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A Tale of Two Shelters: Using XRF Analysis to Assess Compositional Variability of Pottery from Two Sites in Franklin County, Tennessee

Sierra May Bow
swentwo1@utk.edu

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Jan F. Simek, Major Professor

We have read this thesis and recommend its acceptance:

Charles H. Faulkner, Sarah C. Sherwood

Accepted for the Council:

Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)
A Tale of Two Shelters: Using XRF Analysis to Assess Compositional Variability of Pottery from Two Sites in Franklin County, Tennessee

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Sierra May Bow
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This thesis is dedicated to a sweet, little miracle.
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Abstract

The Southern Cumberland Plateau of Tennessee is an area characterized by the presence of thousands of caves and perhaps tens of thousands of rock shelters which served many purposes during the prehistoric Woodland Period (ca. 1000 B.C.-1000 A.D.). This thesis will discuss two Woodland rock shelter sites situated along the western escarpment of the South Cumberland Plateau.

The Griffin Rockshelter is a relatively small sandstone shelter which contains a predominantly Late Woodland archaeological component. Recovered artifacts consist of a wide assortment of material remains including fauna, shell, and lithics, and over 700 pottery sherds. In addition, the shelter contains engraved petroglyphs which line the interior. The Uzzelles Site, on the other hand, consists of Early Archaic through Late Woodland occupations based on the presence of recovered cultural materials. This shelter does not contain rock art.

This thesis presents investigations of both assemblages using a multi-faceted approach, consisting of detailed typological analysis accompanied by the use of X-ray fluorescence techniques to explore variation in pottery paste composition. Rather than determining the geographic origins of the pastes themselves, this methodology will provide information on how paste composition varies with respect to chronology and site function. The operating assumption is the "provenience postulate" which states that significant differences among pottery pastes reflect varying geographic locales for the parent material, clay, while homogeneous paste compositions indicate a narrow, localized area of clay resource acquisition. In short, understanding the variation that is present in pottery pastes from two functionally different rock shelter sites provides an initial step towards understanding the culture history and changing land use patterns of this unique geographic region.
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Chapter I: Introduction

The Cumberland Plateau which dissects eastern Tennessee is a unique physiographic area that has long been a regional distinction by geographers (Fenneman 1938; Luther 1977). In this physiographic region, large open air sites are relatively rare in contrast to the adjacent lowland regions. Instead, the Cumberland Plateau is characterized by a plethora of caves and rockshelters which were and are as much a part of the cultural landscape as they are the natural landscape. They served many purposes across this region from habitation to mortuary to special purpose sites; a wide range of prehistoric human behavior can be found and documented within this region (Franklin and Bow 2009).

Ongoing archaeological research in this area has the goal to build an accurate prehistoric culture history for the region. Culture histories have long been established in most regions, “unfortunately, the Cumberland Plateau is an archaeological terra incognita” (Faulkner 1968: 54). Traditionally, this region has been viewed as a marginal zone or cultural backwater (Swanton 1946:14); however, a growing body of research refutes these notions and elucidates a region possessing a rich, diverse, and long history of prehistoric occupation (Franklin 1999, 2002; Sherwood et al. 2011; Simek et al. 2001, 2009).

Prehistoric peoples in this, as in all regions, mapped their lives onto their landscape, including the procurement of resources like food and their religious and ceremonial beliefs. Because of limited data, specific function and chronology of sites have been difficult to differentiate. Prehistoric cultural sequences applied to the
Cumberland Plateau in large part were developed in the adjacent Eastern Highland Rim to the west and the Ridge and Valley Province to the east. Yet it is clear that the Cumberland Plateau was a unique physiographic region possessing its own culture trajectories or histories (Franklin 2002).

This thesis seeks to expand the current body of knowledge for the region, through systematic, scientific study of pottery assemblages from two distinctive rockshelter sites in Franklin County, Tennessee. Both a detailed typological analysis and a compositional analysis by means of X-Ray Fluorescence Spectrometry are used to explore how pottery assemblages might differ with respect to function and chronology. Previously, X-ray fluorescence technology has been used to discuss trade and distribution through identifying geographic origins of pottery pastes (Rice 1987; Shackley 2010, 2011). Methodology employed in this thesis, however, will determine whether this technology can detect and define patterned compositional differences between pottery assemblages from functionally distinct sites, thereby providing empirical signatures for paste variation in site use.

To accomplish this, two rockshelter sites along the southern end of the Cumberland Plateau, the Griffin Rockshelter and the Uzzelles Site, are examined. The Griffin Rockshelter is the only open-air rock art site to be systematically excavated in Tennessee. The site possesses a rich artifact assemblage including flora, fauna, lithics, and pottery in association with numerous petroglyphs along the inner walls of a small sandstone shelter. Because of its rock art, Griffin represents one of a number of rockshelters situated on the Plateau that was likely used as a special purpose
ceremonial site during prehistory. The shelter contains a wide diversity of pottery types which are contemporaneous with one another both stratigraphically and contextually.

On the other hand, the Uzzelles Site is a relatively large sandstone shelter which possesses an array of lithic and pottery types and floral remains from occupation that spans the Early Archaic through the Late Woodland periods. This rock shelter does not possess any rock art. The Uzzelles Site likely represents a task shelter, specifically focused upon the economic procurement and processing of nut food stuffs. Pottery represented from this assemblage is not diverse in types.

This thesis focuses on compositional differences among pottery pastes and how they relate to archaeological sites that served different functions in prehistory. A key concept used is what Weigland, Harbottle, and Sayre (1977: 24) call the Provenience Postulate which holds that chemical differences within a single clay source are less than the differences between sources. X-Ray Fluorescence Spectrometry gives the elemental composition or “fingerprint” of pottery, which is used to distinguish the similarities and/or differences among pastes.

Both the Griffin Rockshelter and Uzzelles Site served different functions during prehistory. If Griffin truly represents a special purpose or ceremonial site at which people aggregated, we would expect to see a different pattern of paste composition in the pottery than from Uzzelles, a utilitarian site focused on procurement, processing and storage. This is because those that came to these sites in the past came from different locations and/or with different intent even if they were the same people. The following thesis presents this research, analyses and findings.
In Chapter II, the environmental setting of the Cumberland Plateau region is discussed in some detail. Descriptions of both the physiography and geology serve to highlight the uniqueness of the Plateau region in general and to underscore the formation processes responsible for rockshelters characteristic to this region. Summaries of the prehistoric culture histories adjacent to the Plateau, both in East and Middle Tennessee, are also presented. In the absence of a developed cultural history of the Plateau itself, these will serve as a context for the understanding of prehistory in the project area. Primary emphasis is placed upon the Woodland Period sequences as pottery from this period was analyzed for this project. Lastly, due to the presence of rock art at the Griffin Rockshelter this chapter also provides a general overview of prehistoric, open-air rock art sites in the Eastern Woodlands. This serves to underscore similarities and differences in prehistoric art produced on the Cumberland Plateau. It also explains why these sites are considered ceremonial in function.

The site background for both rockshelters is covered in Chapter III including descriptions of the excavation and field methods. All recovered artifacts as well as a general interpretation of the functions that each of these sites served are represented. The pottery assemblages are only briefly mentioned here, as an extensive analysis is reported in Chapter V. Overall site interpretations are discussed more fully and completely in the conclusions, Chapter VI.

The remaining chapters represent the bulk of the thesis. Chapter IV presents the general methodology and the basis for X-ray fluorescence (XRF) spectrometry, the analytical methods employed, and a comprehensive pottery analysis. In particular specific analytical methods are outlined, including the process of both qualitative and
semi-quantitative analyses conducted using results of XRF, and their relevance to the interpretation of pottery compositions are described. Finally, this chapter includes a fully detailed typological analysis of the pottery assemblages from both sites.

Lastly, Chapters V and VI cover the results and discussion of the pottery and X-ray fluorescence analyses as well as the overall conclusions, respectively. The results of the qualitative and semi-quantitative analyses are presented and interpretations are discussed for each site. General conclusions are outlined with broad interpretations of what pottery compositions look like with respect to archaeological site function and chronology. Some thoughts for future work with X-ray fluorescence and pottery are also offered. We will begin with the physiography and geology characteristic to the Cumberland Plateau.
Chapter II: Environmental Setting & Cultural Background

Physiography and Geology

The Griffin Rockshelter and Uzzelles Site are both located in Franklin County, Tennessee, and are situated along the western escarpment of the Cumberland Plateau physiographic region. The Cumberland Plateau, as Fenneman describes it (1938) is a part of the Appalachian Plateau’s physiographic province, contiguous with the Allegheny Plateau, which is part of a tableland region extending from western Pennsylvania into northeastern Alabama (Miller 1994). In Tennessee, this plateau extends thirty to fifty-five miles wide and on average is over a thousand feet higher than the adjacent lowland region of the Ridge and Valley province to the east and the Highland Rim to the west (Figure 1). The Cumberland Plateau’s broad, undulating surface is submaturely dissected by young valleys in which the steepness and depth increase towards it edges (Fenneman 1938: 337). The physiographic and geologic character throughout this province differs considerably over such a great distance and indeed within Tennessee itself (Luther 1977). The difference in appearance of the eastern and western escarpment of the Cumberland Plateau is attributed to the effect of geology on topography.
The eastern escarpment, or the Cumberland Front, is abrupt and prominent, with a single drainage emptying eastward into the Tennessee River. In contrast, the western escarpment is more irregular, characterized by ragged edges, deep gorges, and two anticlinal valleys; the northern Elk and southern Sequatchie. Furthermore, the western escarpment region is deeply incised by a trifecta of rivers which drain it; the Cumberland, Duck, and Elk rivers.

