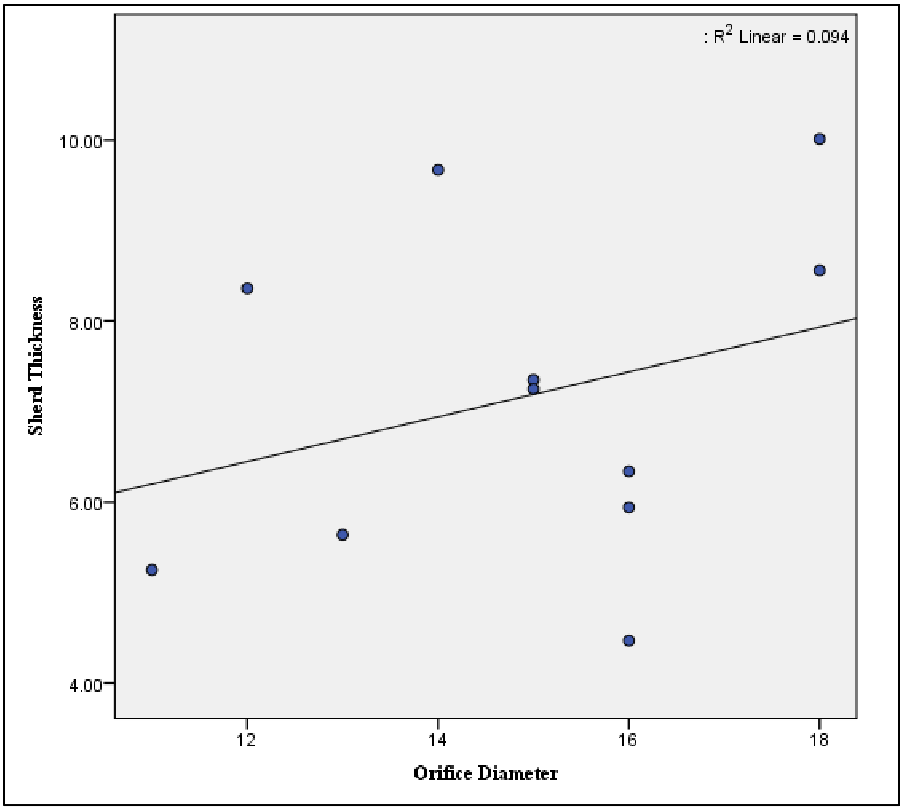


Figure 3-2: 15Ru10 Thickness by Rim Orifice Diameter.

Long Site (15Ru17)

Like Rowena, the Long Site yielded both shell tempered and non-shell tempered ceramic sherds. Only those without shell tempering were analyzed (n = 959). A total of 616 of these where less than four square centimeters in size and not analyzed here. Of the non-shell tempered ceramic sherds recovered from the Long Site, 343 were analyzed for this study. Variables germane to questions of potters' choice and manufacture of ceramic vessels during the Woodland Period in the Upper Cumberland Region of Central Kentucky were recorded. Four different sherd types were identified, the majority of which were body sherds (n = 305; 88.9%). All the analyzable sherds were assigned as one of the four sherd types (Table 3-8).

Table 3-8: Long Site (15Ru17) Sherd Types.

Sherd Type	Frequency	Percent
Body	306	89.2
Shoulder	3	0.9
Rim	29	8.5
Base	5	1.5
Total	343	100.0

Other morphological characteristics measured include the thickness of the sherd wall (when possible) and the total size of each sherd (in square centimeters). Thickness could not be determined for one sherd because it lacked either the interior or exterior surface. The average sherd size is 13.33 square centimeters; therefore I was able to sample about 13 cm² of most vessels that were manufactured during the Woodland period in this region. This despite the fact that many of the sherds are less than the average sherd size (see mode, Table 3-9).

Table 3-9: 15Ru17 Sample Statistics for Sherd Size and Thickness.

		Sherd Size cm2	Sherd Thick
N	Valid	343	342
	Missing	0	1
Mean		13.33	9.3387
Median		9.00	9.2450
Mode		5[a]	8.67[a]
Std. Deviation		12.178	2.22449

a. Multiple modes exist. The smallest value is shown

Again, because of my research questions, the most important variable observed is temper, the prominent aplastic identified in the sherd paste. A total of 10 different types of aplastics are identified within the paste of the sample sherds. The most frequently used tempering agent is grog (n = 121), followed by the generic category of grit (n = 65) (Table 3-10). Siltstone is the third most frequently utilized primary tempering agent (n = 52), while sandstone (n = 3) and quartz (n = 3) are used less frequently.

Table 3-10: 15Ru17 Temper Frequency.

Temper	Frequency	Percent
Grog	121	35.3
Grit	65	19.0
Siltstone	52	15.2
Conglomerate	28	8.2
Quartzite	28	8.2
Shale	26	7.6
Limestone	15	4.4
Sandstone	3	0.9
Quartz	3	0.9
Hematite	1	0.3
Undetermined	1	0.3
Total	343	100.0

Other inclusions, or aplastics, within the paste were also observed. The order in which these are numbered (i.e., Aplastic 1, Aplastic 2, etc) is based solely on the observed density of the aplastic in the paste. By far, the most frequently utilized initial aplastic, or Aplastic 1, is quartzite (n = 114) (Table 3-11). Shale (n = 77), quartz (n = 67), and grit (n = 62) make the other most frequently used Aplastic 1 inclusions. Only one ceramic sherd did not have any observable Aplastic 1 within the paste besides the primary temper.

Table 3-11: 15Ru17 Aplastic 1 Frequency.

Aplastic 1	Frequency	Percent
Quartzite	114	33.2
Shale	77	22.4
Quartz	67	19.5
Grit	62	18.1
Conglomerate	13	3.8
Siltstone	5	1.5
Limestone	2	0.6
Mica	1	0.3
River Pebble.	1	0.3
Absent	1	0.3
Total	343	100.0

Quartz is the most frequently occurring Aplastic 2 (n = 177; 51.6%), Aplastic 3 (n = 93; 27.1%), and Aplastic 4 (n = 10; 2.9%) where inclusions occur within the paste. The majority of sherds do not have an Aplastic 3 or Aplastic 4 observable in the paste (Appendix Figures 4-7). When aplastics do occur, they are either quartz or hematite. The density of the aplastic in the paste does not seem to be dependent on the type or size of the aplastic itself.

The presence or absence of surface treatment also was observed for this collection, though it was not a major part of the analysis. The type of surface treatment present was also observed. The vast majority of sherds exhibited some surface treatment (n = 309; 90.1%), while only 34 have a plain surface treatment (9.9%) (Table 3-12). Of the ceramic sherds with surface treatment, cordmarking is the predominant type (n = 292; 85.1%). Knot roughening (n = 15; 4.4%) and incising (n = 2; .6%) make up the other surface treatment types observed at the Long Site.

Table 3-12: 15Ru17 Surface Treatment Type Frequency.

Surface Treat Type	Frequency	Percent
plain	33	9.6
cordmarking	290	84.5
punctation	1	.3
incising	2	.6
fabric impressed	15	4.4
undetermined	2	.6
Total	343	100.0

Core types observed for this assemblage include those with sharp margins, diffuse margins, and with double cores. Again, using guidelines established by Rye (1980), a total of 104 or 30.3 percent had no observable core. Of those with observable cores, the majority appear to have diffuse margins (n = 165; 48.1%), meaning the margins of the core itself are not easily distinguishable in the profile of the sherd. Fewer cores are observed as having sharp margins (n = 73; 21.3%). Only one of the sherds in the assemblage has a distinguishable double core (0.3%). The color of each core also was assessed using the Munsell (1975) soil color chart in order to maintain consistency. The predominant colors for both diffuse and sharp margin categories are very dark gray, dark gray, dark reddish brown, reddish brown, and red (Table 3-13).

Table 3-13: 15Ru17 Core Type by Core Color.

Core Color	Core Type				**Total**
	Diffuse Margins	Sharp Margins	Double Core	Indeterminate	
very dark gray	29	23	0	0	52
dusky red	0	1	0	0	1
dark reddish brown	11	4	0	0	15
dark red	2	0	0	0	2
dark gray	52	13	0	0	65
weak red	5	4	0	0	9
reddish brown	22	5	0	0	27
red	15	5	1	0	21
brown	5	5	0	0	10
black	8	7	0	0	15
dark reddish gray	9	3	0	0	12
yellowish red	4	0	0	0	4
strong brown	2	0	0	0	2
dark brown	1	3	0	0	4
not applicable	0	0	0	104	104
Total	165	73	1	104	343

A total of 81, or 49.1 percent, of those sherds with diffuse margins were characterized as either very dark gray (n = 29) or dark gray (n = 52) in color. Forty-eight or 29.1 percent were characterized as dark reddish brown (n = 11), reddish brown (n = 22), or red (n = 15) in color. Of those sherds assessed as having sharp core margins, 36 (49.3%) are either very dark gray (n = 23) or dark gray (n = 13) in color. Fewer are dark reddish brown (n = 4), reddish brown (n = 5), or red (n = 5) in color, or only 19.2 percent of the sharp margin cores were characterized as these colors. The only double core observed in the assemblage was characterized as red in color (Table 3-13).

A total of 29, or 8.5 percent of all sherds, have either black (n = 15), brown (n = 10), or dark brown (n = 4) cores (Table 3-13). Of those cores with diffuse margins, eight or 4.8 percent were black, five (3%) are brown, and only one or 0.6 percent is dark brown. Seven (9.6%) of the cores assessed as having sharp margins are black. Five (6.8%) of the sharp margin cores are brown, and only three (4.1%) are dark brown in color. Other colors observed during analysis include dusky red (n = 1), dark red (n = 2), weak red (n = 9), yellowish brown (n = 4), and strong brown (n = 2). As seen above (Table 3-13), a total of 43 observed cores characterized as having sharp margins are black (n = 7), dark gray (n = 13), or very dark gray (n = 23) in color.

A total of 30 sherds or 8.7 percent of the assemblage are identified as rim sherds; or ceramic sherds with lip present. A number of additional attributes were observed for rim sherds; they are often the only analyzable ceramic sherd which can yield information about the date and/or cultural affiliation of the potters and the group in general. The rim sherds are tempered primarily with grog (n = 13; 43.3%), quartzite (n = 6; 20%), or grit (n = 5; 16.7%) (Table 3-14). Measurements taken on rim sherds included not only the thickness of the wall (mm) and the size of the sherd (cm^2), but also the thickness of the lip at its thickest point (mm). On average, rim sherds are 16.5 square centimeters in size, but a mode of three and a high standard deviation reveals that the majority of rim sherds were smaller; meaning that a small number of rim sherds are much larger than the rest. Sherd size is important for taking more accurate measurements. Wall thickness of the rim sherds averages 8.22 mm and the mean lip thickness is 5.88 mm (see Appendix Table 4).

Table 3-14: 15Ru17 Rim Sherd Temper Types.

Temper	Frequency	Percent
Grog	13	43.3
Quartzite	6	20.0
Grit	5	16.7
Shale	3	10.0
Siltstone	2	6.7
Conglomerate	1	3.3
Total	30	100.0

The orientation of the rim can indicate the shape and type of vessel to which the sherd had been a part. Some of the rim sherds were too fragmentary or had too little lip present to accurately determine orientation. Of those for which orientation could be determined, most are direct (n = 10). Everted (n = 8) and inverted (n = 7) lip orientations also were observed. As for the shape of the lip, most are either flat (n = 14) or rounded (n = 8) (see Appendix Table 5). The majority of direct rims have a flat lip shape (n = 7). This too is the case with everted rims (n = 4), while the majority of inverted rims have rounded lip shapes (n = 4) (see Appendix Table 5). Using a diameter gauge (semicircular chart), 20 of the rim sherds were measured to determine the orifice diameter (or the size of the mouth) of the vessel from which they fragmented. Ten of the rim sherds could not be measured in this manner because of their size or fragmented condition. The majority of rims measured between 12 cm and 20 cm in diameter ($\bar{x}$ = 13.9 cm) (Figure 3-3). Comparing the orifice diameter of the rim sherds to its wall thickness and excluding an outlier, there appears to be a weak (R^2 = 0.408), positive correlation between the two (Figure 3-4).

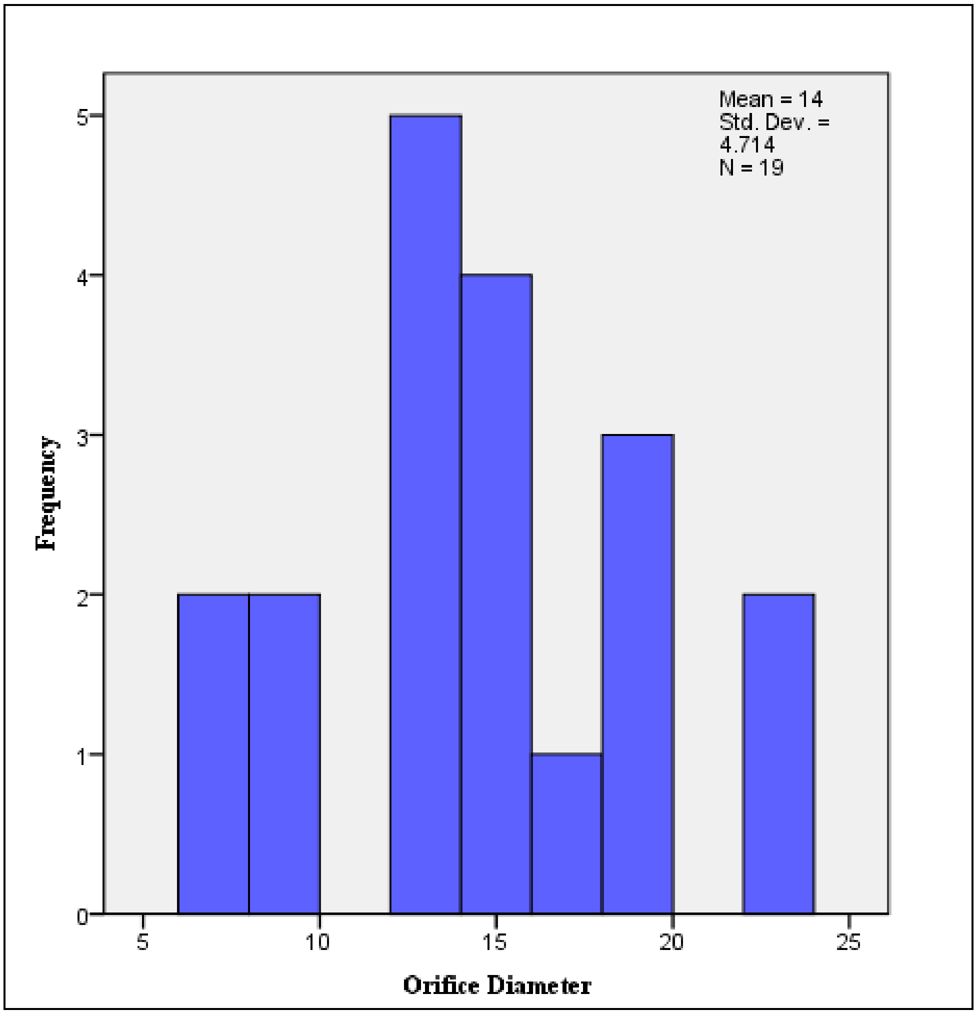


Figure 3-3: 15Ru17 Rim Orifice Diameter by Frequency.