The difference between the two escarpments is due to dramatic compressional forces which took place during the Appalachian mountain building episode at the end of the Paleozoic era, around 250 million years ago which stretched far enough westward to bend the eastern Plateau edge but not the western (Luther 1977). Through these forces, "rocks were folded or broken (or both), so that the same rock layers that form the flat-lying rim-rock to the west are tiled in the east… even standing vertically" (Luther 1977: 55). It is the direction of the folds which controls the shape of the escarpment. Where the escarpment is protected by sandstone layers, erosion is slowed, resulting in the topographic differences between the two escarpments of the Plateau.
The vegetation of the Cumberland Plateau region is characterized by Braun (2001[1950]) as a Mixed Mesophytic Forest Region (see also Dyer 2006 for revision). The western escarpment lies within the “Cliff Section”. The most common canopy-type tree species include yellow poplar (*Liriodendron tulipifera*), white basswood (*Tilia heterophylla*), sweet buckeye (*Aesculus flava*), red oak (*Quercus rubra*), white oak (*Quercus alba*), sugar maple (*Acer saccharum*), hemlock (*Tsuga canadensis*), hickory (*Carya sp.*) and historically the American chestnut (*Castanea dentata*) (Braun 2001 [1950]:40-41). Other characteristic non-canopy species include dogwood (*Cornus florida*), sourwood (*Oxydendrum arboretum*), magnolia (*Magnolia sp.*), American holly (*Ilex opaca*), and hop-hornbeam (*Ostrya virginiana*) (Braun 2001 [1950]:43).

The geology which formed the Cumberland Plateau produced ideal conditions for the formation of both open glades and rockshelters along the upper sandstone layers of the Pennsylvanian Formations, and caves formed within the lower Mississippian limestone formations. Geologically speaking, the Plateau is a “dynamic, ever-changing series of geological systems that occur rapidly enough for us to understand the major processes and see irreversible change, yet slowly enough to preserve” (Knoll and Potter 1998:144).

The Plateau surface in this region is capped by hard conglomerates, sandstones, and shales of the Pennsylvanian Crab Orchard Mountain and Gizzard groups. Underlying these geologic beds are the Mississippian layers of dolomite, limestone and shales of the Pennington Formation, Bangor Limestone, Hartselle Formation and Monteagle Limestone (Figure 2) (Hardeman 1966; Wilson and Stearns 1993[1958]).
The Uzzelles Site, situated within the Domain of the University of the South is formed out of the upper clastic sequence, the Warren Point Sandstone of the Pennsylvanian Period (Figure 2). It is this formation of fluvial origin that forms and controls the shape of the prominent bluff line: “the prominent bluff, and northwest-and northeast-trending vertical joint sets control the shape of the bluff line” (Knoll and Potter 1998:148). Rock shelters located in this geologic stratum are typically larger and more numerous than those found within the upper layer of the Sewanee Conglomerate. The Griffin Rockshelter is located near the Franklin/Marion County line and was formed within the Pennington Formation of the Mississippian series. This formation represents the last major phase of the Mississippian sequence and is categorized by the presence of interbedded limestones, dolomites, and red and green shales.
Culture History

Due to the physiographic and geologic nature of the Appalachian Plateau province, a vast karst system of caves and rockshelters can be found throughout the area extending from northern Alabama through Tennessee and into southern Kentucky (Fenneman 1938). These karstic features are not only a part of the geographic landscape, but also the cultural one; as Watson states, “throughout Appalachia, almost by definition, rockshelters are extremely important repositories of archaeological materials” (2001:320). Prehistoric peoples used these features for a variety of purposes throughout much of prehistory from Paleoindian through the Mississippian Periods.

The following discussion of culture histories is based upon the current body of knowledge for East and Middle Tennessee initiated by Lewis and Kneberg at sites such as Hiwassee Island (Lewis and Kneberg 1946), the Camp Creek Site (Lewis and Kneberg 1957), the Eva Site (Lewis and Lewis 1961), and the Chickamauga Basin (Lewis and Lewis 1995). Additional information was derived from three-decades of systematic excavations from reservoir projects such as Normandy (Faulkner 1988, 2002), Tim’s Ford (Faulkner 1968a), Nickajack (Faulkner and Graham 1966) and Tellico (Chapman 1977, 1985). While it has been noted, existing artifact typologies are not entirely adequate for the Northern or Upper Cumberland Plateau (see Franklin 2002), they are used in the southern end in the absence of a developed typology specific to the region. The following discussion of culture histories covers only the prehistoric periods that are represented at the two rockshelter sites considered in this project.
Archaic Period (ca. 8000 to 1000 BC)

The Archaic Period marks the longest defined span of prehistoric cultural development in the Southeast (Anderson 2001: 156; Bense 1994: 62) and is distinguished from its predecessor, the Paleoindian Period, through a series of subsistence, technological and social advances. The initiation of the Archaic Period roughly coincides with the environmental changes occurring at the Pleistocene-Holocene boundary at around 10,000 years ago and ends with the apex of modern climactic conditions (Anderson 2001). Settlement patterns, generally speaking, are characterized by small groups of mobile hunter-gatherers using seasonal base camps and special purpose camps. As the Archaic Period progresses, aggregation locales or base camps become the focal point for larger groups of people to congregate at certain times of the year (Griffin 1952). Lithic technology associated with this period is significantly different from the Paleoindian Period, reflecting the transition from large blade tools to less complex core reduction and flake tool technology. Archaic projectile points become more varied in shape, but typically have stemmed bases, notches, and barbs (Hudson 1976). During this time span, Archaic populations adapted to the warmer and drier environmental conditions by adopting a more broad-based subsistence strategy to include a wide variety of plant and animal food resources (Steponaitis 1986:371). An increase in the number of sites and artifacts throughout the Southeast during this period indicate that Archaic populations successfully spread across almost the entire region and exploited a wide variety of terrestrial and marine resources.

The Early Archaic Period marks a period of significant change. The Pleistocene-Holocene transition brought warmer global temperatures and drier conditions in a
relatively short period of time resulting in marked environmental changes to both flora and fauna. The Early Archaic is characterized by successive tool technologies, logistically organized and mobile populations throughout the regional landscape, band-level societies (e.g. 25-50 individuals related by kinship marriage), gradual shift from formal to expedient tool kits and an overall shift towards foraging lifestyles. Across the Southeast, side-notched (e.g. Big Sandy), corner-notched (e.g. Palmer, Kirk Corner-Notched, and MacCorkle), and bifurcate based points (e.g. Lecroy) are used to identify Early Archaic sites ca. 8000-6000 BC (Anderson et al. 1996:15).

The Middle Archaic Period (ca. 6000-3000 BC) corresponds to the Hypsithermal climactic event, where trends of post glacial warming peaked and seasonal temperature extremes were greater (Anderson 2001:158; Bense 1994: 74; Sassaman 2010:21). As a result, riverine areas become more favorable than upland areas. It is a time of dramatic cultural change: shell and earthen mounds appear on the landscape as well as long-distance trade networks, new tool technologies are adopted, and increased evidence of violence related to social organization and territories appears (Anderson 2001; Lewis and Kneberg 1959; Lewis and Lewis 1961; Sassaman 2005, 2010). During the Middle Archaic, notched-projectile points become replaced regionally with stemmed-biface technologies such as Sykes/White Springs, Stanley Stemmed, Morrow Mountain/Eva, Kirk Stemmed/Serrated and Benton. Additionally, technological innovations involving groundstone (e.g. bannerstones, grooved axes and net sinkers), antler and bone tools appear across the landscape (Walthall 1980:58). Exploited resources include deer, turkey, turtle, various types of fish and mussels as well as plant food such as nuts and weedy annuals (Steponaitis 1986:371).
With the apex of the Hypsithermal interval and as the climate begins to ameliorate thereafter, climactic conditions and vegetation become similar to those of today (Sassaman 2010:23). These conditions fostered a significant increase in population size and were favorable for large-scale, sustained occupation in several regions (Sassaman 2010). In addition, the adoption of weedy plants into the diet, the use of containers and storage pits, intensification of long-distance trade, and the appearance of large dense middens typify the Late Archaic period from ca. 3000-1000 BC (Steponaitis 1986:373). Projectile points characteristic of the Late Archaic Period include: Ledbetter and Wade in the Eastern Highland Rim and fairly large asymmetrically-stemmed projectile points in the Ridge and Valley to the east such as Appalachian Stemmed.

One of the most important changes to take place during the Archaic Period was the increased importance placed upon native cultigens around ca. 4000 BP (Chapman 1985: 54-55; Smith 1989). In addition to hunting wild game like white-tailed deer and black bear, the gathering of wild, native plant foods was important (see Yarnell 1993). Local plant species such as sunflower, sumpweed, goosefoot, maygrass, knotweed, little barley, and local cucurbits/gourds have potential crop yields as high as 1000/kilograms/hectare (Smith 1992). These represent both “oily” and “starchy” seeds providing excellent sources of both fats and carbohydrates (Anderson 2001:161). As subsistence patterns shifted, so did settlement patterns, reflecting an increase in sedentism as compared to earlier periods.

The transition of nomadic hunting-gathering to horticulture and increased sedentism broadly correlates to the use of containers or vessels. Commonly referred to
as the “container revolution” (Smith 1986), this technological innovation spanning from 4500 to 2500 BP (depending upon regions/areas) marks the initial production of containers or vessels in the New World. Early forms are represented by modified bottle gourds, fiber-tempered pottery and steatite (soapstone) or sandstone vessels. Fiber-tempered pottery was produced by adding vegetable (fiber) matter, serving as a tempering agent, to the clay then molded into flat bottomed bowls or pans (Steponaitis 1986:373-374). Containers made from stone were carved from steatite or sandstone, commonly found throughout the Carolinas, northern Georgia and Alabama, and in eastern Tennessee. Steatite quarries are abundant in these areas and boulders would be carved, chipped off, and then scooped out to make round, flat-bottomed bowls. Even though the function(s) of these early containers are debated, it is reasonable to assume they were likely used for cooking and storage purposes.

Cultural and technological innovations came about during the span of the Archaic period as a result of the environmental changes taking place around these cultures. The container revolution as well as the beginnings of the Eastern Agricultural Complex would lay the groundwork for future agricultural innovations. These innovations, as well as environmental changes, would set the stage for an even more residential and stable lifestyle, reflected in the succeeding Woodland period.

**The Woodland Period (ca. 1000 BC to AD 1000)**

The Woodland Period is marked by gradual building on the innovations and ideas originating in the Late Archaic. This cultural period is traditionally divided into three segments; Early (1000-200 BC), Middle (200 BC-AD 400) and Late (AD 400-1000). These delineate intervals generally characterized by the “first widespread use of pottery
across the Southeast, the rise and then decline of a vast panregional ceremonially based interaction network, and, finally, a period of political fragmentation, increasing agricultural intensification and population growth in many areas” (Anderson and Mainfort 2002:1). The term ‘pottery’ is used here because it indicates a low fired, unvitrified form, whereas ‘ceramic’ denotes a high fired, usually glazed and vitrified form (Rice 1987:3).

The Early Woodland Period (1000-200 BC) in actuality represents more of a transitional time from the Late Archaic with the gradual adoption of pottery and a shift in subsistence and settlement patterns as well as the beginnings of plant cultivation (Watson 1989). Indeed, differentiating Early Woodland sites from Terminal Archaic ones is difficult in many areas of the Eastern Highland Rim. Indigenous seed-producing plants including goosefoot, maygrass, knotweed, sumpweed, little barley, and sunflower began to be systematically exploited and in some instances show morphological variations suggestive of initial domestication (Gremillion 1998, 2002).

The adoption of pottery technology is impossible to trace back to its precise inception as the use of clay does not appear to have originated in any single place and time in history. Rather the idea of clay to make pottery seems to have independently developed in a number of cultural centers once settlement mobility decreased. Regardless, the invention and use of pottery remains an important development. It infers a level of human knowledge of the properties of versatile earthy materials, e.g. clay, and the understanding of the transformation of clay bodies with the application of heat (Rice 1999:3-5).

The Watts Bar Phase represents the earliest phase in the Duck and Elk river valleys. It is characterized by the retention of Wade corner-notched and Adena-like
stemmed points in addition to quartz-tempered, fabric-marked pottery (Faulkner 2002:188) similar to the Watts Bar Fabric-Marked type ubiquitous to intensively occupied Early Woodland sites in the eastern Tennessee Valley (Lewis and Kneberg 1957). Two sites in the Normandy Reservoir produced Watts Bar Phase features ca. 750 BC and 475 BC from Nowlin II and Banks III, and contained “deep conical or deep circular storage pits and shallow circular basins, similar to circular storage pits and basins found on earlier Late Archaic sites in the area” (Faulkner 2002:188). The earliest *well-defined* Early Woodland phase in the region is the Long Branch, in which quartz-tempered fabric-marking is replaced by the use of limestone tempering, which also sees the introduction of stemless triangular projectile points (Faulkner 2002:189). In the Middle Cumberland River area, Jolley (1980) suggests a settlement pattern for the Early Woodland characterized by floodplain and upland sites and an extensive exchange network. The Colbert culture of northern Alabama is the most similar to Long Branch in the upper Duck Valley (Faulkner 2002:190). In the western Middle Tennessee Valley, the Colbert tradition is considered to be an Early Woodland manifestation diffused from the eastern Appalachians (Dye 1988).

The Middle Woodland Period, from roughly 200 BC-400 AD, comprises two main phases: the early Middle Woodland McFarland Phase and the late Middle Woodland Owl Hollow culture, both derived and defined in the Duck and Elk valleys (see Faulkner and McCollough 1973, 1974; Faulkner and McCollough eds. 1977, 1978, 1982a, 1982b; Kline et al. 1982; McCollough and Faulkner eds. 1976, 1978).

The McFarland Phase, 200 BC-AD 200, is characterized by the presence of high frequencies of medium-large sized unstemmed, triangular projectile points and
limestone tempered pottery types similar to those found in the northern Alabama Copena culture. According to Faulkner (1988:79), “formal features of McFarland habitation sites include earth ovens, cylindrical storage pits, windbreak shelters, and oval to round tensioned pole structures containing formal interior facilities such as storage pits and shallow basins” as well as fleshted inhumations and cremations at some sites.

The early McFarland (ca. 200-100 BC), is primarily categorized by limestone tempered fabric-marked vessels while limestone tempered check stamped (most frequent), simple stamped and complicated stamped types with podal supports become predominant during later McFarland occupation (ca. AD 100-200). Cord-marking is apparently a minor or rare surface treatment. A full understanding of the early McFarland is somewhat hampered due to the prevalence of cord-marking at some contemporaneous sites, prompting researchers (e.g. Bacon 1982) to define an Early Woodland Neel Phase which overlaps both the Long Branch and McFarland Phases. The Neel Phase seems to have close relations to the Lick Creek Phase in northern Alabama, and northwest Georgia, and is apparently more common further west in the Elk River drainage (Faulkner 2002:191). Faulkner (1988, 2002) suggests that sites such as Yearwood and Parks may have functioned as mortuary camps within the Neel Phase system. These sites have been interpreted as gathering points for not only the ritualistic disposal of the dead but also the redistribution of exotic goods (e.g. galena, copper and mica from Yearwood and a siltstone pipe, atlatl handle, and single sherd of limestone tempered red-filmed pottery from Parks) are consistent with the Hopewell Interaction Sphere (Faulkner 1988, 2002).
By the middle McFarland Phase, distinctive community and settlement patterns emerged consisting of "discrete dwelling and food processing zones, with cylindrical storage pits and shallow basins or hearths", that ultimately characterized the culture for nearly 200 years (Faulkner 1988:84). Furthermore, “these habitation sites were permanently occupied villages, but not occupied for long periods of time, indicating that frequent shifting of settlement to new hunting and gathering locales was still important” (Faulkner 1988:95). Late McFarland villages were considerably larger and likely affected by the establishment of the Old Stone Fort ceremonial center (40CF1). The McFarland site proper (40CF48) is located ca. 1.6km from the fort and represents the largest known habitation site of the culture (Faulkner 1988:85). While the function of Old Stone Fort is still unclear, it is obvious that prehistoric peoples in this region possessed a spiritual realm and expressed it upon the landscape.

During the late Middle Woodland Period, the Eastern Highland Rim is characterized by new traditions emerging in the Owl Hollow culture. The date range for the Owl Hollow Phase is AD 200-600. Community settlement patterns in this phase are characterized by large permanent villages with debris-free ‘plaza’ areas, deep and extensive middens and a dual house pattern represented by a “permanent oval double-oven winter lodge being the main structure type… the companion structure to the double oven house is the lighter constructed pole house” (Faulkner 1988:88). These settlement patterns further indicate the notion of increasing sedentism and dependence upon cultivation during the late Middle Woodland. Diagnostic projectile point types include Spike Cluster and expanding stemmed and side-notched points (Faulkner 1978:197, 2002:199), replacing the stemless triangular points of the earlier McFarland.
Owl Hollow pottery is characterized by limestone tempered wares. However, a small but consistent quantity of mixed limestone and chert, chert, quartz and other forms of grit temper are present in Owl Hollow assemblages (Cobb 1982; Faulkner 1978). Both simple stamped and plain surface treatments are represented with the former more prevalent in early Owl Hollow contexts and the latter becoming more common later in Owl Hollow. Check stamping, complicated stamping, and cord-marking occur in much lower frequencies and thus are a minority ware; however, only trace amounts occur toward the end of the phase (Faulkner 1978:189-191, 2002:199). The predominant vessel forms are sub-conoidal jars with slight shoulder development; rim forms are straight to slightly flaring, and notched-lips are common. Vestigial podal supports occur in the early Owl Hollow but also disappear around AD 400 towards the end of the Owl Hollow Phase.