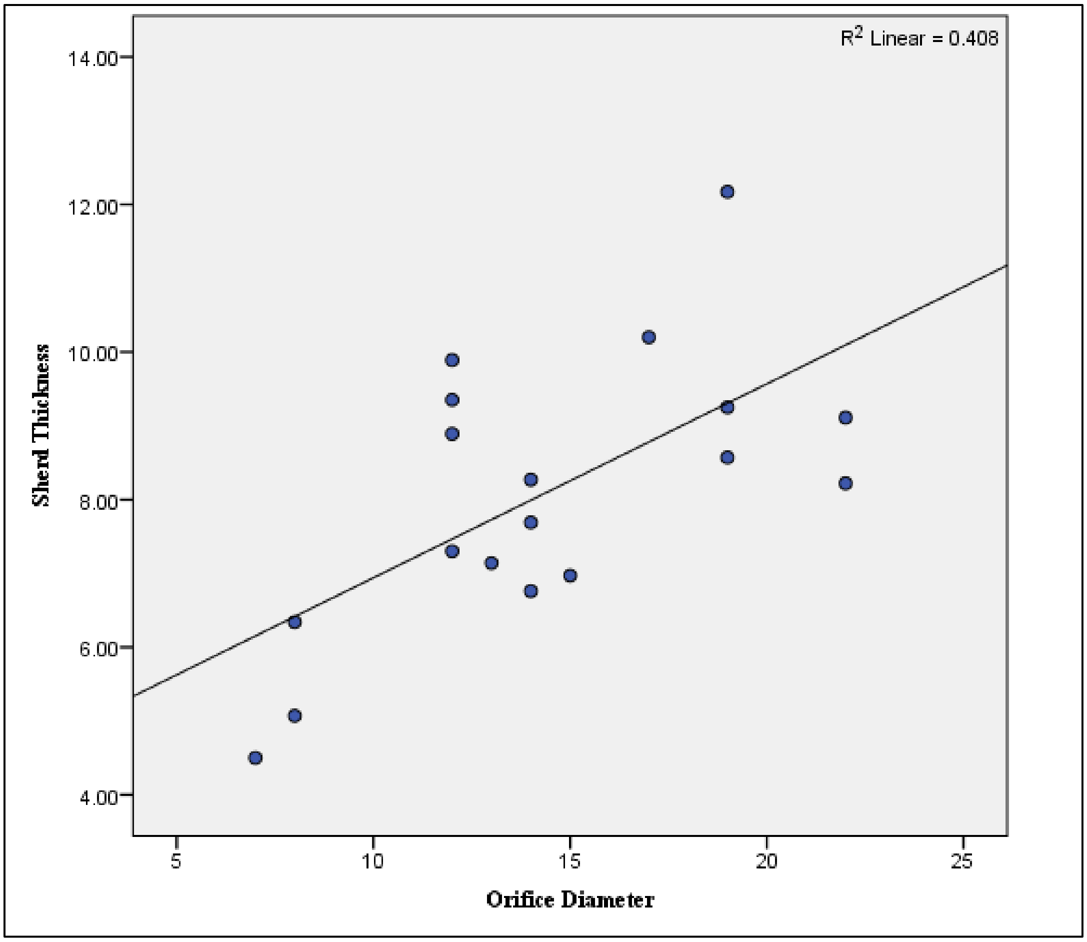


Figure 3-4: 15Ru17 Thickness by Rim Orifice Diameter.

Data presented in this chapter represent an important step toward answering the questions posed about technological choice and the behavior of ceramic potters of the Woodland Upper Cumberland Valley. Each of these ceramic assemblages exhibit morphological characteristic both similar to and different from the other. In the next chapter, comparisons are made between the two sites and with available resources (presented in Chapter 2). Comparisons also will be made between the Long and Rowena sites and other, temporally similar sites in the surrounding area and wider region. These evaluations are the next step in answering questions pertaining to potter choice and the context of choice.

Chapter 4

Ceramic Assemblage Comparisons

Comparing ceramics from a known site, described in technical reports, to an assemblage of sherds that have been extensively analyzed can be difficult, at best. Different methods of analysis and interpretation are two of the most problematic obstacles to overcome in terms of comparison. Here, I will compare ceramic analysis in the Eastern Woodlands and the generic nature of many of the characterizations of known types to the Rowena and Long assemblages. The non-shell tempered ceramic assemblages from the Long (15Ru17) and Rowena (15Ru10) sites were specifically analyzed for this study. Analysis of these ceramics included the collection of attributes germane to questions of technological choice in the Upper Cumberland River region (presented in Chapter 3). Information gathered about the prehistoric potters' choices during manufacture is now compared to information about other, comparable sites not only in the immediate region but in a broader region and to the geological environment.

The Rowena and Long Sites

The Rowena non-shell tempered ceramic assemblage is slightly smaller (n = 275) than that of the Long Site (n = 343). In terms of sherd characteristics, the sites compare in different ways. The most predominant sherd type for both sites is body sherds; 86.5 percent for Rowena and 88.9 percent for Long. The Long site has a greater percentage of rim sherds (8.7%) than the Rowena site (5.1%), while base sherds are more predominant for Rowena (6.2%) compared to the Long site (1.5%). The average sherd thickness for both sites is similar, with Rowena being 8.87 mm and Long being 9.34 mm. Average sherd size, on the other hand, for the Long site (13.33 cm^2) is significantly larger than for the Rowena site (9.09 cm^2) (Table 4-1).

Table 4-1: Rowena and Long Statistics.

		Rowena (15Ru10)	Long (15Ru10)
Sherd Size	Mean	9.09 cm^2	13.33 cm^2
	Median	8.00 cm^2	9.00 cm^2
Sherd Thickness	Mean	8.87 mm	9.34 mm
	Median	8.60 mm	9.25 mm

Comparison of these different characteristics can be important for salient details related to typology and occupation densities. Knowing the average sherd size can inform the analyst about the percentage of vessel represented, that he or she is able to analyze, while average sherd thickness can be compared to other known ceramic types. Surface attributes are helpful for learning about culture historical identification, but more information is needed to understand further the behavior of the potter and how that behavior fits within the culture as a whole. Temper and other aplastics within the paste of ceramic vessels is one way of attaining insight into behavior.

The temper has been defined here as the most prominent aplastic in the paste or any aplastic that could not be naturally included in the paste itself. Grog is the only aplastic identified in these assemblages that does not occur naturally and would have been included in the paste only by the potter’s choice. Within the context of the Midcontinent in general, grog tempering is indicative of Late Woodland time period for manufacture. Grog makes up 35.8 percent of temper for the Long site (n = 121), and is its most commonly occurring temper. Though not the most common temper type, 23.2 percent of Rowena sherds were tempered with grog (n = 64).

Other tempering agents occur in the natural environment surrounding the Wolf Creek Dam Reservoir and were utilized by the occupants of Rowena and Long sites. Quartzite figures prominently as a tempering agent in both assemblages (Table 4-2). As noted in the methods section of Chapter Three, quartzite is a clastic, medium- to coarse-grained, opaque particle that can be different colors. It is similar to sandstone but without the cement that creates the sandstone structure.

Table 4-2: Rowena and Long Temper Frequencies.

	Rowena (15Ru10)		Long (15Ru17)	
Temper Type	N	%	N	%
Quartzite	84	30.5	28	8.2
Quartz	2	0.7	3	0.9
Sandstone	2	0.7	3	0.9
Shale	49	17.8	26	7.6
Siltstone	8	2.9	52	15.2
Limestone	33	12.0	15	4.4
Grit	13	4.7	65	19.0
Conglomerate	18	6.5	28	8.2
Hematite/Other	2	0.7	2	0.3
Grog	64	23.3	121	35.3
Total	275	100.0	343	100.0

Quartzite found in the paste of the Long and Rowena assemblages has been classified as angular to very angular and has a sub-spherical to spherical shape. Though the amount of quartzite occurring in either assemblage differs, the quartzite particles themselves are very similar for both. Quartzite comprises 30.5 percent (n = 84) of primary tempering agent for Rowena, while it only comprises 8.2 percent (n = 28) of

Long (Table 4-2). Sandstone comprises a much smaller percentage of tempering agents for both assemblages. For Rowena, sandstone makes up 0.7 percent (n = 2) of temper and 0.9 percent (n = 3) for Long (Table 4-2). The lower portion of the Pennsylvanian geologic strata, which outcrops throughout much of the Appalachian and Eastern Interior basin in Kentucky, is characterized by thick sequences of pebbly, locally conglomeratic, quartzose (i.e., more than 95% quartz) sandstone (McDowell 1986: H33).

Quartz is also a sand-like particle that ranges in size from very fine to medium grained. It is distinguished in this study from quartzite by its relative size. Quartz is like sand in the paste of the ceramic sherds. As a primary tempering agent, quartz is not predominant for either assemblage, but does occur as an aplastic inclusion in most sherds for both assemblages. Quartz is the temper for 0.7 percent (n = 2) of the sherds from Rowena and 0.9 percent (n = 3) of the sherds from Long (Table 4-2).

Shale and siltstone are similar to each other in composition and structure; and come from the same source material. Shale has *fissility,* as noted earlier, and splits along thin layers (*laminations*). Siltstone does not have fissility and is composed of coarser silt grains. Shale comprises 17.5 percent (n = 49) of the primary tempering agent for the Rowena Site, while comprising only 7.6 percent (n = 26) of Long. Conversely, siltstone comprises 2.9 percent (n = 8) of the primary tempering agent for Rowena, and 15.2 percent (n = 52) for Long (Table 4-2). In the Upper Cumberland region and specifically the area upstream of the Wolf Creek Dam, part of the geological makeup of that area is composed of the Chattanooga Shale outcrop (see Figure 2-3). The same Pennsylvanian strata that are characterized by the quartz and sandstone outcrop are also characterized by middle and upper portions dominated by discontinuous sequences of siltstone and shale; as well as another sandstone type with a clayey matrix (McDowell 1986: H33).

Limestone is not often seen in the paste of prehistoric ceramic sherds, but is identified as sub-angular and sub-rounded voids in the paste. Soil acidity often causes the limestone to leach from the paste, leaving only the voids. This crushed limestone is a common tempering agent in early pottery types and continued throughout much of the Woodland Period although to a lesser degree. Limestone makes up a moderate percentage of the temper for the Rowena site, 12 percent (n = 33), and less for Long (4.4%; n = 15) (Table 4-2). The underlying geology of the Wolf Creek area is made up of many different limestone formations. The oldest, the Leipers Limestone and Cumberland formations, also occur along the Cumberland River (now Lake Cumberland) below the dam location (KGS 2007; see Figure 2-3). Other limestone formations include Salem and Warsaw Limestone and St. Louis Limestone, which were both formed several million years after the Leipers and Cumberland Formations (Plummer et al. 1999).

Grit is often a generic term used for rock temper that has not been or cannot be identified. As noted earlier, in Chapter Three, for the purposes of this analysis, grit has been designated as a number of different particles occurring in the paste. These are crinoids, fragmented shell, calcareous tufa, gypsum variety *satin spar*, and river pebbles; all of these may occur together. The crinoids and fragmented shell are common along the Cumberland River and may have been the detritus of fossiliferous limestone that eroded before being used as a tempering agent. Grit temper makes up 4.7 percent (n = 13) of the Rowena sherds and 19 percent (n = 65) of the Long sherds (Table 4-2). These particles could be the product of a number of different geologic formations in the area. This includes the limestone formation mentioned above and the reef limestone of the Fort Payne Formation that occurs upstream from the dam location.

The temper type conglomerate occurs less frequently as a primary tempering agent than many of the others. For the Long Site, conglomerate makes up 8.2 percent (n = 28) of the assemblage and 6.5 percent (n = 18) of the Rowena assemblage (Table 4-2). The Rockcastle Conglomerate formation, which is near the project areas, is the most recent geologic formation and overlies the earlier limestone formations (see Figure 3-2). The least frequently occurring primary tempering agent is hematite. It occurs naturally and is ubiquitous in the right conditions. Hematite was identified as the temper for only 0.3 percent (n = 1) of the Long Site assemblage and 0.7 percent (n = 2) of the Rowena assemblage (Table 4-2). The occurrence of hematite in the paste of these sherds is less likely to be an intentional temper and more likely to occur naturally in the clay. Because no other aplastics occur (or could be identified with 10x magnification) within the paste, the quality of clay did not necessitate additives to the clay vessel. Only one sherd from the Long Site contained a primary tempering agent that could not be identified.

Secondary tempering or aplastics, referred to as inclusions, can be just as important to interpret as the primary agents. As explained earlier, I have designated the secondary tempering agent or inclusion as Aplastic 1. The most frequently occurring Aplastic 1 for the Rowena Site is quartz (n = 115) at 41.8 percent of the total assemblage (see Appendix Figure 1). Quartzite is the most commonly occurring Aplastic 1 for Long (33.2%; n = 114) (see Appendix Figure 5). The two other most commonly occurring Aplastic 1 for the Rowena Site are quartzite (27.6%; n = 76) and shale (14.5%; n = 40). Shale and quartz also make up large portions of Aplastic 1 for Rowena, at 22.4 percent (n

= 77) and 19.5 percent (n = 67) respectively. Only one ceramic sherd, from the Long Site, was identified as containing no Aplastic 1. The percentage of sherds for which additional aplastic inclusions is absent increases with each category. Aplastic 2 is absent in 23.6 percent (n = 65) of the Rowena ceramics and absent in 14 percent (n = 48) of the Long sherds (see Appendix Figure 2 and Figure 6).

Quartz is the most predominate Aplastic 2 for both sites, with 49.1 percent (n = 135) for the Rowena Site and 51.6 percent (n = 177) for Long. Hematite (9.6%; n = 27) and quartz (7.3%; n = 20) comprise the other two most commonly occurring Aplastic 2 inclusions. Aplastic 3 is absent in 64.4 percent (n = 177) of the Rowena ceramics and 62.4 percent (n = 214) of the Long Site ceramics. Quartz and hematite are the two most commonly occurring Aplastic 3 inclusions for both sites. The vast majority of an Aplastic 4 is absent in the sherds from both sites; 95.6 percent for Rowena and 94.5 percent for Long (see Appendix Figure 4 and Figure 7).

In terms of surface treatment, the assemblages differ in both percentage of sherds with surface treatment and the types they display. Rowena ceramics are divided almost evenly by those with plain surface treatment (n = 120; 43.6%) and those with other surface treatment (n = 155; 56.4%). The majority of ceramic sherds in the Long Site assemblage display some type of surface treatment (n = 309; 90.1%), while only a total of 34 sherds (9.9%) do not have surface treatment. Cordmarking is the most predominant surface treatment for both assemblages (Table 4-3). Surface treatment, its presence or absence and type, is useful in a typological capacity. Though the positive and negative aspects of typologies have been visited here, using surface treatment to place ceramic assemblages within temporal context remains an important method. This is especially true when comparing assemblages among and within archaeological sites.