In the upper eastern Tennessee Valley, the Middle Woodland cultures are represented by the Candy Creek and Conestee phases (200-600 AD). The Candy Creek Phase was defined by Lewis and Kneberg (1941, 1946) and is characterized by limestone-tempered plain, fabric-marked, and fine-cord marked as well as stamped types (simple stamping, check stamping, and complicated stamping). McCollough and Faulkner (1973:95) argue for another Middle Woodland phase for the region due to the numerous combinations of surface treatments and temper types. The Conestee Phase
is predominantly represented by sand tempered pottery. Common surface treatments are represented by brushed, plain, simple stamped, cord-marked, check stamped and fabric-marked types. Projectile points for these phases continue to be unstemmed-triangular forms.

The Late Woodland in the Eastern Highland Rim is represented largely by the Mason Phase (Faulkner 1968a, 2002). Dating to circa AD 800, this phase appears in the upper Duck and Elk river valleys and “represents a major break in the technological and social traditions that had existed in this area for centuries” (Faulkner 2002:199). Community patterning in the Mason Phase replaces the formal village structure of the preceding Owl Hollow Phase with smaller, more dispersed communities with features being irregularly placed and configured (Faulkner 2002). Diagnostic projectile points in this phase are small unstemmed-triangular points (Duggan 1982; Faulkner 1968a); however, these types are common in Mississippian contexts throughout the region (Jolley 1979:47). Chert tempered pottery especially a knot-roughened/net impressed surface treatment is highly diagnostic for the Mason Phase (see Faulkner 1968a, 1968b). Limestone tempering occurs during this phase as well the following surface treatments: cord-marking, fabric-impressing, as well as some plain and check stamping.

In eastern Tennessee, the Late Woodland period is less well understood and documented. The Hamilton Phase, originally defined by Lewis and Kneberg (1946), is the only defined Late Woodland culture for East Tennessee. Projectile points are small, triangular, unstemmed forms (e.g. Hamilton Incurvate and Madison types). Early Hamilton pottery types are limestone tempered, cord-marked, with plain vessels occurring and become more predominant by the late Hamilton Phase. Settlement
structure in the Late Woodland of eastern Tennessee is also poorly understood as few archaeological sites have been identified. Lewis and Kneberg (1946) identified “individual household” middens strung along the river banks, thought to represent year round occupations. The abundance of shell was thought to reflect “the staple protein source” (Lewis and Kneberg 1946:44). However, excavations at the Doughty site showed evidence for winter and early spring camps occupied by small family groups (McCollough and Faulkner 1973:124-129). McCollough and Faulkner (1973) further postulate that both caves and rockshelters in the adjacent uplands (e.g. the Cumberland Plateau) were used by males as hunting camps. While some sites on the Cumberland Plateau probably were hunting camps, it is now clear that prehistoric people were utilizing the area for a variety of functions.

By the Late Woodland, regional interactions increase significantly, populations become larger, and evidence for increased violence begins to emerge (Anderson 2001). It is a period in which bow and arrow technology developed in addition to intensive corn agriculture (in some areas) and chiefdoms. Burial mounds and mortuary rituals continue; however, these became simpler and less elaborate than earlier due to the more common practice of primary burials. In addition, grave offerings become less elaborate, exotic materials virtually disappear, while shell pendants and beads become the primary artifact associated in burials (Steponaitis 1986: 384-385).

The Mississippian Period (ca. AD 1000 to AD 1600)

The Mississippian Period is the final period in Southeast North American prehistory and represents the “pinnacle of religio-socio-political complexity” of societies (Chapman 1985). Across Tennessee, this 700 year span represents one in which clear
ascribed status was present and it is marked by the rise and fall of several regional polities. Chapman (1985:74) lists several characteristics that demarcate, at its peak, the Mississippian Period:

(1) the construction of earthen platform mounds on which were erected temples, elite residences, and council buildings, (2) the arrangement of mounds and the individual household structures around open plazas, (3) increased population and more stable settlements than in the preceding Woodland period, (4) the emergence of organized chiefdoms, (5) increased territoriality and warfare, (6) elaborate and well developed religious ceremonialism (the Southern Cult), (7) a dependence upon new and improved strains of corn and the introduction of beans, and (8) morphological changes in ceramics and a fluorescence in ceramic styles.

The Mississippian people developed a highly elaborate ceremonial complex of which traces can still be seen today in many Native American cultures. This complex has been historically known as the Southeastern Ceremonial Complex (SECC) or the “Southern Cult” (Waring and Holder 1945) and is described as a complex of display goods or paraphernalia of a cult. Essentially, it was the material expression of a short-lived religious focus which crosscut regional cultures. However, archaeologists have argued recently against this term (Knight 2006) as including the divergent trajectories of art, iconography, ritual and exchange during the Mississippian Period throughout the Southeast. Manifestations of the culture’s religious practices include distinctive iconography in the form of symbols or motifs (e.g. cross, circle, bi-lobed arrow, mace and monolithic axe), animal forms (e.g. the Birdman, various birds of prey and rattlesnakes), ceremonial objects (e.g. masks, monolithic axe, and copper plates), costume embellishments (e.g. antlered head-dress, skirt, and feathers and bands) and human forms (e.g. hands, feet, heads and full bodies) (Henson 1986:90; Waring and
Holder 1945). These iconographic symbols are enveloped in how Mississippians viewed the cosmos; these religious beliefs permeated both the sacred and profane realms of Mississippian culture.

In East Tennessee, the Mississippian Period is divided into three primary phases: the Martin Farm, Hiwassee Island, and the Dallas phases. The earliest, Martin Farm Phase (AD 900-1000) in actuality represents the transition between Late Woodland and fully developed Mississippian lifeways or the emergence of the latter (Faulkner 1977). The Emergent Mississippian designation is due to evidence which supports that cultural innovations during this period were the product of indigenous developments (Schroedl et al. 1990). This phase is characterized by a mixture of both limestone tempered and shell tempered pottery types such as cord-marked and plain Schroedl et al. 1990:185). Martin Farm settlements are relatively similar in population size to the Late Woodland and are located primarily on first river terraces. Mortuary practices remain the same; however, conical burial mounds are present (Lewis and Kneberg 1946).

The Hiwassee Island Phase represents the “classically” defined Mississippian Period and manifests around AD 1000-1300. During this phase, pottery assemblages contain much more shell tempered pottery than the earlier Martin Farm Phase. Surface treatments represented include predominantly plain, with some cord-marking, fabric-marking, complicated stamping and occasional red-filmed surface treatments. Projectile points in both the Martin Farm and Hiwassee Island phases are represented by small-triangular Hamilton, Madison and incurvate blade types. Community patterns between these two phases are the only real differences. Although construction is similar,
Hiwassee Island villages are larger and more complex and are mostly located on second terraces.

The Late Mississippian Dallas Phase (after the Dallas type site 40HA1) succeeds the Hiwassee Island Phase in the eastern valley (Chapman 1985, Lewis and Kneberg 1995). These settled villages are also typically located on second river terraces and show evidence of marked population increase. Pottery is still largely shell tempered plain, with some cord-marking; both are considered diagnostic. It is also during this phase that negative-painted pottery appears. Projectile points are still characterized by small-triangular forms, with the diagnostic type being Dallas Excurvate. Another Late Mississippian phase, the Mouse Creek Phase (AD 1400-1600) has been identified but confined to the lower Hiwassee River and the adjacent portions of the Tennessee River. What this phase actually represents is debated. Schroedel (1988) suggests this phase is intermediary between the Dallas Phase and proto-historic Cherokee.

Mississippian long distance trade networks, as well as the monumental construction that so characterized the period began to decline with the onset of the Little Ice Age and the end of the Medieval Warm Period (Anderson 2001: 166). Several Mississippian chiefdoms were unable to sustain themselves without sufficient agricultural production. By the time of the first European contact the Mississippian culture was in dramatic decline and the disease and turmoil brought on by European arrival finally resulted in a complete collapse (Steponaitis 1986:393).

In the following section, a short survey of rock art in the Eastern Woodlands is presented. This includes both methods for interpreting and describing the art as well as a brief review of rock art sites in the Southern Cumberland Plateau.
Rock Art in the Eastern Woodlands

The rich and diverse inventory of prehistoric rock art in the eastern Woodlands has only been relatively recently acknowledged and studied. It was not until the 1960's that intensive effort to locate and systematically record rock art sites began. For Tennessee in particular, emphasis upon rock art was stimulated by the discovery of Mud Glyph Cave in 1979, the first dark zone cave art site recognized in North America (see Faulkner 1986). Since then, extensive research has been devoted to locating and documenting rock art sites along bluff lines and within the dark zones of caves to understand this elaborate art tradition and to further understand how prehistoric peoples situated themselves upon the landscape. In the Southern Appalachian Plateau region, it is clear that rock art was produced in both cave and rockshelter contexts from the Archaic to the Historic periods (Simek et al. 2001) and is always (in addition to earthen mounds found throughout the New World) “the most visible archaeological evidence of prehistoric religious and magical ritual in eastern North America” (Faulkner 1996:111). Furthermore, once “enough sites have been recorded in several areas that it is possible to identify regional styles that can be attributed with some degree of confidence to specific cultures” (Faulkner 1996:1). While art has been documented in both open air and cave contexts, the former will be primarily emphasized here.