Table 4-3: Long and Rowena Surface Treatment Frequencies.

Surface Treatment	Long (15Ru17)		Rowena (15Ru10)	
	N	%	N	%
Plain/Absent	33	9.6	120	43.6
Cordmarked	290	84.5	150	54.5
Incised	2	0.6	3	1.1
Fabric Impressed	15	4.4	1	0.4
Punctated	1	0.3	0	0
Check Stamped	0	0	1	0.4
Indeterminate	0	0	1	0.4

Regional Site Comparison

Both the Long and Rowena Sites were located in the area inundated by the Wolf Creek Dam Reservoir, now known as Lake Cumberland (see Figure1-1). These were not the only sites investigated by Haag (1947) and company ahead of construction. The most substantial site excavated during this project was the Reiny Site (15Ru27). It included a thick midden deposit and artifact assemblage that suggests an intense early Middle Woodland Period occupation (Railey 1990: 105). Generally, ceramic sherds recovered from Reiny span the Woodland Period. The majority of sherds were thick with shale or siltstone tempering and cordmarked exterior surfaces (Applegate 2008; Railey 1990). Few sherds were characterized as thin with check stamped, simple stamped, or cord-wrapped dowel impressed exterior surface treatments. One sherd exhibited noded or punctated surface treatment (Railey 1990).

Other sites in the area are comparable to both Long and Rowena. Further west in the Cumberland River drainage, in Cumberland County, Kentucky, is Site 15Cu27. This site is a substantial rockshelter site located at the base of a bluff above the Big Renox Creek floodplain, which drains directly into the Cumberland River. A multicomponent rockshelter, it contained an 85 cm thick midden deposit, storage pits, hearths, and grave features (Applegate 2008: 444; Kerr et al. 2004). Primary occupation of the site occurred during the Early and Middle Woodland Periods. Early Woodland pottery recovered from site 15Cu27 includes shale tempered with smoothed-over cordmarked and fabric impressed exterior surfaces (Kerr et al. 2004; Applegate 2008: 444). Pottery recovered from early Middle Woodland contexts were tempered with grit (a generic term) and had cordmarked and fabric impressed surface treatments as well as limestone tempered sherds with cordmarked surfaces. Though not a substantial component, Late Woodland sherds with cordmarked surfaces and limestone tempering were also recovered from the site (Kerr et al. 2004; Applegate 2008).

Also located along a tributary in the Cumberland River drainage is Site 15Cu110. Previous investigations at this site indicate that primary occupation occurred during the Middle Woodland Period. Of the 73 prehistoric ceramic recovered during the 2003 investigations, ten were characterized as having shell tempering. The remaining sherds were tempered with grit (n=32), limestone (n=23), quartzite (n=1), or sand (n=5) and are thus temporally placed within the Woodland Period (French 2004). The sherds typed as “grit” tempered (n = 32) also included minute fragments of [crushed] ground rock and sand (French 2004: 87). Though a more detailed description of the ceramic sherds would have been better in terms of future research purposes, information provided in state site reports can be limited. The inclusions (aplastics) of “ground rock and sand” was expanded on, and was described as including bits of limestone, sandstone, quartzite, and chert in various combinations (French 2004: 87).

Also included in the grit tempered sherds from Cu110, is one rim sherd with a “pie-crust” treated lip (French 2004: 89). This rim sherd consisted of raised vertical ridges, perpendicular to the body; and appears to have been made by impressing a dowel or stick along the rim surface (French 2004: 89). Recovered from feature context, the “pie-crust” rim sherd is comparable to similar sherds recovered from known Owl Hollow phase sites in south-central Tennessee (Bradbury and Day 1998: 34; French 2004).

Limestone tempered pottery sherds (n = 32) at Cu110 included those with plain surfaces (n = 12), cordmarked (n= 5), and simple stamped (n = 2) surfaces (French 2004: 90-92). The description of these limestone tempered sherds is lacking, substantially, because there is no indication in the text of the report how the analyst concluded these to be limestone tempered. I will have to assume that the limestone tempering is voids left in the paste. One sherd from 15Cu110 was classified as quartzite tempered. This sherd was not included with the generic grit tempered sherds because it was tempered solely with large fragments of ground quartzite (French 2004: 92).

The Woodland component of two Bell County, Kentucky, sites yielded ceramics which could be compared to those recovered from Rowena and Long, the Mills Site (15Bl80) and the Main Site (15Bl35). The Mills Site yielded 486 ceramic sherds, 270 of that were large enough to be analyzed. All but 41 of the analyzed sherds were non-shell tempered, and thus assigned to the Woodland time period by default (Kerr 1995a). Non-shell tempered sherds recovered from the Mills Site were assigned to a new series, the

Mills Series, of ceramics. Because the “prehistoric ceramic chronology for the area is not well known,” the analyst felt that creating a new provisional type of ceramic series was most advantageous (Kerr 1995a: 9-1). Though Kerr later makes comparisons of his new series typology to known types in a wider region, he contends that the Mills site assemblage was not, for the most part, comparable to existing defined types (Kerr 1995a: 9-1). For the purposes of this study, I will use his ceramic series typology to compare both the Long and Rowena assemblage to other defined types.

First in the Mills Series, *Mills Plain,* is characterized by both crushed siltstone and crushed sandstone tempering agents. These sherds contained a moderate to high amount of tempering in the paste; plain, well-smoothed to smoothed surfaces; moderate to highly friable paste textures; and all contained observable cores (Kerr 1995a). Temporally, the *Mills Plain* sherds were placed in the Middle Woodland (240-170 B.C.), and geographically seem to be most common in the Upper Cumberland River drainage. The analyst compares these to similar Adena Plain (Haag 1940: 75-79) and Mulberry Creek Plain (Haag 1939: 10; Kerr 1995a: 9-4). Kerr also suggests that *Mills Plain* is similar to Johnson Plain (Haag 1942: 341-342), which is a variant of Adena Plain defined in the Big Sandy River drainage (Kerr 1995a: 9-4). The problem with the comparison to Adena Plain and Mulberry Creek Plain is that Adena Plain is tempered primarily with limestone. There is no comparison to vessel shape or wall thickness, nor are there comparisons to any other similarities between the two groups who would have manufactured these ceramics. The comparison with Johnson Plain is more valid, because Johnson Plain vessels contain crushed siltstone and crushed sandstone as their two primary tempering agents. But, again, there is no other comparison made between other characteristics like paste texture, vessel shape, wall thickness, etc. So, the comparability could stop at tempering agent, which could very well be a product of similar geological resources between the two areas.

Another type within the Mills Series, *Mills Cordmarked,* is similar to the *Plain* in that the primary tempering agent is crushed sandstone. The density of temper in the paste and paste texture is also similar; the only real difference is the exterior surface treatment, which is cordmarked. *Mills Cordmarked* was placed temporally within the Early Woodland (ca. 380 B.C.) (Kerr 1995a: 9-6). Four rim sherds were assigned to *Mills Cordmarked* type. These exhibited direct orientation and flattened lip shape (Kerr 1995a: 9-6).

Woodland (i.e., non-shell tempered) ceramics from the Main Site (15Bl35) were also assigned to the Mills Series typology (Kerr 1995b). This site yielded 380 ceramic sherds, 261 of which were analyzable. Seventy-one body sherds and six rim sherds were assigned to *Mills Plain* type from the Main Site. These sherds also exhibited crushed siltstone and crushed sandstone tempering agents. Included in this analysis, though, was also a description of secondary inclusions (aplastics) within the paste. These included sandstone, sand, and quartzite within the siltstone tempered sherds and siltstone and quartzite inclusions within the sandstone tempered sherds (Kerr 1995b: C-2). The rim sherds assigned to this typology were either excurvate or direct in orientation. Lips were characterized as flat, beveled, and rounded, while another was characterized as a Type A lip shape (Kerr 1995b: C-3). Type A, according to Kerr (1995b; C-4) appears to be a rim with a bolstered lip shape that abruptly dips below the surface of the vessel body below the lip. These all date to the Early and Middle Woodland (post-370 B.C.) (Kerr 1995b: C-3).

A substantial number of sherds were also characterized as *Mills Check Stamped*. Also tempered with crushed siltstone and crushed sandstone, these sherds exhibited check stamped exterior surfaces, though not well-defined (Kerr 1995b: C-5). One check stamped rim sherd had a recurved orientation and a rounded lip (Kerr 1995b: C-5). Two flat bottom, basal sherds both exhibited undefined check stamped exterior surfaces as well as podal supports which had been broken off at some point. These *Mills Checked Stamped* sherds were temporally placed within the Middle Woodland period (post-370 B.C.) (Kerr1995b: C-6).

Other sherd types recovered from both the Mills and Main Site include Swannanoa Cordmarked (Keel 1976), Mulberry Creek Plain (Haag 1939), Candy Creek Cordmarked (Lewis and Kneberg 1946), and Pine Mountain Plain and Cordmarked. Swannanoa Fabric Impressed (Keel 1976) also was recovered from both the Mills and Main Sites. The Swannanoa ceramics included in the Mills Site assemblage were tempered with crushed quartzite (Kerr 1995a: 9-7). The amount of tempering in the paste was moderate and included a low density of sand inclusions. Distinguishable cores could be observed in 89 percent of these sherds (Kerr 1995a: 9-7). They were similar to the Phipps Bend II variety of Swannanoa Cordmarked defined by Lafferty (1981: 308-312) based on the temper and the presence of sand in the paste as well as other attributes of the sherds. Quartzite tempered, cordmarked ceramics from Fishtrap Reservoir (Dunnell 1972) and the Paintsville Reservoir (Johnson 1982: 810-812) in the Big Sandy drainage of Eastern Kentucky are similar to the Swannanoa type ceramics from the Mills Site.

The Main Site yielded a wider variety of defined ceramic types. Sherds with angular to subangular voids in the paste where the temper has leached were categorized as Mulberry Creek Plain (Haag 1939: 10). Kerr (1995b) posits that the leached temper could have been siltstone or limestone, but was most likely limestone. Considering there were other sherds from the same site and context with visible siltstone tempering, it is likely that there would not be an entire category of sherds with leached siltstone. It is also worth noting that determining if leach temper is limestone is as simple as testing the voids with hydrochloric acid. Bubbling in the void indicates the presence of a calcareous substance, like limestone. Quartzite inclusions were also present in the sherds. These characteristics are comparable to the Mulberry Creek Plain type (Kerr 1995b: C-6). Temporally, these sherds are placed within post-370 B.C. late Early and Middle Woodland and are found in the Tennessee and Cumberland River drainages as well as their tributaries.

Four body and two rim sherds categorized as Candy Creek Cordmarked were also recovered from the Main Site. Angular to subangular voids where the primary temper had leached also was the primary temper in these sherds. Quartzite was the secondary inclusion (Kerr 1995: C-7). Exterior surface treatment was cordmarking. The rims exhibited flattened lips and were direct and slightly excurvate (Kerr 1995: C-7). Temporally, the Candy Creek Cordmarked sherds are placed in the Early to Middle Woodland (590 B.C. to 370 B.C.) (Haag 1939; Kerr 1995b). Geographically, they can be found in the Tennessee and Cumberland River drainages as well as their tributaries.

Both the Pine Mountain Plain and Pine Mountain Cordmarked sherds were tempered primarily with crushed quartzite (Kerr 1995b: C-9 – 10). Observed secondary inclusions (aplastics) were almost exclusively fine sand. For the Plain sherds, temper was moderately dense in the paste and 88 percent exhibited an observable core. Two rim sherds were assigned to the Plain type, one of which was slightly excurvate in orientation and had a flattened lip (Kerr 1995b: C-9). The other was recurved, with a slightly restricted neck and had a Type B shaped lip; which is a flat lip with squared-off edges (see Kerr 1995b: C-11, Figure C-6c). Radiocarbon dates taken from feature context associated with this sherd type date them from 830 B.C. to 730 B.C., uncorrected (Kerr 1995b: C-10). Geographically, they are found in the Upper Cumberland River drainage. For the Pine Mountain Cordmarked variety, temper density in the paste was moderate to high and 77 percent exhibited observable cores. Four rims were assigned to this type, three had direct orientations and one was slightly excurvate. Two lip shapes were described as “peaked” while one was flat and one Type B (Kerr 1995b: C-10). One rim sherd exhibited a repair hole. Radiocarbon samples from feature context associated with these sherds ranged from 830 B.C. to 730 B.C., uncorrected (Kerr 1995b: C-10). Geographically, they also were situated in the Upper Cumberland River drainage. Fishtrap Reservoir (Dunnell 1972), in the Big Sandy River drainage, also yielded similar (though in smaller numbers) quartzite tempered cordmarked ceramics.

Other sites in the Upper Cumberland Region of Eastern and Southern Kentucky yielded ceramics indicative of Woodland Period occupations. The Wolf River Rockshelter (15Cu23) in Cumberland County yielded both siltstone and chert tempered ceramic sherds (Breitburg et al. 1993). Both plain and cordmarked chert tempered sherds were recovered at the rockshelter. Siltstone tempered sherds exhibited fabric marked exterior surfaces, of which a substantial portion of a complete vessel was reconstructed.

This reconstruction also included part of the rim and lip, of which measurements were taken. Rim orientation (not specified in the text of this report) suggests a wide-mouthed, shallow vessel, similar to a flower pot or a vat (Breitburg et al. 1993: 44). Lip shape was flat and well smoothed or burnished. Orifice diameter, based on approximately 9% of the rim, was estimated at 26 cm. A section of the base was also reconstructed, which was flat, measured 25 mm in thickness (Breitburg et al. 1993: 44).

Comparison to a Wider Area

According to Breitburg et al. (1993:47) siliceous temper, including quartz, quartzite, chert, and sand, are indicative of an Early Woodland manufacture in the Middle Cumberland River valley. They base their position that the chert-tempered sherds from Wolf Creek Rockshelter were manufactured during the Middle Woodland on both relative sherd thickness and associated radiocarbon dates assayed from feature context. Locally available St. Louis Formation chert as the tempering agent and the presence of siltstone within the rockshelter itself suggest that the ceramic vessels were manufactured at the shelter (Breitburg et al. 1993: 47).

Further west, in the lower portion of the Cumberland River drainage, comparable ceramic sherds were recovered from archaeological sites (Sanders and Maynard 1979). Though the majority of ceramics recovered and analyzed during this study were shell tempered, and thus associated with the Late Prehistoric Mississippian Period, some were non-shell tempered and therefore comparable to those ceramics in the present study. Many of these sherds (n = 69) were identified as having clay or grog temper as the primary tempering agent. These grog tempered sherds were assigned to three different known ceramic types. The first, Baytown Plain (Phillips, Ford and Griffin 1951: 76-82;

Phillips 1970), is characterized in the Cumberland River drainage by crushed clay temper, with small amounts of crushed limestone, as well as small amounts of hematite (Sanders and Maynard 1979: 132). Exterior surfaces range in color from light brown to grayish orange and have distinctive cores which range in color from grayish orange to dark gray. Mulberry Creek Cordmarked (Phillips, Ford and Griffin 1951: 76-82), is defined by crushed clay in approximately 20 percent of the paste, as well as crushed limestone inclusions (Sanders and Maynard 1979: 135). Exterior colors range from yellowish brown to dark gray and have cores ranging in color from dark gray to grayish black. Exterior surfaces are cordmarked. The third ceramic type identified was Kimmswick Fabric Impressed, which is also tempered with grog and includes crushed limestone inclusions (Sanders and Maynard 1979: 135). These are thicker vessel forms, most likely salt pans, but are not applicable to the assemblages from Long or Rowena, which do not include fabric impressed sherds indicative of salt pans.

Also included in the Christian County study are limestone tempered ceramics, though only one could be identified as an established type (Sanders and Maynard 1979: 136). Rough River Plain (Schwartz and Sloan 1959) is characterized by finely crushed limestone tempering and very fine sand inclusions. Exterior surface color was grayish red with a reddish brown core. Apparently, this sherd is similar to the Mulberry Plain Type defined by Haag (1939: 10), but in a different region of the state. An unknown type of limestone tempered, plain ceramic was also recovered. It is characterized by finely crushed limestone tempering, but had no discernible inclusions in the paste (Sanders and Maynard 1979: 136). Though this sherd is not described as having any evidence of shell tempering, the authors did include a note that the sherd resembled the Bell Plain sherds also recovered during the investigations. Bell Plain is finely manufactured Mississippian Period pottery, tempered with finely crushed shell fragments.

Located along the Tennessee River in Decatur County, Tennessee, Site 40Dr226, yielded an intact and deeply stratified midden which was occupied from the Archaic to Mississippian Periods (Deter-Wolf and Tuschi 2005:19). The Woodland occupation yielded numerous ceramic sherds. Limestone tempered pottery sherds were the most abundant variety of the assemblage. These included plain, fabric-marked, cordmarked, and complicated stamped surface treatment types. Investigations here determined that the Woodland occupation marked the appearance of the Copena culture (Deter-Wolf and Tuschi 2005: 25). Copena appears in the Middle Tennessee Valley around 1600 – 1200 BP. Copena occupations are characterized by high frequencies of plain, carved, and paddle stamped limestone tempered ceramic sherds (Walthall 1980; Deter-Wolf and Tuschi 2005: 26). Types identified from the limestone tempered ceramics at 40Dr226, included Mulberry Creek Plain, Longbranch Fabric Marked, Flint River Cord Marked, and Pickwick Complicated Stamp. Clay tempered or grog tempered pottery sherds recovered from along the Tennessee River in the vicinity of 40Dr266 included Wheeler Check Stamped , Mulberry Creek Cordmarked, and McKelvey Plain ceramic types (Deter-Wolf and Tuschi 2005: 26).

Investigations performed in rock shelters in the Upper Cumberland Plateau of Middle Tennessee along the South Fork of the Cumberland River and other tributaries yielded limestone tempered, plain and cordmarked ceramic sherds (Franklin 2008). Though the primary objective of these investigations was to recover ceramic sherds for luminescence dating, information on sherd types, dates, and manufacturing could also be gleaned. Though initial excavations of the Far View Gap Bluff Shelter suggested a multicomponent site with occupations ranging from the Late Archaic to the Late Woodland, further investigations showed that the site consists primarily of a Late Woodland midden deposit (Franklin 2008: 90-91). Plain and smoothed over cordmarked, limestone tempered ceramics were recovered from this midden, as well as a variety of artifacts representing a wide range of occupations. Based on the luminescence dating methods utilized for that study, the limestone tempered sherds date to the terminal Late Woodland period (Franklin 2008: 92). Because of this dating method, the author needed to analyze the sherds on a microscopic level, revealing the composition of the paste. These included fine grained quartz, feldspar and other minerals as well as coarser grained quartz and feldspar.

In upper East Tennessee, the Nelson Site (40Wg7) yielded a wide variety of Woodland ceramics (Franklin et al. 2008). It is located on the Little Limestone Creek, approximately 600 meters upstream from its confluence with the Nolichucky River. Ceramics recovered from Nelson included Early Woodland Watts Bar and Long Branch types, as well as Middle Woodland Wright Check Stamped, Candy Creek Cordmarked, Mulberry Creek Plain, and Bluff Creek Simple Stamped (Franklin et al. 2008: 182). Connestee ceramic sherds were also recovered. The majority of Middle Woodland ceramic types in the site assemblage, along with two AMS dates, suggest that the most intensive occupation of the Nelson Site occurred during the Late Middle Woodland period (Franklin et al. 2008: 185). Though the majority (more than 50%) of the Nelson ceramic assemblage was classified as Wright Check Stamped, which occurs more often than any other Middle Woodland type in East Tennessee, an additional 107 check stamped sherds have a combination of limestone and sand/grit/quartz (Franklin et al. 2008: 186). The authors contend that the classification of pottery with mixed temper types is problematic in southeastern U.S. ceramic studies, but it is easier to classify these mixed temper varieties in terms of the most abundant temper type. Using traits, other than tempering agents, related to known ceramic types is the only way of comparing newly excavated ceramics.

Mulberry Creek Plain, Candy Creek Cordmarked, and Connestee wares also occurred in significant numbers at Nelson (Franklin et al. 2008: 187). The Nelson Site is framed in a larger regional analysis of Middle Woodland ceramic systematics in Southern Appalachia. Two Middle Woodland phases have been suggested for the eastern Tennessee Valley portion of Southern Appalachia: the Candy Creek phase and Connestee phase (McCollough and Faulkner 1973: 95; Franklin et al. 2008). The Candy Creek phase, the earlier of the two phases, is characterized by limestone tempering as well as cordmarking, check stamping, simple stamping, and complicated stamping surface treatment types (Franklin et al. 2008: 185). The later phase, Connestee, is represented by sand tempered ceramic types with brushed, plain, simple stamped, cordmarked, check stamped, and fabric marked surface treatments (Franklin et al. 2008: 185). This phase is likely due to contact with western North Carolina where Connestee ceramics were first described and were most prevalent. Though Hopewell or Hopewell-related artifacts (including ceramics) have been found at sites in East Tennessee and in the wider region of Southern Appalachia, no obvious evidence of Hopewell interaction was recovered at Nelson (Franklin et al. 2008: 187).

The Yearwood Site (40Ln16) is a Middle Woodland site located on the rim of the Elk River in Southeastern Tennessee. Occupation of Yearwood spanned the Woodland Period, and included two distinct phases associated with the Appalachian foothills: The McFarland and Owl Hollow Phases. The McFarland Phase occurred most predominately during the early Middle Woodland subperiod and is characterized primarily by a mixture of limestone tempered fabric-marked and check stamped pottery (Butler 1979: 150). The Owl Hollow Phase occurred during the late Middle Woodland. This phase is characterized, among other things, by limestone tempered pottery with plain and simple stamped surface treatments (Butler 1979: 150).

Ceramic materials found at Yearwood included locally made pottery sherds that were virtually all limestone tempered. The major surface treatments also included cordmarked (54%), plain (32%), and check stamped (8%) (Butler 1979: 153). Evidence of local and regional trade was also evident at Yearwood. Typical Hopewellian trade goods, as well as a number of other goods from different sources throughout southern Appalachia, were recovered from Yearwood. Though some exotic materials were obvious imports related to exchange networks, others were locally made and represent obvious Hopewell stylistic influences (Butler 1979: 153).

The Hurricane Branch Site (40Jk27) is a multi-component site located in middle Tennessee along the Cumberland River (Gatus 1984). The Woodland component is represented by occupations of all three sub-periods. Of the ceramic sherds recovered from the Hurricane Branch Site, the vast majority (91.6%) was tempered with limestone and is primarily plain or simple stamped (Henderson 1984: 232). Earlier investigations in the Middle Cumberland region suggest that limestone tempered pottery, in general, are indicative of a Middle Woodland occupation (Cobb and Faulkner 1978: 23). Other tempering agents seen at Hurricane Branch include quartz (sand) and quartzite, but in much smaller quantities. Henderson (1984: 233) believes this small occurrence of quartzite tempered sherds could be associated with the Watts Bar ceramic sequence which is assigned to the Early Woodland in the region. Watts Bar is known to co-occur with limestone tempered, plain ceramics (Calabrese 1976).

Comparisons were made between the Woodland assemblage from Hurricane Branch and other ceramic types in central and eastern Tennessee. The closest correlations were Mulberry Creek Plain and Hamilton Plain as well as Candy Creek Cordmarked and Hamilton Cordmarked. Like the Yearwood Site, the Owl Hollow phase was represented at Hurricane Branch. Limestone tempered ceramics with check stamped and plain surface treatments are indicative of the early Owl Hollow Phase (A.D. 200 – 400) ceramics from south-central Tennessee (Faulkner 1978) and most closely resemble those from Hurricane Branch (Henderson 1984: 233).

Back to the Rowena and Long Sites

Like the ceramic assemblages from the sites reviewed here, the Rowena and Long sites may contain more than one ceramic type, and/or an unidentified ceramic type. Though not the primary objective of this analysis, it is important to identify the ceramic types comparable to those from Rowena and Long in order to answer a wider range of questions.

The closest site associated with Long and Rowena, and also excavated during the Wolf Creek Reservoir investigations, is the Reiny site. According to preliminary observations on the non-shell tempered sherds recovered there, tempering was mainly shale or siltstone (Railey 1990; Applegate 2008). Shale and siltstone occurs as both the primary and secondary tempering agent at both the Long and Rowena sites. It also seems that shale occurs most frequently as the secondary aplastic within the sherds whose primary temper is grog. To a casual observer, grog can resemble both shale and siltstone on the occasion that the observer does not use magnification during analysis. But the sherds from the Reiny site are also described as thick with cordmarked surfaces, indicators of sherds manufactured before the inclusion of grog as a primary tempering agent (Late Woodland in this particular area).

Site 15Cu27 also yielded shale tempered sherds, which are classified as being manufactured during the Early Woodland occupation of that site (Applegate 2008). These sherds also are described as thick and with cordmarked exterior surface treatment, which are characteristics common to Early Woodland ceramic manufacture. Cordmarked sherds recovered from Rowena ranged in thickness from 4.47 mm to 17.57 mm, with a median thickness of 8.79 mm. The Long site yielded cordmarked sherds that ranged in thickness from 4.15 mm to 18.66 mm and with a median thickness of 9.45 mm. The early Middle Woodland occupation of 15Cu27 yielded grit tempered sherds with cordmarked and fabric impressed exterior surfaces. Though not substantial, the Late Woodland component was characterized by limestone tempered sherds with cordmarked exterior surfaces.

Analogous to ceramics from both sites are the *Mills Plain* and *Mills Cordmarked* types identified in Bell County, Kentucky (Kerr 1995a). The Mills Series is characterized by crushed siltstone and sandstone temper, both of which occur at Long and Rowena. As discussed previously, shale and siltstone are similar in source composition and are sometimes indistinguishable without magnification. I will assume that the analyst did not distinguish between the two tempers during analysis because no methodological characterization of either temper type was given.

The Rowena Site (15Ru10) assemblage is made up of 17.8 percent (n = 49) shale tempered sherds and 2.9 percent (n = 8) siltstone tempered sherds (Table 4-4). Together these are the third most prevalent tempering agents for Rowena. Of those sherds tempered with siltstone, most contained 5 to 7 percent temper within the paste; which is comparable to the Mills Series ceramics (Kerr 1995b). Temper volume within the paste of those tempered with shale fell predominately within the 3 to 7 percent range. Surface treatment of the siltstone tempered sherds is divided into 25 percent plain or untreated and 75 percent cordmarked exterior surfaces. Most of the shale tempered sherds are also cordmarked (55%), while 43 percent are plain or untreated and 2 percent have fabric impressed exterior surfaces (Table 4-4). Three of the four rim sherds tempered with siltstone exhibited no surface treatment, and are not comparable to the description of *Mills Plain* sherds given by Kerr (1995b). One, however exhibited a cordmarked surface treatment and also exhibits an everted, or outward slanting, rim orientation with a bolstered lip shape. Though there is only one siltstone tempered cordmarked sherd described by Kerr, it too has an outward slanting rim form but has a rounded lip (1995b: C-5; Figure C-3, d). Because the analyst makes a distinction between sandstone and quartzite tempering agents, I can only make the assumption that the analyst did know the difference and use that assumption in my own comparison. Yet, a comparison is difficult since only two sherds from Rowena are sandstone tempered and neither of the two are rim sherds.

Table 4-4: Rowena (15Ru10) Siltstone and Shale Temper Characteristics.

		Siltstone		Shale	
Frequency		N = 8	2.9%	N = 49	17.8%
		N	% of siltstone	N	% of shale
Temper Volume in Paste	1-3%	1	12.5	17	34.7
	5-7%	5	62.5	29	59.2
	10-15%	2	25	3	6.1
Exterior Surface Treatment	Plain	2	25	21	42.9
	Cordmarked	6	75	27	55.1
	Fabric Impressed	0	0	1	2.0

Though the majority of the Long Site (15Ru17) assemblage is made up of grog tempered sherds, siltstone (n = 52; 15.2%), shale (n = 26; 7.6%), and sandstone (n = 3; 0.9%) were also recovered. The presence of these temper types makes it possible for the Long Site assemblage to also be compared to the Mills Series ceramics. Like the comparison with the Rowena Site, I will assume that the analyst did not make a distinction between siltstone and shale tempering types. Siltstone tempered sherds made up approximately 5 to 10 percent of the paste by volume, which is comparable with the moderate to high amount of temper in the paste of the Mills ceramics described by Kerr (1995b), though the percentage given in that study does not make sense in terms of volume within the paste (Table 4-5). Shale represents a lower volume in the paste, 3 to 7 percent, but is still within the moderate range described for *Mills*. The majority of both temper types exhibited cordmarked exterior surfaces. Siltstone tempered sherds were comprised of 92.3 percent cordmarked (n = 48), 5.8 percent absent or plain (n = 3), and 1.9 percent fabric impressed (n = 1) surface treatments. Shale tempered sherds were also comprised of 92.3 percent cordmarked (n = 24), as well as one fabric impressed (3.8%) surface treatment (Table 4-5). One sherd from Long was missing an exterior surface.

Table 4-5: Long (15Ru17) Siltstone and Shale Temper Characteristics.

		Siltstone		Shale	
Frequency		N = 52	15.2%	N = 26	7.6%
		N	% of siltstone	N	% of shale
Temper Volume in Paste	1-3%	2	3.8	14	53.9
	5-7%	45	86.6	11	42.3
	10-15%	5	9.6	1	3.8
Exterior Surface Treatment	Plain	3	5.8	0	0
	Cordmarked	48	92.3	24	92.3
	Fabric Impressed	1	1.9	1	3.8
	Indeterminate	0	0	1	3.8

Because only two rim sherds with siltstone tempering and three rim sherds with shale tempering were recovered from Long, a comprehensive comparison with the Mills Series ceramics is difficult. Of those tempered with siltstone, one was everted in orientation, or outward flaring, with a flat lip and the other was inverted in orientation, or inward flaring, with a rounded lip. There is also a shale tempered rim sherd with an inverted orientation and a rounded lip. The other two are different still. One shale tempered sherd has a direct orientation and a bolstered lip, and the other a flat lip shape and an undetermined orientation because of the small size of the rim sherd. All of the rim sherds exhibit cordmarked exterior surfaces. There are only three sherds from the Long Site tempered with sandstone, all of which are body sherds and have cordmarked exterior surfaces. No further comparison is needed.