There are two predominant categories of rock art, pictographs and petroglyphs. Petroglyphs are engravings, carved into the surface of natural rock. This term comes from the Greek word petros meaning “stone” and glyphein meaning “to carve”. Techniques used to produce petroglyphs include incising, pecking, rubbing and drilling (Henson 1986:87). Pictographs are painted on the natural rock surface by the process
of applying pigments, most often black or red. Regardless of color, the pigments are typically ground and then mixed with a liquid and/or binding agent. Paint recipes in the Southeast vary with respect to additives but primarily consist of charcoal and clay for black pigments and red ochre or hematite and clay for the red paints. White paint can also be produced and is made from natural chalk, kaolinite clay, or diatomaceous earth (Whitley 2011:24). Occasionally other binders such as gypsum (probably mined from caves) are added. Thus, the paint may also be important in understanding the beliefs and rituals of those who created the art. In many non-Western cultures, the production of rock art was created during rituals and itself tied into the culture’s belief system.

One of the most difficult aspects of studying prehistoric rock art is interpreting what the images represent or mean and why artists chose to depict them (Simek and Cressler 2001):

The distinctive character of a group of rock art arises therefore from a variety of human choices: the subjects depicted; the technology used with the picture making methods it permits or suits; and the choice of conventions in dealing with the myriad individual picture problems that arise in reducing the complex three-dimensional to the simplified two-dimensional [Chippendale 2001:260].

Furthermore it is difficult to separate one’s own cultural views from those that might characterize images produced by prehistoric societies. However, archaeologists can use both formal and informed approaches to logically interpret, define and categorize images from the prehistoric past (Whitley 2011).

Perhaps one of the simplest methods of delineating rock art meaning is through its patterning (Faulkner 1996:111). There are several reoccurring designs that correspond to the mythological beliefs of prehistoric inhabitants. Research conducted
under the University of Tennessee, Cave Archaeology Research Team (CART) has documented a number of cave and open air rock art sites revealing an overarching spatial pattern concerning the location of sites and context in which particular types of paint colors occur. A correlation between motifs depicted in some contexts is also apparent (Simek et al 2009). These stylistic affiliations can play an important part in warranting hypotheses on the social and ideological implications of the art.

Henson (1986) suggests that many art sites were probably utilitarian in use as rest stops, for short habitation, and for general hunting purposes. However, not all rock art sites can be ascribed to a purely utilitarian interpretation. Special purpose rock art sites can also be described as being private, semi-private, or public, dependent upon context (Docktor 1983:63). Those described as “private” are ritual sites which were likely viewed by only a few members of a society. These sites are small on average and somewhat inaccessible. On the other hand, “public” ritual or ceremonial sites are open, large and easily accessible. These types of sites may have been used for performing hunting rituals or other socio-religious activities. Regardless, ritual sites likely possess ceremonial or shamanistic implications that cannot be readily ignored, especially if archaeological deposits are associated (Lewis-Williams 2002).

Rockshelter Sites

Over the past few years, a number of open-air bluff sites have been documented along the Cumberland Plateau comprising both petroglyph and pictograph forms of rock art. Several pictograph sites have been recorded on the Domain of Sewanee: The University of the South. Rock art sites in this area possess a rather uniform theme: art produced in shelters of the Pennsylvanian sandstone geologic layer, and
anthropomorphic representations with extremities emphasized or enlarged. One such site, the McCollough Site, contains upwards of six pictographs, and was recently visited to collect artifactual data to determine the chronology of the site. This site had been looted extensively, with spoil piles some 35m long, 2 m wide and half a meter in height. Despite this condition, a very diverse and rich assemblage was recovered including a variety of Archaic and Middle and Late Woodland projectile points and both Woodland and Mississippian pottery. The main group of pictographs includes three human stick figures. One of these figures exhibits a long neck and extended digits, which is not an uncommon characteristic for the area. Another one however, is uncommon with “open” or negative painted eyes.

The Moonshadow Site located in Hamilton County, Tennessee, is a small south-facing sandstone shelter, containing a series of pit and groove petroglyphs (Figure 3). Bart B. Henson (1986) first reported on this site and suggested a Late Woodland association based on artifacts discovered in the drip line (Faulkner 1996:113; Faulkner et al. 2004; Henson 1986:106). Subsequent visits were made in 2001 in an effort to systematically document and record the art. As is the case for many open-air sites in the southern Plateau, the main deposits were completely looted up to a depth of around 75cm. Five spatially discrete petroglyph panels are present consisting of two pit and groove concentrations, so-called “turkey track” elements, linear and geometric overlays, clusters of small pits, and a possible stick figure quadruped or an anthropomorph figure.
In addition, a faint red-pigment pictograph of a two-legged anthropomorph with apparently long arms or possibly wings was discovered in 2011 during a recent visit to the site. Several artifacts were recovered by sifting through the looter spoil-piles, and the context of the artifacts, and the chronological information they yield suggest small scale, intermittent occupations beginning in the Middle Archaic and continuing through the Middle and Late Woodland, into the Mississippian (Simek et al. 2012).

The occurrence of both pictographs and petroglyphs at a single location has only been documented at one other bluff locality. The Cross Site in Grundy County is a high, but shallow sandstone shelter, possessing at least four red pictographs and numerous incised petroglyphs (Henson 1986:96; Faulkner 1966:112). One of the pictographs may
represent a human figure with spread hands, while another depicts a human stick figure with “no discernible head but with extended, downturned arms and legs” (emphasis added; Faulkner 1996:112). No apparent habitation is associated with this site due to the extensive rock fall and small nature of the shelter itself.

Further north in Van Buren County, is another small south-facing sandstone bluff shelter site containing numerous petroglyphs along the back wall. Glyphs consist primarily of deeply incised linear and rectilinear shapes such as simple and complex crosses, turkey tracks, numerous drill holes as well as two motifs interpreted as vulva-like (Henson 1986:94). Analyzed artifacts from the shelter indicate occupation from Late Archaic through the Emergent Mississippian periods with the Late Woodland/Emergent Mississippian being the most intensively occupied period.

This short discussion of rock art in the Eastern Woodlands, particularly the South Cumberland Plateau serves as a basis for which the Griffin Rockshelter petroglyphs are compared. Similar production methods and design elements are present in many rock art sites throughout this area. The following chapter describes in detail the site background and history of the Griffin Rockshelter and the Uzzelles Site.
Chapter III: Site Background

The Griffin Rockshelter (40FR151)

The Griffin Rockshelter is a relatively small sandstone shelter located in Franklin County, Tennessee on the Sinking Creek quadrangle topographic map. The site is approximately 1 mile southeast of the small community of Sherwood, Tennessee. Declination of the shelter is west facing at 270°, and it is located at the base of a sandstone bluff which extends down 30-35 meters from the scarp edge at 1744 meters AMSL. Additionally, a southward flowing tributary of the Tennessee River, Crow Creek, runs 900 feet beneath the shelter entrance. The shelter measures approximately 4.27m by 3.05m, and approximately 1.83m in height at the entrance (Figure 4). The roof gradually slopes towards the sides of the shelter (north to south) and slopes more abruptly towards the rear (east). This bi-lobed shaped shelter is dry and contains around 8 square meters of floor space. Additionally, in close proximity approximately 45-50 meters to the north, is another small rock shelter from which a spring emerges. With regards to spatial organization the Griffin Rockshelter is situated geographically in close proximity to a continuous water source (Crow Creek) and the plateau surface above the shelter. Nearby, some 60 meters north of Griffin, the Mandy Hollow Branch flows off the plateau into Crow Creek below, and at this break in the escarpment wall, the plateau surface can be easily accessed. Therefore, this shelter is situated so that prehistoric peoples had easy access to the site either from the top of the plateau, or from the valley below.
The Griffin Rockshelter was first reported by Mike Garner and subsequent excavations at the shelter were conducted in the winter of 1974-75 under the aegis of the University of Tennessee at Chattanooga at the direction of Dr. Duane King. A wealth of cultural materials was recovered and the shelter was entirely excavated. Unit excavations were gridded into roughly 1 x 1 meter squares (3 x 3 foot squares). However, due to the confines of the shelter, not all units are equal in size, those closer to the inner walls being considerably smaller. A total of 18 units were excavated to bedrock. The natural stratigraphy in the shelter was recorded; however, excavations following the natural strata appeared too complicated and units were excavated in arbitrary levels. Units were initially excavated in 15.24cm (0.5 feet) arbitrary levels. But,
after excavating four units to a total of 1 foot (2-15.24cm levels), more control over provenience of artifactual material was needed and the decision was made to excavate remaining units in a second level (designated B1) of 9.14cm (0.3 feet) and then continue in 6.09cm (0.2 feet) levels to bedrock. All unit levels were dry screened through ¼” mesh and more than 76.2m of cultural deposits bearing artifacts were uncovered.