The comparison with the Mills Series (*Mills Plain* and *Mills Cordmarked*) to the Rowena and Long assemblages is problematic. While they share certain characteristics, the analysis of the Bell County, Kentucky, assemblages on which the Mills Series is based appears incomplete. The siltstone and shale tempering from both the Rowena and Long Sites is congruous with the tempering of *Mills Plain* ceramics, but the majority of those from Rowena and Long are cordmarked. According to the description given by Kerr during his identification of *Mills Cordmarked*, that particular type is mainly sandstone tempered. There are very few sandstone tempered sherds from Rowena and Long, though they are primarily cordmarked. While there may be some correlation between the manufacture of ceramics from Rowena and Long and the Mills Series identified in Bell County, they are limited and most likely performed during differing time periods. Kerr (1995a,b) assigned the *Mills Plain* type to the Middle Woodland (240-170 B.C.) time period and the *Mills Cordmarked* type within the Early Woodland (ca. 380 B.C.).

Quartzite was the primary tempering agent for the *Pine Mountain Plain* and *Pine Mountain Cordmarked* ceramic types. The Pine Mountain Series ceramics is described by Kerr (1995b) during his analysis of the Main and Mills Sites ceramics, but he does not include any references to where and by whom the Pine Mountain Series was first named. Quartzite is also the primary tempering agent for the Rowena assemblage (n = 84; 30.5%), the majority of which is cordmarked (n = 53; 63.1%) (Table 4-6). Like *Pine Mountain Cordmarked* the quartzite tempered sherds have a primary secondary inclusion (aplastic 1) of quartz (sand), which makes up 73.6 percent of the cordmarked sherds (Table 4-6). Compared to my own analytical methods, the quartzite temper also comprises a moderate to high percent of the sherd paste (5-10%). One quartzite tempered rim sherd with a cordmarked exterior surface was identified in the Rowena assemblage. This rim exhibited a direct orientation with a flat lip shape, which is comparable with the rim form suggested for the *Pine Mountain Cordmarked* type described by Kerr (1995b).

Table 4-6: Rowena (15Ru10) Quartzite Temper Characteristics.

		Plain/Absent	Cordmarked	Incised
Frequency of Quartzite Tempered Sample		N = 30; 35.7%	N = 53; 63.1%	N = 1; 1.2%
Sherd Thickness Statistics	Mean	8.69 mm	8.84 mm	-
	Median	8.56 mm	8.71 mm	-
	Range	5.68-12.25 mm	4.47-14.16 mm	-
Aplastic 1	Quartz	N = 22; 73.3%	N = 39; 73.6%	-
	Grit	N = 2; 6.7%	N = 3; 5.7%	-
	Shale	-	N = 6; 11.3%	-
	Other	N = 6; 20%	N = 5; 9.5%	-

Pine Mountain Plain ceramics are similar to the cordmarked variety, but with smoothed or untreated exterior surfaces. A total of thirty, or 35.7 percent, of the quartzite tempered sherds from Rowena have plain surfaces. The most abundant secondary inclusion is also quartz (sand) which comprises of 73.3 percent of the plain sherds (Table 4-6). Radiocarbon dates from the Main Site associated with both the *Pine Mountain Plain* and *Cordmarked* sherds, places the range of discard from 830 B.C. to 730 B.C., within the Early Woodland Period (Kerr 1995b). Geographically, the Pine Mountain Series is found in the Upper Cumberland River region, which includes tributaries of the Cumberland in the foothills of the Appalachian Summit.

Also recovered from the Mills Site (15Bl80) was a small assemblage of Swannanoa Cordmarked sherds. Originally described by Holden (1966: 61) as the “Early Series,” Swannanoa is an indicator of Early Woodland occupation of the Appalachian Summit of Eastern Tennessee. *Swannanoa Cordmarked* ceramics are characterized as being densely tempered with coarse, crushed quartz[ite] or coarse sand (Keel 1976: 260). This description also indicates that many of the quartzite particles are fairly large, and may comprise as much as 40 percent of the paste itself. While I am certain that the density of temper in the paste was substantial, there is no indication of how the analyst came to this conclusion or if they utilized any type of measuring reference. So a one-to-one comparison between the description of Swannanoa Series ceramics and those I analyzed from the Long and Rowena Sites is not possible, only an educated estimation. Those *Swannanoa Cordmarked* sherds analyzed from sites in eastern Tennessee (Keel 1976) had either vertical (direct) or slightly incurvate rim orientation. Lips were either rounded or flat. A small number exhibited notched lips (Keel 1976: 260). Though the *Swannanoa Cordmarked* sherds recovered from the Mills Site were similar in temper type and density to those described by Keel, there were no rim sherds recovered for a comparison between the vessel form and lip characteristics.

The Rowena Site yielded 53 quartzite tempered sherds with cordmarked exterior surfaces. Of these, only one was a rim sherd. Quartz (sand) was the most abundant inclusion. Sherd thickness is 8.70 mm, with a more variable range from 4.47 mm to 14.16 mm, but still encompasses the averages given for those samples (Table 4-6). Though there is only one rim sherd in the Rowena sample, it exhibits both a direct orientation and a flat lip shape, which are characteristics consistent with *Swannanoa Cordmarked* type ceramics (Keel 1976: 260).

Quartzite sherds recovered from Long are comparable to the *Swannanoa Cordmarked* type as characterized by Keel (1976) and also recovered from the Main Site (Kerr 1995a). A total of 21 sherds analyzed from Long exhibited both quartzite tempering and cordmarked exterior surfaces, five of these are rim sherds. Average sherd thickness for this sample of sherds is 9.73 mm with a range of 5.07 mm to 12.17 mm (Table 4-7). This average thickness is greater than that for the Swannanoa description given for the eastern Tennessee sample (8.1 mm) (Keel 1976) and for those analyzed from the Mills Site (8.92 mm) (Kerr 1995a). However, the range of sherd thickness from Long is more in line with the other two samples; at 7.00 mm to 10.14 mm for the Mills and 6.00 mm to 12.00 mm for eastern Tennessee (Kerr 1995a). The most prominent inclusion (aplastic) for this sample is quartz (sand), as it is with the other examples. Rim sherds from Long have direct orientations with a flat lip (n = 2), everted, or flaring out, with a flat lip (n = 1), inverted, or flaring inward, with a round lip (n = 1), and an unidentified rim orientation with a round lip shape (n =1).

Table 4-7: Long (15Ru17) Quartzite Temper Characteristics.

		Plain/Absent	Cordmarked	Punctated
Frequency of Quartzite Tempered Sample		N = 6; 21.4%	N = 21; 75%	N = 1; 3.6%
Sherd Thickness Statistics	Mean	10.01 mm	9.73 mm	-
	Median	8.44 mm	10.6 mm	-
	Range	6.99-18.2 mm	5.07-12.17 mm	-
Aplastic 1	Quartz	N = 5; 83.3%	N = 10; 47.6%	-
	Grit	N = 1; 16.7%	N = 7; 33.3%	-
	Other	-	N = 4; 19.1%	-

Both Long and Rowena yielded quartzite tempered sherds without surface treatments, or plain. Though none were described for the Mills or Main Sites (Kerr 1995a, b), there were plain quartzite tempered sherds described for eastern Tennessee (Keel 1976: 263) as *Swannanoa Plain*. Characteristics for the *Plain* variety were the same as those for the *Cordmarked* variety (Keel 1976: 263). There are only six sherds from Long which exhibited both quartzite tempering and a plain exterior, one of which is a rim sherd and one a base sherd. In terms of sherd thickness, the average and range are larger (10.01 mm and 6.99 mm to 18.22 mm respectively) (Table 4-7). The wide range in values and the larger average thickness is due to the base sherd which is much thicker and skews the other values. Temper volume is moderate at 5 to 7 percent within the paste. Characteristics of the single rim sherd include an undetermined orientation due to sherd size with a tapered lip. Rowena yielded 30 quartzite tempered sherds with plain exterior surfaces, two of which are rims and two are base sherds. Average sherd thickness for this sample is 8.68 mm with a range of 5.68 mm to 12.25 mm. Quartz is by far the most prominent inclusion at 73.3 percent (n = 22) of the sample (Table 4-7). Rim characteristics are unique in that they both exhibit everted (outward flaring) orientations with rounded lips, both with appendages on the lip.

Limestone tempering is the least frequently occurring temper type for both the Long and Rowena Sites. Thirty-three sherds analyzed from the Rowena Site were tempered with crushed limestone fragments. These exhibited either cordmarked exterior surfaces (n = 19) or plain exterior surfaces (n = 14). The average sherd thickness for those with cordmarked surfaces is 8.32 mm with a range of 6.20 mm to 10.85 mm (Table 4-8). Temper volume was moderate, at approximately 5 to 7 percent within the paste. Secondary inclusions were mainly quartzite (47.4%; n = 9) or quartz (31.6%; n = 6). Of the fourteen limestone tempered sherds with plain exterior surfaces analyzed for Rowena, two were rims. Average thickness is 8.54 mm with a range of 6.34 mm to 11.25 mm. Temper volume was low to moderate with most sherds exhibiting 3 to 5 percent of temper within the paste. Secondary inclusions were most frequently crushed quartzite (57.1%; n = 8) or quartz (21.4%; n = 3). Of the two rims with limestone tempering and plain surfaces, one exhibited a direct orientation with a tapered lip while the other exhibited an everted (slightly outflaring) orientation with a rounded lip.

Table 4-8: Rowena (15Ru10) Limestone Temper Characteristics.

		Plain	Cordmarked
Frequency of Limestone Tempered Sherds		N = 19; 57.6%	N = 14; 42.4%
Sherd Thickness Statistics	Mean	8.55 mm	8.32 mm
	Median	8.62 mm	8.40 mm
	Range	6.34-11.25 mm	6.20-10.85 mm
Aplastic 1	Quartz	N = 3; 21.4%	N = 6; 32.6%
	Quartzite	N = 8; 57.1%	N = 9; 47.4%
	Shale	N = 2; 14.3%	N = 3; 15.8%
	Other	N = 1; 7.1%	N = 1; 5.3%

A total of 14 sherds analyzed from Long were tempered with limestone fragments, most of which have cordmarked exterior surfaces (n = 12). Unfortunately, none of these were rim sherds, all were body or shoulder fragments. The average sherd thickness of the cordmarked sherds is 9.59 mm, with a thickness range of 6.12 mm to 12.30 mm (Table 4-9). Volume of tempering in the paste is approximately 5 to 10 percent, while most contained crushed quartzite fragments as the primary inclusion (50%; n = 6) and quartz as the second most frequent inclusion (25%; n = 3). Only two sherds were analyzed that exhibited both limestone tempering and plain exterior surfaces. Mean thickness is 8.83 mm, with a range of 6.75 mm to 10.90 mm (Table 4-9). The difference in sherd thickness between the two is substantial, but one sherd appears to be a shoulder or base and is thicker because of its placement on the vessel from which it fragmented. Temper volume is 7 to 10 percent in the paste while secondary inclusions are quartzite and quartz. One limestone tempered sherd from Long exhibited incising on its exterior surface.

Table 4-9: Long (15Ru17) Limestone Temper Characteristics.

		Plain	Cordmarked
Frequency of Limestone Tempered Sherds		N = 2; 14.3%	N = 12; 85.7%
Sherd Thickness Statistics	Mean	8.83 mm	9.59 mm
	Median	8.83 mm	9.79 mm
	Range	6.75-10.90 mm	6.17-12.30 mm
Aplastic 1	Quartz	N = 1; 50%	N = 3; 25%
	Quartzite	N = 1; 50%	N = 6; 50%
	Other	-	N = 3; 25%

The limestone tempered sherds analyzed for the Long and Rowena Sites can be compared to other limestone tempered ceramics from different sites in the region. The Hurricane Branch Site yielded a substantial plain, limestone tempered sample, which was comparable to Mulberry Creek Plain ceramics and, to a lesser degree, Hamilton Plain ceramics. These sherds had an average thickness of 7.5 mm with a range of 4 mm to 12 mm (Henderson 1984: 213). Temper volume was variable, but contained at least a moderate amount within the paste. Secondary aplastics included sand, quartzite, red and white rock fragments, and the rare fragment of chert (Henderson 1984: 213). Rim sherds were generally slightly outflaring, though few were also direct or very outflaring in their orientation, while lip shape was mostly rounded or flattened (Henderson 1984: 213). Fewer of the limestone tempered sherds analyzed from Hurricane Branch exhibited cordmarked exterior surfaces, and were compared to both Candy Creek Cordmarked and Hamilton Cordmarked ceramic types. Characteristic of these cordmarked sherds were similar to those with plain surfaces, though there were none with quartz or chert fragment inclusions (Henderson 1984: 221-222).

Grog tempered ceramics are a substantial portion of both the Long and Rowena assemblages. Grog can be an indicator of choice in that a potter did choose to use fired clay as a tempering agent instead of or in addition to locally available temper types, such as limestone or quartzite. Far fewer grog tempered sherds were examined as part of the Rowena Site (n = 64) analysis. The majority of these have plain exterior surfaces (n = 37), with almost as many cordmarked (n = 25) and few with incising on the exterior surfaces (n = 2). Those with plain exterior surfaces have an average thickness of 8.59 mm with a range of 5.20 mm to 14.55 mm (Table 4-10). The grog tempering makes up from 3 to 10 percent of the paste volume, with the majority between 5 and 7 percent. Secondary inclusions were predominately shale (n = 14; 37.8%) and crushed quartzite fragments (n = 9; 24.3), with quartz and siltstone occurring less frequently as secondary inclusions (Table 4-10). The two rim sherds were quite different from each other morphologically. One exhibited a direct orientation with a bolstered lip shape and the other exhibited an inverted orientation and a flat lip shape with appendages (Figure 4-1, b and c).

Table 4-10: Rowena (15Ru10) Grog Tempered Sherd Characteristics.

		Plain	Cordmarked	Incised
Frequency of Grog Tempered Sherds		N = 37; 27.9%	N = 25; 39%	N = 2; 3.1%
Sherd Thickness Statistics	Mean	8.59 mm	9.81 mm	6.38 mm
	Median	8.36 mm	10.29 mm	6.38 mm
	Range	5.20-14.55 mm	5.54-15.08 mm	5.86-6.89 mm
Aplastic 1	Shale	N = 14; 37.8%	N = 9; 36%	-
	Quartz	N = 6; 16.2%	N = 5; 20%	N = 2; 100%
	Quartzite	N = 9; 24.3%	N = 5; 20%	-
	Other	N = 8; 31.6%	N = 4; 16%	-
Volume of Temper in the Paste	1-3%	N = 8; 21.6	N = 4; 16%	-
	5-7%	N = 24; 64.8%	N = 13; 52%	N = 1; 50%
	10-15%	N = 5; 13.5%	N = 8: 32%	N = 1; 50%

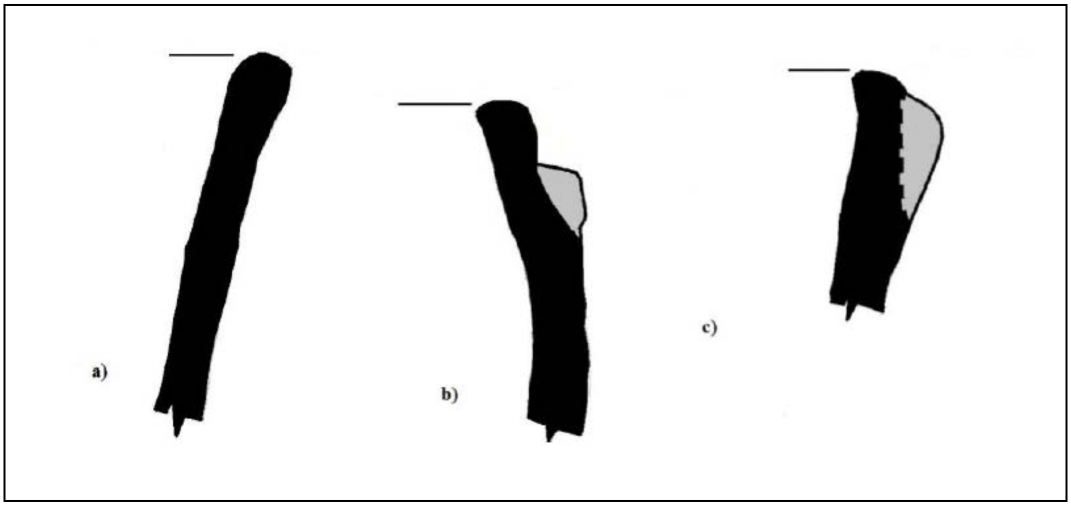


Figure 4-1: Rowena (15Ru10) Grog Tempered Rim Profiles.
a) direct with thickened lip; b) inverted with flat lip and castellations; and c) direct with bolstered lip and castellations just below lip.

Cordmarked grog tempered sherds were also predominately body sherds (n = 23; 92%); however one shoulder and one rim sherd were also present. Mean sherd thickness is 9.81 mm, and ranges from 5.54 mm to 15.08 mm (Table 4-10). The wide range of thicknesses can be attributed to the morphological characteristics of different sherd types.

In this case, the presence of a shoulder fragment in the sample can skew the thickness statistics. Temper made up approximately 5 to 10 percent of the paste volume. Shale is the most frequently occurring secondary inclusion (n = 9; 36%). Quartzite (n = 5; 20%) and quartz (n = 5; 20%) also frequently occur as secondary inclusions. The singular rim sherd exhibited a direct orientation with a thickened lip shape (Figure 4-1, a). Two grog tempered body sherds exhibited incising on their exterior surfaces. Their average thickness is 6.37 mm and range from 5.86 mm to 6.89 mm. The grog tempering was 5 to 10 percent of the paste volume, with quartz as the secondary inclusion in both sherds.

Grog-tempered sherds analyzed for the Long site exhibited plain, cordmarked, and fabric-impressed exterior surfaces, and was the most frequently occurring temper type analyzed (Table 4-11). Of these, plain exterior surfaces occurred least often (n = 6). Average sherd thickness is 7.99 mm with a range of 5.48 mm to 10.76 mm. Temper volume was moderate at approximately 3 percent within the paste. A conglomerate rock was the frequently occurring secondary inclusion (n = 4), with grit and shale also occurring. There were no plain grog tempered rim sherds from Long. The majority of grog tempered sherds had cordmarked exterior surfaces (n = 104). Average sherd thickness is 8.10 mm, with a range of 4.15 mm to 12.84 mm (Table 4-11). Temper volume is low to moderate and varies from 2 to 7 percent within the paste. The most frequently occurring secondary inclusion for this sample is shale (n = 56; 53.8%), yet there are several other frequently occurring secondary inclusions; grit (n = 16; 15.4%), quartz (sand) (n = 13; 12.5%), and quartzite (n = 12; 11.5%). The shale aplastic was easily discernible from the grog temper by its fissility, or its structure (see Chapter 3). A total of 13 rim sherds from Long exhibited both grog tempering and cordmarked exterior surface treatment. Of these, most had direct rim orientations (n = 5), and exhibited either flat (n = 3) or rounded (n = 2) lip shapes (Figure 4-2, a). Rim sherds with everted, or outward flaring, orientations (n = 4) also exhibited flat (n =1), bolstered (n = 2), and thickened (n = 1) lip shapes (Figure 4-2, b and c). Three of these rim sherds exhibited inverted with rounded, flat, or bolstered lips (Figure 4-2, d). One rim sherd, with an indeterminate orientation, exhibited a rounded lip shape.

Table 4-11: Long (15Ru17) Grog Tempered Sherd Characteristics.

		Plain	Cordmarked	Fabric Impressed
Frequency of Grog Tempered Sherds		N = 6; 5%	N = 104; 86%	N = 11; 9%
Sherd Thickness Statistics	Mean	8.00 mm	8.11 mm	8.54 mm
	Median	8.01 mm	8.29 mm	8.59 mm
	Range	5.48-10.76 mm	4.15-12.84 mm	7.69-9.51 mm
Aplastic 1	Shale	N = 1; 16.7	N = 56; 53.8%	N = 7; 63.6%
	Grit	N = 1; 16.7	N = 16; 15.4%	-
	Quartz	-	N = 13; 12.5%	-
	Quartzite	-	N = 12; 11.5%	N = 4; 36.4%
	Other	N = 4; 66.7%	N = 7; 6.7%	-
Volume of Temper in Paste	1-3%	N = 5; 83.3%	N = 48; 46.2%	N = 2; 18.2
	5-7%	N = 1; 16.7%	N = 51; 49.1%	N = 9; 81.8%
	10-15%	-	N = 5; 4.8%	-

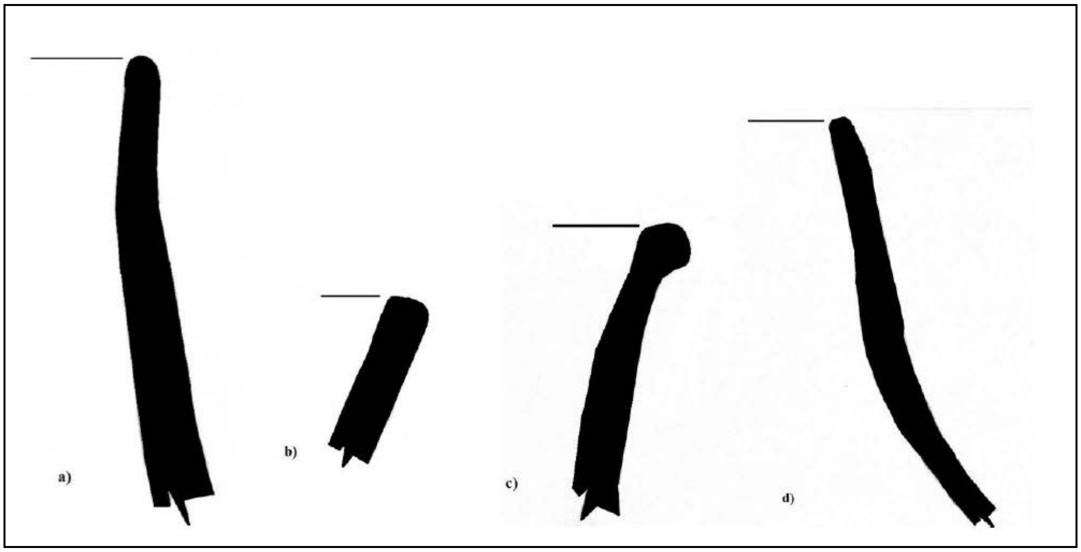


Figure 4-2: Long (15Ru17) Grog Tempered Rim Sherd Profiles.

a) direct with rounded lip; b) everted with flat lip; c) everted with bolstered lip; and d)inverted with flat lip

A moderate amount of the grog tempered sherds from Long exhibited fabric impressed exterior surfaces (n = 11), all of which are body fragments (Figure 4-3). Average sherd thickness is 8.54 mm; with a range from 7.69 mm to 9.51 mm (Table 4-11). Temper density is moderate, with most of the sherds containing 5 to 7 percent within the paste. Shale is also the most frequently occurring secondary aplastic (n = 7; 63.6%) in the grog tempered, fabric impressed sample and crushed quartzite particles (n = 4; 36.4%) is the other inclusion.

Figure 4-3: Long (15Ru17) Grog Tempered, Fabric Impressed Sherds.

Differences in the grog tempered samples from the Long and Rowena sites are apparent in the calculations performed above. One can see that there are more grog tempered sherds in the Long assemblage than the assemblage from Rowena and that there are more cordmarked sherds from Long, but that the reverse is true of plain sherds. Here, I compare the two grog tempered samples statistically to determine if the two were manufactured by the same or different populations of sherds, by performing a chi-squared (χ^2) test. Starting off with the assumption, or null hypothesis (H_o), that the two grog tempered samples are from the same population, I look at the totals for plain, cordmarked, and fabric impressed sherds (Table 4-12). The resulting chi-squared is greater than the critical value at 95% ($\alpha = 0.05$) confidence, resulting in a rejection of the null hypothesis. Statistically, the grog tempered sherds from Long and Rowena were not from the same population of potters.

Table 4-12: Rowena and Long Grog Tempered Chi-Squared Test.

		Observed Values	Expected Values	Chi-Squared χ^2	Critical Value $\alpha = 0.05$
Rowena (15Ru10)	Plain/Absent	37	14.6	34.37	5.991
	Cordmarked	25	43.7	8.00	5.991
	Fabric Impressed	0	3.7	3.7	5.991
Long (15Ru17)	Plain/Absent	6	28.4	17.7	5.991
	Cordmarked	104	85.3	4.1	5.991
	Fabric Impressed	11	7.3	1.8	5.991
	Total	183	183.0	**69.72**	**5.991**

Similarly, the chi-squared test can be used to determine if the differing temper types are from the same or different population of sherds. Table 14-13 presents the observed values for grog, limestone, quartzite, grit, shale, and siltstone tempered sherds for both the Rowena and Long sites. The resulting chi-squared value (122.03) is substantially larger than the critical value at 95% confidence ($\alpha = 0.05$). This result rejects the null hypothesis (H_o) that the sherds were from the same population. Using the results of this chi-squared test, I can infer that if the two sites do not contain the same population of ceramic assemblages, the potter’s who occupied and worked in the two sites were not the same population of potters.

Table 4-13: Rowena and Long Sites Temper Types Chi-Squared Test.

		Observed Values	Expected Values	Chi-Squared χ^2	Critical Value $\alpha = 0.05$
Rowena (15Ru10)	Grog	64	83.25	4.45	11.070
	Limestone	33	21.6	6.02	11.070
	Quartzite	84	50.4	22.4	11.070
	Grit	13	35.1	13.91	11.070
	Shale	49	33.75	6.89	11.070
	Siltstone	8	27	13.37	11.070
Long (15Ru17)	Grog	121	101.79	3.63	11.070
	Limestone	15	26.41	4.93	11.070
	Quartzite	28	61.6	18.33	11.070
	Grit	65	42.9	11.49	11.070
	Shale	26	41.3	5.67	11.070
	Siltstone	52	33.01	10.94	11.070
	Total	558	558.011	**122.03**	**11.070**

Comparing only the quartzite tempered sherds, both cordmarked and plain, on the other hand reveals that the two assemblages may have come from the same population of potters (see Appendix Table 6). With a chi-squared value of 1.84 and critical value at 95% confidence of 3.841, the null hypothesis cannot be rejected. It is possible that the two populations of quartzite tempered sherds are one in the same. The same holds true for the shale and siltstone tempered sherds from Rowena and Long. The chi-squared value is 1.35, with a critical value of 3.841; the null hypothesis cannot be rejected (see Appendix Table 7). These calculations likely are indicative of a small sample, and are not reliable to form theories about the two whole assemblages. There also may be closer relations between the two populations of potters during the Middle Woodland when quartzite and shale and siltstone were used more predominately than other aplastics as tempering agents.

Finding comparable ceramic samples in the region of the Wolf Creek Dam Reservoir proved difficult because of the sparse research on Late Woodland period sites in general and ceramics in particular within the region. Baytown Plain is a fundamental clay [grog] tempered type defined in the Lower Mississippi Alluvial Valley (Phillips, Ford, and Griffin 1951: 76-82). Similar to Baytown, Mulberry Creek is the cordmarked counterpart Cordmarked (Phillips, Ford, and Griffin 1951). These grog tempered types were manufactured during the Late Woodland and in Kentucky grog tempering is generally associated with Late Woodland and terminal Late Woodland occupations. Grog is also found in conjunction with shell in early Mississippian ceramics, presumably an indication of a transition into the Late Prehistoric.

Baytown Plain, as mentioned earlier, is tempered with grog or clay particles and contains primarily quartz sand as a secondary inclusion. Much of the Baytown Plain paste has a coarse, lumpy and contorted appearance which is dependent on the nature of the tempering material (Phillips, Ford, and Griffin 1951: 77). Sherd thickness ranges from 4 mm to 13 mm, with an average thickness of 7.6 mm. A characteristic Baytown Plain rim is simple and unmodified with a plain, rounded or slightly flattened lip (Phillips, Ford, and Griffin 1951: 77). Few of the rims are modified by thickening of the interior adjacent to the lip, which is often beveled or flattened (Phillips, Ford, and Griffin 1951: 78). The majority of rim sherds are undecorated, with only few with rimfolds, a single incised line, notched and pinched rims, or nodes. Of special note, when they occurred, nodes were closely spaced in a single row just below the rim edge. These occurred infrequently.

Mulberry Creek Cordmarked sherds are similar in temper and paste composition to Baytown Plain, with the exception that have cordmarked exterior surfaces (Phillip, Ford, and Griffin 1951: 82). In one instance, a shallow bowl exhibited cordmarking on its interior surface. This ceramic type was also defined using sherds from the Lower Mississippi Valley. Common Mulberry Creek Cordmarked vessel forms include jars with recurred rims and rounded shoulders, vertical or slightly incurved sided vessels, and bowls (Phillip, Ford, and Griffin 1951: 84). Some rim modification or decoration also is characteristic of the type. These include rim folds, a single incised line, and pinched rims (Phillip, Ford, and Griffin 1951: 84). The majority of lip forms were rounded or oval, but sometimes were flattened, presumably as a result of paddling (Phillips, Ford, and Griffin 1951: 86).

It is more difficult to find comparable material for the grog tempered, fabric impressed sherds analyzed from the Long Site. The region surrounding the Wolf Creek Reservoir yielded only a small sample of sherds with these characteristics. Unfortunately, these were Kimmswick Fabric Impressed ceramics (Williams 1954), which are characteristic of salt pans manufactured during the Late Prehistoric, not in the purview of this study. The closest comparable type for this small sample of grog tempered fabric impressed sherds also came from the Lower Mississippi Valley and defined by Phillips, Ford, and Griffin (1951: 73). Withers Fabric Impressed is characterized by grog tempering with a moderate to dense amount of quartz sand inclusions also in the paste, giving it a slightly sandy texture (Phillip, Ford, and Griffin 1951: 73). The average thickness for these sherds was 7.7 mm and ranges from 5 mm to 10 mm, with one basal sherd measuring 15 mm thick. Vessel shape is mainly simple, curved-sided bowls and the occasional slightly incurvate beaker or jar form (Phillips, Ford, and Griffin 1951: 73). The majority of rims were unmodified and vertical, few exhibited rim folds. Lip shape was either rounded or slightly flattened, rarely square (Phillip, Ford, and Griffin 1951).