This shelter contained only one centrally located large feature covering an area approximately 1.82m in diameter (Figure 5 and 6). The feature, designated Feature #1, originated 30.48cm below the surface and extended 15.24cm deep in the deposits. The feature was composed primarily of ash, charcoal, burned limestone and contained a substantial artifact assemblage including fauna, shell and pottery. This feature most likely represents a hearth or roasting pit. All artifacts were bagged separately from those of the same level and square. While the primary focus of this thesis pertains to the pottery recovered from this site, a comprehensive discussion of all cultural materials at the site is presented in order to understand the function of this prehistoric site.

A complete analysis of the Griffin Rockshelter faunal remains is currently underway. Thus only preliminary results on the significant volume of material are reported. A variety of animals is represented including but not limited to turtle, black bear and white tailed deer in addition to gastropods and mussel shells. Both aquatic and land gastropods are represented at the site and comprise a total NISP of 511 and 182 respectively, while mussel shells comprise 409 of the total recovered remains. The total faunal assemblage comprises approximately 2,211 bone fragments. Interestingly, the highest concentration of faunal materials is centrally located in the northern portions of
the shelter and the highest concentration is found within the main hearth feature which cuts across squares 3E3, 3E6, 6E3, and 6E6 (Figure 5 and 6).

Figure 5: Plan view map of the Griffin Rockshelter.

A full analysis of the material will significantly aid in the overall investigation of site function. However, faunal remains already indicate a variety of subsistence resources being utilized at this shelter and a majority of the bone fragments exhibit evidence of burning.
Figure 6: Original plan view map from 1974-75 excavation of the Griffin Rockshelter.
So far, only one Carbon-14 sample was obtained from the rear of the shelter in unit 6E9 level B at 0.24-0.30m below the surface. The sample was sent to the University of Georgia Geochronology Lab and yielded a determination of 1050 ± 55 BP (cal. A.D. 966±54), representing a late-terminal Woodland/Early Mississippian period affiliation. Additionally, only one float sample was taken from square 3E3 level H at 0.60-0.67m below surface, presumably to recover plant remains. This sample has yet to be comprehensively analyzed. A paleobotanical analysis will significantly aid in understanding the seasonality and type of plant use at this shelter.

A preliminary report on a lithic analysis from the Griffin Rockshelter was written by James F. Bates in 1981, then a master's student at the University of Tennessee, Knoxville. A total of 10,975 lithic artifacts was recovered from the shelter. Lithic types and raw materials represented in the assemblage are quite varied. Material descriptions were based on macroscopically observable characteristics with reference to classifications used during the Normandy Archaeological Project (Faulkner and McCollough 1973; Penny and McCollough 1976). A majority of the material represented in the lithic assemblage is local in origin, although a small portion of the assemblage may be from more distant locales. A total of 14 raw material types were defined and are listed in Table 1. The source of the Dark Gray Chert was located by Bates west of the shelter in the shaly dark gray limestone of the Mississippian Pennington Formation. A thin band (approximately 30 cm thick) of nodule outcrops occurs on Mandy Branch, which flows below the shelter into Crow Creek. The nodules vary in shape from irregular, flattened, and ovoid and were interspersed at intervals of up to one foot. The chert nodules also ranged in thickness anywhere from 0.30-1.0 cm in diameter.
Table 1: Raw Material Distribution at the Griffin Rockshelter.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Number</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>Dark Grey Chert</td>
<td>5,489</td>
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<tr>
<td>B</td>
<td>Grey and Tan Chert</td>
<td>3,462</td>
</tr>
<tr>
<td>C</td>
<td>Variegated Nodular Chert</td>
<td>354</td>
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<td>D</td>
<td>Blue-Green Nodular Chert</td>
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<tr>
<td>E</td>
<td>Black Vitreous Nodular Chert</td>
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<tr>
<td>F</td>
<td>Fossiliferous Chert</td>
<td>29</td>
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<tr>
<td>G</td>
<td>Parallel Banded Algal Chert</td>
<td>104</td>
</tr>
<tr>
<td>H</td>
<td>Vien Quartz/Chalcedony</td>
<td>11</td>
</tr>
<tr>
<td>I</td>
<td>Horse Mountain Agate</td>
<td>17</td>
</tr>
<tr>
<td>J</td>
<td>Limestone</td>
<td>667</td>
</tr>
<tr>
<td>K</td>
<td>Sandstone</td>
<td>291</td>
</tr>
<tr>
<td>L</td>
<td>Siltstone/Mudstone</td>
<td>24</td>
</tr>
<tr>
<td>M</td>
<td>Limonite/Hematite</td>
<td>23</td>
</tr>
<tr>
<td>N</td>
<td>Other (Porcelaneous Chert)</td>
<td>1</td>
</tr>
</tbody>
</table>

Large water worn cobbles and broken chunks of Gray and Tan Chert types, the second most abundant raw materials represented, were also located below the shelter in Mandy Branch, and appear to have originated from tabular beds in the local Mississippian Bangor limestone or perhaps in limestones in the lower Hartselle Formation. Chert of this type is extremely variable in coloration from light blue and blue-gray to light gray and buff, to tan and pink. The pink coloration of this type occurs when the material is heat-treated (Hood and McCollough 1976: 197-206). Additionally, some of the tan chert cobbles contained blue-gray interiors with white inclusions. Retouched artifacts recovered from the shelter include all of the various colorations abovementioned.
Several formal lithic types are represented in the shelter’s assemblage. Primary lithic types include a variety of cores (subconical, discoidal & amorphous), flakes (utilized, bifacial thinning, core trimming, and retouched), and a single hammerstone. Unifacial and bifacial implements are composed of various types of scrapers, gravers, perforators, denticulates, drills, knives and several amorphous forms (see Table 2). In addition, several groundstone implements such as pitted cobbles, pestles, and abraders were recovered. Preliminary analyses of the projectile points from the Griffin Rockshelter reveal types spanning the Late Archaic through Late Woodland Periods. A total of six Archaic projectile points, 5 Woodland, and 7 Late Woodland/Emergent Mississippian projectile points have been identified. Archaic Period projectile points include 2 indeterminate, 1 Middle/Late Archaic Benton, 1 Ledbetter, 1 Pickwick and 1 unidentifiable stemmed corner-notched point. Early and Middle Woodland types include 3 indeterminate triangulars, 1 Adena, and 1 Copena. Lastly, Late Woodland/Emergent Mississippian types include 1 Jacks Reef pentagonal, 5 Madison/Hamilton forms and 1 Bradley Spike.
Table 2: Total of each typological category of lithic artifacts recovered from the Griffin Rockshelter. All typological categories based on the Normandy Archaeological Project. The projectile points/knives have been updated to formal designations.

<table>
<thead>
<tr>
<th>Type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Lithic</strong></td>
<td></td>
</tr>
<tr>
<td>Hammerstone</td>
<td>1</td>
</tr>
<tr>
<td>Crude Subsonical Core</td>
<td>5</td>
</tr>
<tr>
<td>Discoidal Core</td>
<td>1</td>
</tr>
<tr>
<td>Amorphous Core</td>
<td>100</td>
</tr>
<tr>
<td>Core Trimming Flake</td>
<td>1873</td>
</tr>
<tr>
<td>Flat Flake</td>
<td>2133</td>
</tr>
<tr>
<td>Bifacial Thinning Flake</td>
<td>2525</td>
</tr>
<tr>
<td>Utilized Flake</td>
<td>674</td>
</tr>
<tr>
<td>Misc. Retouched Flake</td>
<td>51</td>
</tr>
<tr>
<td><strong>Unifacial Implement</strong></td>
<td></td>
</tr>
<tr>
<td>End Scraper on Flake</td>
<td>13</td>
</tr>
<tr>
<td>Side Scraper on Flake</td>
<td>11</td>
</tr>
<tr>
<td>Transverse Side Scraper</td>
<td>1</td>
</tr>
<tr>
<td>Truncated Flake</td>
<td>5</td>
</tr>
<tr>
<td>Notched Flake</td>
<td>1</td>
</tr>
<tr>
<td>Perforator</td>
<td>2</td>
</tr>
<tr>
<td>End and Side Scraper</td>
<td>2</td>
</tr>
<tr>
<td>End Scraper/Perforator</td>
<td>2</td>
</tr>
<tr>
<td>End Scraper/Graver</td>
<td>2</td>
</tr>
<tr>
<td>Misc. Unifacial Implements</td>
<td>6</td>
</tr>
<tr>
<td><strong>Bifacial Implements</strong></td>
<td></td>
</tr>
<tr>
<td>Misc. Thick Biface: Amorphous</td>
<td>36</td>
</tr>
<tr>
<td>Thick Biface: Blank, Roughout</td>
<td>3</td>
</tr>
<tr>
<td>Knife, including asymmetrical</td>
<td>6</td>
</tr>
<tr>
<td>Preform: knife</td>
<td>8</td>
</tr>
<tr>
<td>Core scraper</td>
<td>9</td>
</tr>
<tr>
<td>End Scraper</td>
<td>3</td>
</tr>
<tr>
<td>Side Scraper</td>
<td>1</td>
</tr>
<tr>
<td>Denticulate</td>
<td>1</td>
</tr>
<tr>
<td>Type</td>
<td>Total</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Graver</td>
<td>1</td>
</tr>
<tr>
<td>Splintered Wedge</td>
<td>8</td>
</tr>
<tr>
<td>Misc. Bifacial Implements</td>
<td>7</td>
</tr>
<tr>
<td>Projectile Points/Knives</td>
<td></td>
</tr>
<tr>
<td>Archaic Period</td>
<td></td>
</tr>
<tr>
<td>Benton</td>
<td>1</td>
</tr>
<tr>
<td>Ledbetter</td>
<td>1</td>
</tr>
<tr>
<td>Pickwich</td>
<td>1</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>2</td>
</tr>
<tr>
<td>Unidentifiable stemmed corner-notched</td>
<td>1</td>
</tr>
<tr>
<td>Woodland Period</td>
<td></td>
</tr>
<tr>
<td>Adena</td>
<td>1</td>
</tr>
<tr>
<td>Copena</td>
<td>1</td>
</tr>
<tr>
<td>Indeterminate triangular</td>
<td>3</td>
</tr>
<tr>
<td>Late Woodland/Emergent</td>
<td></td>
</tr>
<tr>
<td>Madison/Hamilton</td>
<td>5</td>
</tr>
<tr>
<td>Bradley Spike</td>
<td>1</td>
</tr>
<tr>
<td>Mississippian Period</td>
<td></td>
</tr>
<tr>
<td>Ground Stone Implements</td>
<td></td>
</tr>
<tr>
<td>Pitted Cobble</td>
<td>21</td>
</tr>
<tr>
<td>Ground and battered cobble, Type A</td>
<td>12</td>
</tr>
<tr>
<td>Sandstone abrader</td>
<td>2</td>
</tr>
<tr>
<td>Worked siltstone</td>
<td>1</td>
</tr>
<tr>
<td>Ground and faceted hematite</td>
<td>2</td>
</tr>
<tr>
<td>Additional Types</td>
<td></td>
</tr>
<tr>
<td>Sandstone pestle</td>
<td>1</td>
</tr>
<tr>
<td>Blue-green nodular cobble</td>
<td>1</td>
</tr>
<tr>
<td>Ground limestone artifact</td>
<td>2</td>
</tr>
<tr>
<td>Limestone bell shaped pestle</td>
<td>1</td>
</tr>
<tr>
<td>Lithic Shatter</td>
<td>3393</td>
</tr>
</tbody>
</table>
The most interesting recovered artifacts are some of the chipped stone tools from the site. One complete projectile point, stylistically indicative of the Archaic Period, was found in an upper excavation level and exhibits a heavy wear pattern along the point tip. These pieces along with four others including one small drill were sent to Dr. Maureen Hayes at the College of Charleston to analyze any recognizable use-wear patterns. For comparison, I used an experimental projectile point piece and incised a sample of sandstone acquired from the shelter to produce a characteristic signature for sandstone carving. The point was made by a modern flint-knapper out of the local Knox chert variety to be specifically used as an experimental piece in usewear projects. The experiment consisted primarily of incising, with the tip of the projectile point to produce a rough “turkey track” glyph (Figure 7).

Figure 7: Micro-usewear experiment conducted as a comparison to usewear on archaeological projectile points from Griffin exhibiting extreme tip wear.
Total elapsed time spent incising into the sandstone chunk was upwards to 2.5 hours over the course of a few days. Measurements of the experimental point were also taken before and after the experiment in order to assess how much, if any, the grinding wore down the point tip. While this experiment was brief, measurements afterwards show a decrease in length by 0.38 mm.

Out of the six archaeological pieces analyzed microscopically, two showed patterns consistent with the experimental piece (one shown in Figure 8). Attributes that distinguish the experimental piece were apparent and the same patterns were clearly observed on both of the archaeological projectile points. The archaeological point with the heaviest wear was recovered from Unit 6E3 Level B at 0.15-0.30m below surface within close proximity to and in the same level as the radiocarbon date. The point however, is stemmed triangular type; stylistically indicative of the Woodland Period (possibly part of the Copena or Greenville cluster). The second point was found in Unit 3E6 Level A at 0.0-0.15m below surface and is stylistically similar to the Morrow Mountain type in the Archaic Period. Given the consistencies seen, these projectile points may have been used to produce the petroglyphs at the site. Stratigraphically both points were found in the uppermost levels of the shelter at the same level as the Late Woodland-Emergence Mississippian radiocarbon date. It is important to note the chronological differences between the style of the implements that might have been used to produce the glyphs and the period in which they were likely used.
Through the preliminary analysis above, it can be determined that prehistoric people utilizing Griffin probably obtained lithic raw materials locally (from the Mandy Branch tributary) and that these materials were simply collected rather than “quarrying” due to the ease of acquisition in the stream bed (Collins 1975:19). Additionally, almost all reduction phases are included from cores to flakes, indicating that some form of lithic production and retouch took place at the site. Yet projectile points remain the most
common tool form from the shelter, some of which could have been used to make the rock art. Other projectile points from the site are primarily represented by small triangular, Late Woodland forms (e.g. Hamilton/Madison types), lending for the support to a Late Woodland/Emergent Mississippian Period occupation of the site.

Griffin contains a substantial amount of prehistoric rock art lining the interior of the shelter. Drawing on stone may be produced through various techniques, however only incising, rubbing and drilling are represented at the Griffin Rockshelter. Incising creates a line or groove in the stone and is typically used to produce fine and careful detail. Rubbing techniques include smoothing an incised or pecked feature through grinding or polishing with a harder stone implement. Lastly, drilling consists of outlining or defining a feature by drilling a series of closely-spaced holes (Henson 1986: 87). Griffin exhibits glyph patterns of drilled holes and long linear lines and which are predominantly pit and linear groove glyphs. Animal track glyphs such as deer and turkey are also represented. It is important to note that these glyphs are not haphazardly scattered around the shelter but comprise discrete “panels” of artwork (Figure 9). This suggests that the artwork is temporally constrained to one time period and planned, rather than produced at multiple independent periods of construction (Henson 1986)
Figure 9: Petroglyphs at the Griffin Rockshelter depicting "panels" on the left and on the right depicting both incising and pit and groove glyphs.
The most complex image is an elliptically shaped concavity with peripheral rays, containing anthropomorphic creatures (Figure 10). Dimensions recorded by King during excavations of the figure are 0.27m wide and approximately 0.38m long.

![Figure 10: Anthropomorphic figures at the Griffin Rockshelter (photo courtesy AlanCressler).](image)

These anthropomorph figures bear appendages on the head, and similar ones are known from both the sites across the southern Plateau like the University of the South and sites in northern Alabama, which is suggestive of a unitary and consistent South Cumberland rock art type which is distinct from that in other regions of Tennessee.
(Simek et al. 2009: 78). The concentration and stylistic elements of the petroglyphs have been used by both Duane King and B. Bart Henson (1986) to describe Griffin as possibly representing a “shrine”. In one sense this word can represent a receptacle for sacred or religious symbols or in a larger sense the glyphs can be attributed to a place that is dominated by activities which are primarily religious or ceremonial in nature. The symbolic nature of the glyphs might also explain why ‘ancestral’ projectile points were used to produce them.

While excavating the shelter King and colleagues also surface collected an open air site in the valley floor beside Crow Creek. Artifacts were solely prehistoric in origin and consist of predominantly lithic projectile points, cores, and flakes with a sparse sample of limestone tempered pottery. As recorded in the personal notes of King, this open air site is believed to be associated with the rockshelter site situated directly above along the bluff line, through the association of Woodland Period artifacts and close proximity. Although a link between these two sites, open air and rock shelter, cannot at present be made with certainty, the presence of another contemporary prehistoric site in such close proximity to Griffin indicates that this area, both valley and bluff was utilized as a part of a complex prehistoric landscape during the Woodland Period.

The Uzzelles Site (40FR267)

The Uzzelles Site is 5-10 kilometers North-East of the Griffin Rockshelter, on the University of the South (Sewanee) Domain. This shelter is large in comparison to Griffin (Figure 11) ca. 14 m long and 6 m deep. Deposits are roughly one meter in depth,
dropping off steeply towards the front of the shelter at the dripline. Excavations at the
Uzzelles Site began in the summer of 2009 and concluded in 2010 under the direction
of Dr. Sarah Sherwood through an archaeological field school at the Sewanee
Environmental Institute (hereafter SEI).