Though there are several other combinations of characteristics found at both Long and Rowena, those described in greater detail here are the most dominant and so were compared to known types. This comparison is not an attempt to type these assemblages into a cultural historic timeline, but to compare morphological characteristics and methods of manufacture. As I have shown here, there are numerous similarities between the ceramics from the Long and Rowena assemblages and other ceramic assemblages not only from the area but the wider region.

In terms of the technological choices made by the Woodland potters who occupied the Long and Rowena Sites, tempering materials used during vessel manufacture were predominately local resources. Grit tempering, as it is defined here, is most likely the byproduct of fossiliferous limestone found in the area down river from the location of the Wolf Creek Reservoir. Siltstone and shale are abundant throughout the Upper and Middle Cumberland River Valley. Ubiquitous materials such as quartz (sand), quartzite, sandstone, and conglomerate also are easily accessible. These materials were presumably available throughout the Woodland Period, but were not utilized in ceramic production throughout the period.

Morphological characteristics of many of the Long and Rowena sherds are similar to those of known types. These parallels may have been the result of contact between groups or similar influences that resulted in similar pottery styles and manufacturing processes. There are pottery styles and manufacture techniques utilized by potters in nearby areas that would have been accessible to the potters who occupied Long and Rowena, but were not employed. The most obvious of these is the Hopewellian influence that reached the eastern portion of Tennessee. Very little, if any, of the characteristic Hopewell pottery decoration or manufacture techniques were utilized by the Long and Rowena potters. Yet, Hopewell type lithic production does seem to have been prevalent (Haag 1947).

It seems clear that the technological choices made by the Long and Rowena potters reflect the preference for locally available resources for tempering materials. What is less clear is why they preferred manufacturing techniques that did not reflect those of major trade networks. It also seems that in order to understand the technological choices made by potters of the Upper Cumberland River Valley and those of the potters who occupied the Wolf Creek Reservoir area, it is important to understand the different choices and techniques made by the Long and Rowena potters separately. This may be a reflection of differing cultural constructs employed by the two groups of potters as they both occupied the same environmental setting.

Chapter 5

Conclusions

The main objective of my study has been to identify the choices made by potters who lived in the Upper Cumberland River region using the specific assemblages from two sites with Woodland Period occupations. The Long (15Ru170) and Rowena (15Ru10) sites were located upstream from the modern day Wolf Creek Dam and excavated in advance of the construction of the dam in the late 1940's. As discussed in Chapter 3, the only ceramic sherds analyzed here were those without shell tempering, which by default were categorized as having been produced during the Woodland Period. Attributes of the paste have been collected to understand both the resources that were used in the manufacturing process and the influences of surrounding ceramicists.

Using both concepts of *technological choice* coupled with theoretical framework of *ceramic ecology*, I have been able to make conclusions about the choices made by these potters. Overall, the Long Site assemblage contained of far more grog tempered ceramic sherds (n = 121; 35.3%) than any other temper type. This may suggest a more intense later occupation at Long, given that grog tempering is characteristic of Late Woodland pottery. Grog tempered sherds are also present in the Rowena assemblage, though they comprise a smaller percentage (n = 64; 23.3%). This data could reflect a less intense Late Woodland occupation, or could reflect choices made by Rowena site potters.

Quartzite tempered sherds are a little more straight-forward in comparison. Quartzite is the most frequently occurring temper type for Rowena, most of which have cordmarked exterior surfaces. Far fewer of the Long site assemblage exhibits quartzite tempering, yet again the majority are cordmarked. These quartzite tempered sherds compare favorably with Swannanoa type pottery (Lafferty 1981), which occur frequently in both eastern Kentucky and the Appalachian Summit region of eastern Tennessee (Kerr 1995b; Keel 1976). Swannanoa pottery is also comparable to other types characterized in eastern Kentucky; Mulberry Creek Plain (Haag 1939), Candy Creek Cordmarked (Lewis and Kneberg 1946), as well as quartzite tempered pottery sherds recovered from Fishtrap Reservoir (Dunnell 1976) and the Paintsville Reservoir (Johnson 1982). The grog tempered pottery from both Long and Rowena share more morphological characteristics with the Swannanoa type of pottery than with the traditional grog tempered types such as those identified as Baytown Plain or Mulberry Creek Cordmarked (Phillips, Ford, and Griffin 1951).

Limestone tempered pottery from both Long and Rowena is comparable to Owl Hollow ceramics from the Middle Cumberland region of Tennessee (Butler 1979; Henderson 1984), as well as limestone tempered types from eastern Kentucky (Schwartz and Sloan 1959; Haag 1939). Limestone tempered pottery is quite ubiquitous in eastern Tennessee especially in the Southern Appalachian section of the Tennessee Valley (McCollough and Faulkner 1973; Franklin et al. 2008). These ceramics are dated to the late Middle Woodland to the early Late Woodland in these areas. Siltstone and shale tempered pottery was recovered from both sites, as well as from the Reiny Site (15Ru27), which was also excavated ahead of the Wolf Creek Dam construction (Applegate 2008). These siltstone and shale tempered ceramics are most closely comparable to the *Mills Series* defined by Kerr (1995a) in Bell County, Kentucky. Yet, as discussed in Chapter 4, the morphological characteristics are not exactly a one to one correspondence. This is similar to the problem of a comparison to known grog tempered types throughout Kentucky and the wider region. These ceramic types have been dated to the Middle Woodland sub-period.

Characteristics of ceramic morphology shared by the Long and Rowena assemblages and assemblages in the area and wider region can be indicative of similar influences or diffusion by means of marriage or trade. First and foremost, one must identify the resources used during production and then compare those choices to what is available. As discussed in Chapter 4, the tempering agents used by both the Long and Rowena potters are locally available in the Upper Cumberland River Valley. Siltstone and shale outcrop naturally in the region, the Pennsylvanian geologic strata located in eastern Kentucky and Tennessee (McDowell 1986). Quartzite and sandstone also outcrop from the same strata. Other geologic features local to the Upper Cumberland include Salem and Warsaw Limestone, Leipers Limestone, St. Louis Limestone, Chattanooga Shale, and Rockcastle Conglomerate (Plummer et al. 1999). Most abundant below the present day Wolf Creek Dam is the Fort Payne Formation, the reef limestone of which borders Lake Cumberland and is visible along its banks. Evidence of these resources can be seen in the temper types used in the Long and Rowena assemblages.

Sherd morphology characterized at Long and Rowena is similar to known ceramic types throughout the Upper Cumberland and wider region, but differs in many aspects. The most obvious differences are vessel morphology compared to temper type. As Matson (1965) posited, vessel construction was dependent on a number of factors including the number of people in a group unit, the needs of the group, and social factors affecting the vessel morphology, like additions to the group and style changes. So, while the tempering agents used for vessel construction were utilized in conjunction with their corresponding time period, as is seen in ceramic seriation, the vessel size and form was obviously dissimilar to those manufactured by other groups in surrounding areas. This is a possible by-product of socially, culturally, or economic constraints of the occupation of that particular area of the Upper Cumberland River Valley.

While contemporaneous occupations of the Middle Cumberland River region in Tennessee saw influences from the Hopewell exchange network, this is not the case for the area in this study. There is some indication that the excavators believed that the lithic technology was influenced by the Hopewell exchange network; however, I saw no indication in the Woodland period ceramics that a substantial influence was detectable archaeologically. The same is true for the Owl Hollow Phase of eastern Tennessee. While there are similar ceramics, generally in terms of temper and sherd morphology, from Long and Rowena to those characterized as Owl Hollow, again there is not a significant sample of Owl Hollow-like sherds to suggest a strong influence. This, coupled with the similarity of Long and Rowena limestone tempered ceramics to those recovered from sites in eastern Kentucky and the Appalachian Summit region of eastern Tennessee, makes a positive identification of an Owl Hollow influence indefinite.

So, in order to answer the questions with which this study began, all of the information presented in the preceding chapters is considered. The technological choices made by the Long and Rowena potters are laid out in Chapter 3, and can be seen to reflect changes in temper throughout the Woodland Period, where over time one temper type was selected over another. The choices of temper type and vessel form reflect social and cultural context of the Upper Cumberland River Valley. It’s obvious that the potters of this region did not subscribe to the material culture influences of the Hopewellian exchange network. This network originated north of the region, in Ohio and Illinois, and spread to areas further south of the Upper Cumberland. Rivers and streams would have made transmission to the region possible, but there is no evidence of its influence in the Long and Rowena assemblages. For whatever reason, the potters chose not to use the technology of ceramic production used by the Hopewell cultural exchange. It's also obvious that the potters took advantage of local natural resources, though over time, it seems that the Long site potters used grog, or fired ceramic fragments, as a tempering agent more often than the limestone or grit tempering used by later occupations in the region, including the Rowena potters. This could possibly be a reflection of the cultural constraints imposed by the Long site social structure or an indication of influence from different exchange networks. It is possible that the Mississippian culture was beginning to encroach on the area by the time grog tempered vessels were constructed, considering early shell tempered ceramics also contained grog. Evidence of strong Mississippian at both the Long and Rowena sites have been found, as both sites have evidence of mound construction (Weinland 1980; Sulham 1993).

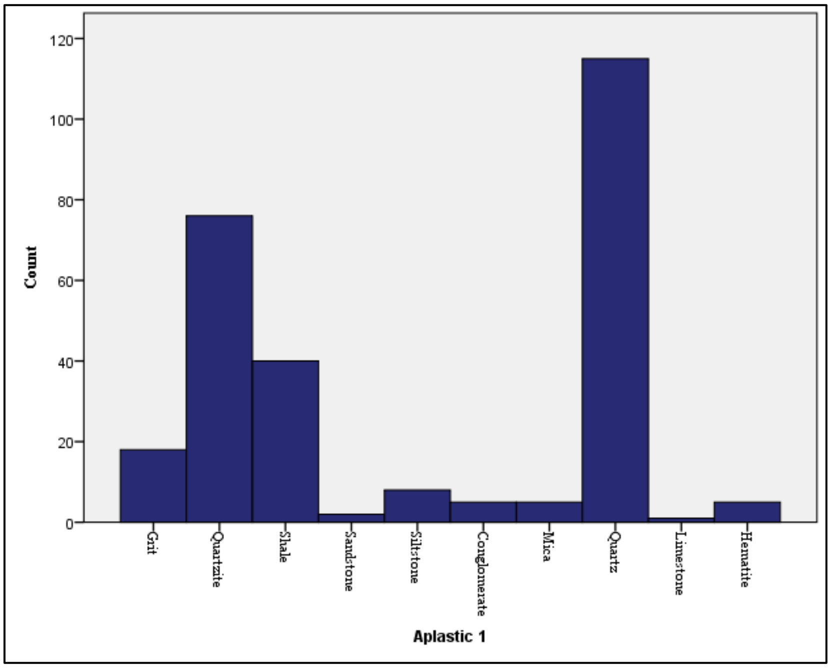
Given the prevalence of ceramic vessels and the other material culture recovered from the Long and Rowena sites (c.f., Weinland 1980), both occupations were at least semi-sedentary village sites. Later occupations of the Long site included Mississippian burials (Lewellyn 1964). The ceramic assemblages have many similarities, as well as differences. The most obvious differences are the frequencies of tempering agents. Rowena temper is dominated by quartzite, siltstone, and limestone. These tempering agents, when used in comparable assemblages, are characteristic of Early Woodland to

Middle Woodland occupations. There are numerous grog tempered sherds also recovered from Rowena, but the percentage of the overall assemblage is smaller than the percent of grog tempered Long site sherds. Conversely, the quartzite, siltstone, and limestone tempered sherds analyzed from Long make up much smaller portions of that assemblage than the same tempers do of the Rowena assemblage. While both sites were occupied during the Woodland Period; the Long site was most intensely occupied during the Late Woodland period, and the Rowena site was most intensely occupied during the Early and Middle Woodland. The quartzite tempered sherds, comparable to the Swannanoa Cordmarked and Plain as well as the Pine Mountain Series, which are indicative of Middle and Early Woodland occupations, respectively.

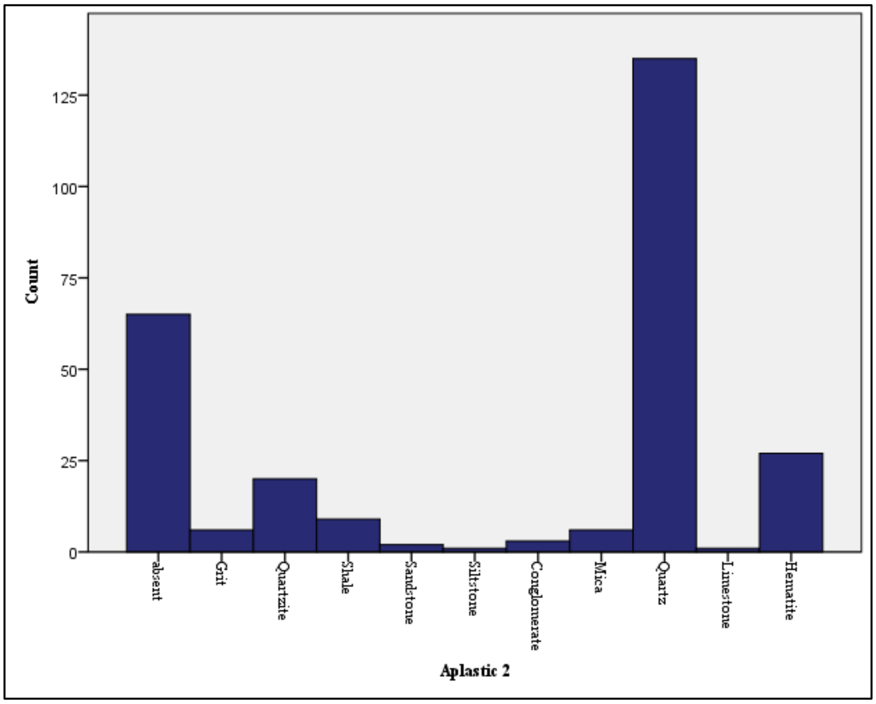
Temper choices during the Late Woodland in both sites show that the Long site potters were choosing grog temper over other forms of temper more frequently than the Rowena site potters. This could be an indication of alliance to a burgeoning Late Prehistoric society (as indicated by the Mississippian burials found there) or choices directed by increased ceramic industry. Grog use as a tempering agent can increase the likelihood that the vessel will survive the firing process. Economically, grog tempering may have been a better investment than less easily available aplastics that would have to have been procured from outcrops or riverbeds. The lower percentage of grog tempered sherds analyzed from Rowena could be a socially constructed choice by the potters to separate themselves from other potters in the area, whether that was made consciously or unconsciously is not possible to address with a great deal of certainty. The chi-squared test presented in Table 4-11, illustrates that the two assemblages of grog tempered pottery were not from the same population of ceramic sherds.

Using the application of technological choice and theoretical framework of ceramic ecology, the research questions posed early in the study have been addressed. It is evident that using a cultural historic framework for ceramic analysis only leaves a vast array of unanswered questions. Of course, the majority of analyses of ceramic assemblages occur in a cultural resource management context, there is really no excuse for leaving valuable information undocumented. Objectives of report writing may be merely using ceramics to place occupations temporally and spatially within a prehistoric context, information pertaining to temper and vessel size and shape should not be overlooked. Future ceramic analysis will involve more and more technologies, useful for chemical and molecular analysis, but will not be useful in the greater perspective of trying to understand our prehistoric forbearers if not framed in the appropriate theoretical context. Using technological choice and ceramic ecology to accomplish this will be an important part of future ceramic analysis.

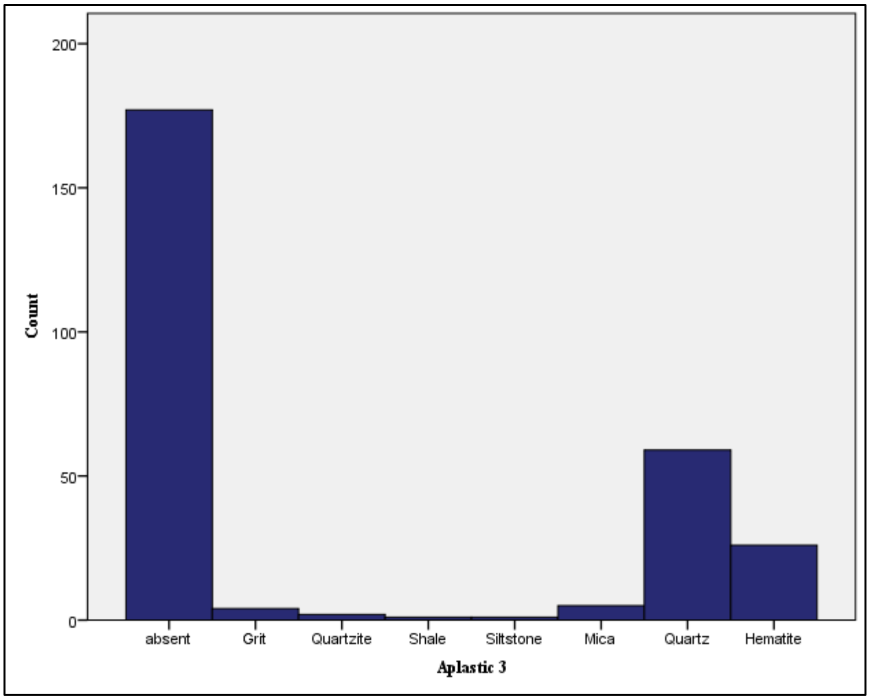
Appendix



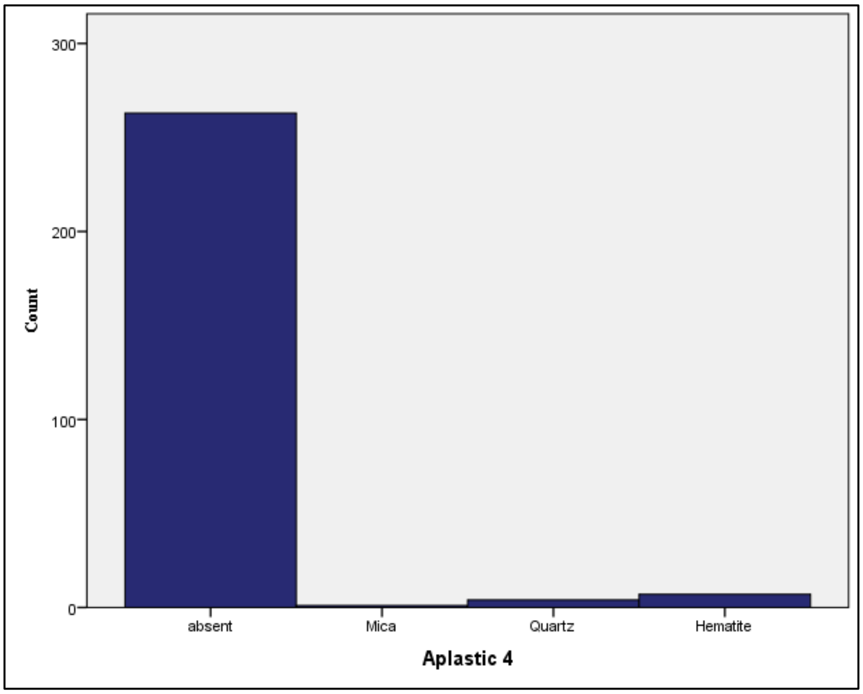
Appendix Figure 1: Rowena (15Ru10) Aplastic 1 Frequencies.



Appendix Figure 2: Rowena (15Ru10) Aplastic 2 Frequencies.



Appendix Figure 3: Rowena (15Ru10) Aplastic 3 Frequencies.



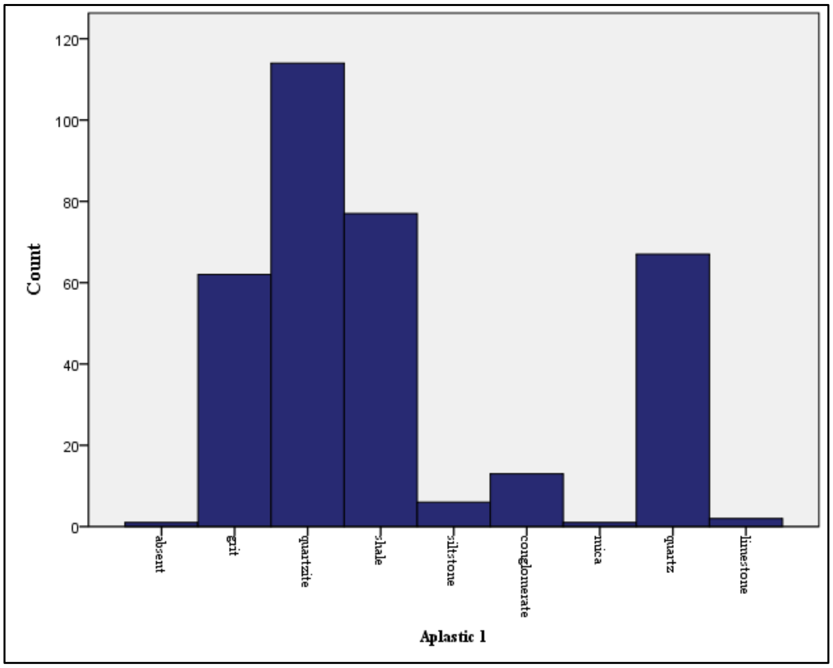
Appendix Figure 4: Rowena (15Ru10) Aplastic 4 Frequencies.

Appendix Table 1: Rowena (15Ru10) Core Types.

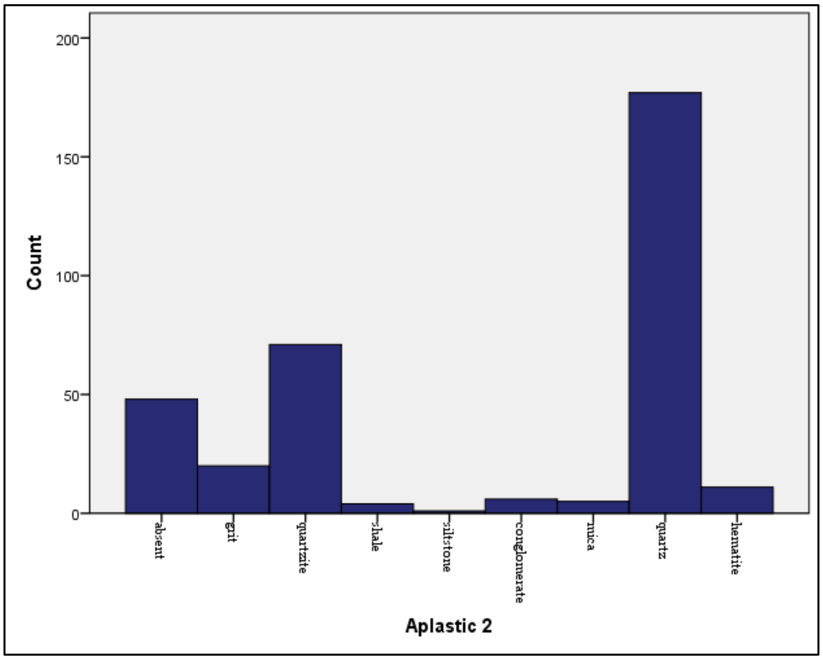
	Frequency	Percent
diffuse margins	115	41.8
sharp margins	56	20.4
no core	90	32.7
undetermined	14	5.1
Total	275	100.0

Appendix Table 2: Rowena (15Ru10) Rim Sherd Temper Frequencies.

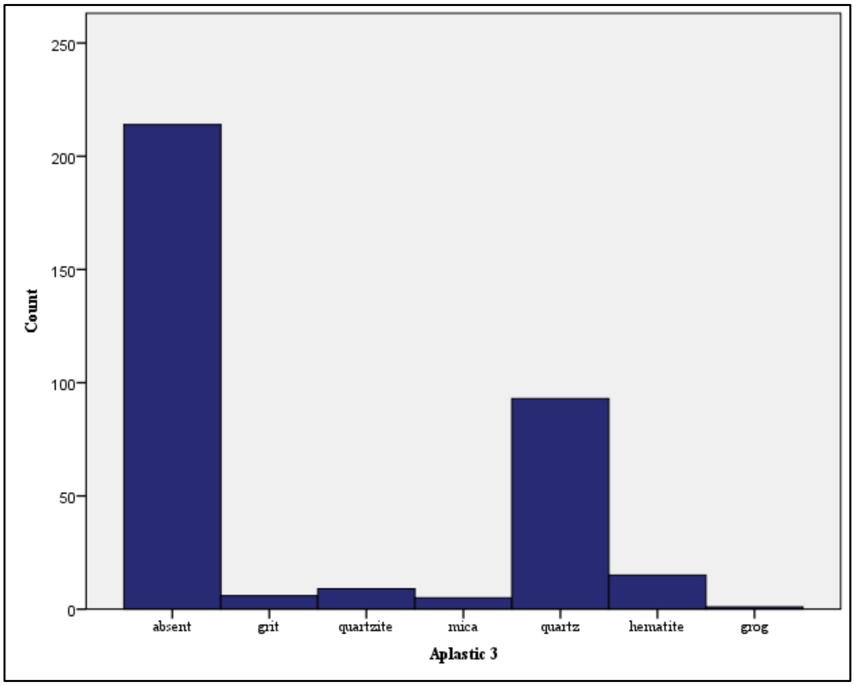
	Frequency	Percent
Quartzite	3	21.4
Shale	4	28.6
Conglomerate	1	7.1
Limestone	2	14.3
Hematite	1	7.1
Grog	3	21.4
Total	14	100.0



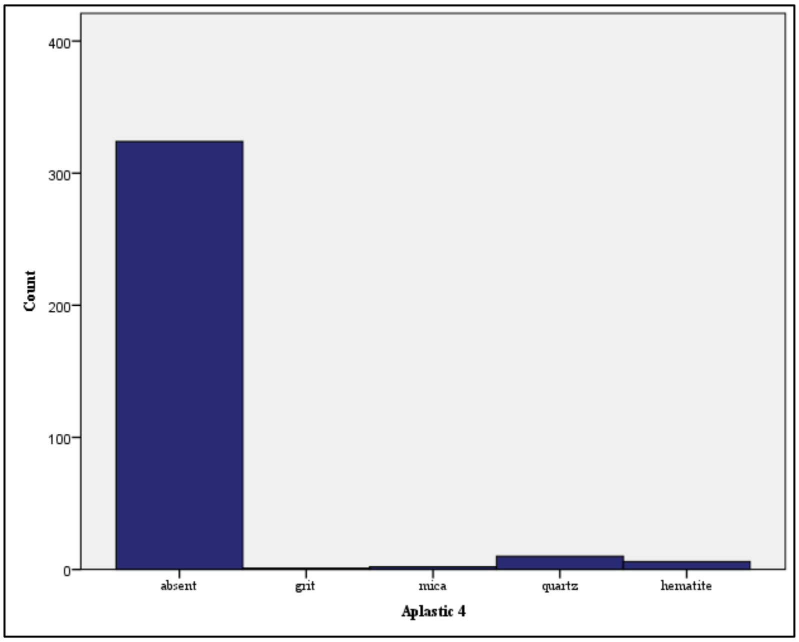
Appendix Figure 5: Long (15Ru17) Aplastic 1 Frequencies.



Appendix Figure 6: Long (15Ru17) Aplastic 2 Frequencies.



Appendix Figure 7: Long (15Ru17) Aplastic 3 Frequencies.



Appendix Figure 8: Long (15Ru17) Aplastic 4 Frequencies.

Appendix Table 3: Long (15Ru17) Core Types.

	Frequency	Percent
diffuse margins	165	48.1
sharp margins	73	21.3
double core	1	.3
no core	104	30.3
Total	343	100.0

Appendix Table 4: Long (15Ru17) Rim Sherd Statistics.

	Sherd Size cm2	Sherd Thickness mm	Lip Thickness mm
Mean	16.50	8.2240	5.8827
Median	10.00	8.2300	5.6850
Mode	3	4.50[a]	2.94[a]
Std. Deviation	23.425	1.84136	1.89475

a. Multiple modes exist. The smallest value is shown

Appendix Table 5: Long (15Ru17) Lip Shape by Lip Orientation.

		Lip Orientation				
		direct	everted	inverted	undetermined	**Total**
Lip Shape	rounded	2	0	4	2	8
	tapered	0	1	1	1	3
	flat	7	4	1	2	14
	bolstered	1	2	1	0	4
	thickened	0	1	0	0	1
	Total	10	8	7	5	30

Appendix Table 6: Rowena and Long Quartzite Tempered Sherds Chi-Squared.

		Observed Values	Expected Values	Chi-Squared χ^2	Critical Value $\alpha = 0.05$
Rowena (15Ru10)	Plain/Absent	30	27.18	0.3031	3.841
	Cordmarked	53	55.87	0.1475	.841
Long (15Ru17)	Plain/Absent	6	8.82	0.902	3.841
	Cordmarked	21	18.13	0.454	3.841
	Total	112	112.0	**1.84**	**3.841**

Appendix Table 7: Rowena and Long Shale and Siltstone Tempered Sherds Chi-Squared.

		Observed Values	Expected Values	Chi-Squared χ^2	Critical Value $\alpha = 0.05$
Rowena (15Ru10)	Shale	49	47.8	0.03	3.841
	Siltstone	2	3.2	0.45	3.841
Long (15Ru17)	Shale	26	27.6	0.09	3.841
	Siltstone	3	1.81	0.78	3.841
	Total	80	80.41	1.35	**3.841**

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