Vandals disturbed the pristine shelter only weeks before the initial field school
began. The looter damage included removal of almost 4-5 square meters along the
back wall and random potholes within the dripline. In this region of Appalachia,
artifact/relic hunting or looting has been a local pastime and rite of passage for more
than 100 years. Many rockshelters in the research area are vandalized to varying
degrees and unfortunately the Uzzelles Site was no exception. Although the depths of
this destruction event vary, test units primarily affected include Units 1, 2, 6, and 10
(Figure 12).
Figure 11: West facing view of the Uzzelles Site after 2009 field excavation (photo courtesy Alan Cressler).
Figure 12: Plan view map of the Uzzelles Site (courtesy Nicholas P. Herrmann).
Nevertheless, over the two summers of excavation, a total of 15, 1 x 1 meter test units was excavated in a contiguous block, save two units, one located in the upper talus, beyond the dripline (Unit 8) and one in the western portion of the shelter (Unit 15) (Figure 12). Units were primarily excavated in arbitrary 10 cm levels and although several test units have been excavated to sterile sediment, far less than half of the site has been excavated, with a total of about 12 cubic meters removed. Excavations ended with the intentions of preserving the rest of the site. An artifact analysis is currently underway and a brief description of artifact classes is presented here in order to gain a
better understanding of the overall site function, thus aiding in the investigations into the pottery assemblage and subsequent analysis of the paste composition.

During excavations two midden deposits were encountered and designated as the Upper and Lower Middens (Figure 13 & 14). The Lower Midden or Feature 9, concentrated at the entrance of the shelter, and was only tested in Units 7, 5, 13, and 14. Contained within this deposit are several diagnostic Early Archaic Points. Micromorphology of the sediment reveals it to be mostly loamy sand with silt and clay size organics with few visible charred wood or nuts (Sherwood et al. 2011). One radiocarbon sample was taken from this Lower Midden and yielded a radiocarbon age of 7725 ±40 BP (8501±44 cal. BP) situating it securely within the Early Archaic Period. The second feature, designated the Upper Midden yielded a radiocarbon age of 2560±20 BP (2702±55 cal. BP). This age is consistent with traditional dates for the Early Woodland Period in the adjacent Duck and Elk River valleys.

Artifacts recovered from the site include several lithic forms, pottery, and floral remains and were present throughout the vertical and horizontal sequence of the excavation. A detailed description of the pottery will be discussed in the next chapter. A number of bone fragments were recovered; however, they are very limited in the form of small calcined fragments, most of it unidentifiable. Additionally, four bowl awl’s were identified (2 complete and 2 broken, distally) in Unit 9 (20-30 cmbs), Unit 13 (35-40 cmbs) and 14 (10-20 cmbs). Several mussel shells were also recovered across the site as well as an abundance of macrobotanicals.
Figure 14: South Profile drawing exhibiting both the Upper (grey) and Lower (black) Midden features from the site along with Zone designations by number (courtesy Sarah C. Sherwood).
Other recovered artifacts include various chert and limestone tools, numerous debitage and several nutting and grinding stones. Based on preliminary analyses, a total of 30 diagnostic projectile points were recovered from the Uzzelles Site excavations, reflecting Early Archaic through the Late Woodland occupation (Figure 15) (Sherwood et al. 2011). Early Archaic types comprise 19 points, including Kirk Corner-notched (n=8), Palmer (n=3), Lost Lake (n=2), MacCorkle (n=2), Kirk Serrated (n=1) and Kanawha (n=3). The diagnostic points are only contained within the lower deposits, in particular the Lower Midden. In addition, several bifurcate forms were recovered, some exhibiting evidence of heavy reworking.

Fewer Middle Archaic points are represented at the site: one Kirk Stemmed and one Crawford Creek. The Hypsithermal interval created less seasonal variation (e.g. warmer winters and cooler summers) during the Middle Archaic, thus making some
areas more favorable than others (Anderson 2001). Typically sites occur on floodplains or near major streams (Smith 1986) during this time. While upland sites have been identified in many locations, there is an overall decline in frequency during this period (Franklin 2002). These tend to be smaller occupation sites in rockshelters or open air locations situated near minor tributaries. Uzzelles would seem to conform to this pattern.

Woodland period projectile points are represented by six types and are primarily associated with the upper midden. One Early Woodland Adena, four Middle Woodland types (two Camp Creek, one Nolichucky and one Copena Triangular) and one Late Woodland Jacks Reef Corner-notched are represented. All of the Middle Woodland points at the Uzzelles Site are primarily associated with the Upper Midden. The increase in points as well as the midden present at the shelter, reflect an increase in the Middle Woodland occupation of the area. The rich Middle Woodland occupation at Uzzelles is also indicated by the predominance of pottery from this period.

Preliminary analyses of material remains suggest that this site had repeated use as a subsistence task site focused on the processing and possible storage of nut food stuffs. The paleoethnobotanical analyses of float samples collected during excavations are currently underway by Stephen Carmody at the University of Tennessee, Knoxville. Several main float columns were collected, and anything considered to be a feature was collected as a float sample. Preliminary results show evidence for hickory, acorn and chenopod within the Lower Midden, and maygrass, along with several chenopod seeds, fruits (grape, blackberry and hackberry) and nuts (hickory and acorn) from the Upper Midden (Sherwood et al. 2011). Further lending support for the Uzzelles Site functioning
as some type of plant or nut processing shelter are the numerous grinding stones and pitted cobbles recovered during excavations. These types of artifacts represent “site furniture”, i.e., tools of a stationary plant processing kit. Several rather large, grinding stones were recovered from the Upper Midden along with two other stones which do not possess the pitted features that characterize nut processing; these are suggestive of seed grinding or possibly root or tuber processing.

In summary, the Griffin Rockshelter and Uzzelles Site are markedly different in several ways. First and foremost is the presence and absence of rock art at the shelters. Virtually the entire interior of Griffin is covered with incised petroglyphs while Uzzelles, a much larger rockshelter, has no evidence of artwork upon the walls, however the Uzzelles Site is formed out of the Warren Point Sandstone formation while the Griffin Rockshelter is formed out of the Pennington. The artifact assemblages contained within both sites are also distinct in quantity and more importantly, variation. Although the pottery will be discussed in more detail in the following chapter, the number of types, that is kinds of pottery, are much more numerous and variable at Griffin than at Uzzelles. That is, at Uzzelles ca. 14 square meters of sediment were excavated while at Griffin only ca. 10 square meters were excavated, however at Griffin more artifacts were recovered.

Perhaps most importantly, the functions of these two rockshelters are strikingly dissimilar. While the volume and variety of artifacts present at the Griffin Rockshelter would typically be interpreted as a “habitation site”, the presence of artwork and the small, confined space of the shelter that negates this kind of interpretation. This shelter was intensively used during the Woodland Period and evidence supports the site
functioning as more of a special purpose ritual site rather than a place for profane activities. On the other hand, the Uzzelle Site has evidence for specific tasks centered on the procurement, processing, and likely storage of food stuffs, primarily seeds and nuts. Additionally, the function of this site seems to have been similar throughout its occupation from Early Archaic through Late Woodland periods. It is important here to reiterate the chronological difference between these two shelters; the Uzzelles Site was utilized from the Early Archaic through the Woodland Period, with the latter being more ephemeral, while the Griffin Rockshelter deposits primarily represent the Woodland Period and most intensively the Late Woodland/Emergent Mississippian.
Chapter IV: Methodology

Pottery Analysis

The pottery analysis from both Uzzelles and Griffin focused on several characteristics, including temper, surface treatment, vessel (sherd) form, and thickness. Primary emphasis was placed upon temper and surface treatment while sherd form was documented when applicable (e.g. rim sherds and podes) and thickness was monitored to ensure specimens were thick enough for XRF analysis. These typological characteristics of prehistoric pottery can be used to tell time in a relative sense and help delineate a chronology, especially when context is taken into consideration. The pottery typology employed was organized around attributes (e.g. kind of tempering and surface treatment) rather than named pottery types. Although formal type designations, such as “Long Branch Fabric-Marked” can accurately be identified in the archaeological record, several pottery sherds from the Plateau, exhibiting characteristics of formal types (e.g. fabric-marking surface treatments that are not “Long Branch Fabric-Marked”), do not readily conform to type designations from the adjacent river valleys. The southern Plateau is unique in that pottery types vary with respect to other regions in terms of surface decorations and even those from the Upper Plateau to the north. Therefore, formal type designations were only used when pottery sherds could be clearly and accurately identified with reference to pottery types set forth by previous researchers (Faulkner 1968b; Hagg 1939; Lewis and Kneberg 1946). All pottery sherds were
examined on a macro scale. Occasionally, a magnified hand lens (10X) was used to help more accurately see sherd temper.

**Portable X-Ray Fluorescence Spectrometry**

X-ray Fluorescence is now a well-established method of analysis both in the laboratory and industry. The fact that the method is essentially non-destructive makes it particularly attractive for the analysis of archaeological and museum artifacts. Due to certain fundamental characteristics of the technique it is not suitable for some projects which would seem at first sight to present no problems [Hall 1960].

The abstract of Edward Hall's 1960 paper entitled “X-ray fluorescent analysis applied to archaeology” is just as appropriate for current archaeology today as it was half a century ago. After achieving analytical prominence in the early 1960’s, X-ray fluorescence spectrometry (XRF) has developed into a well-established, multi-element technique suitable in a wide array of practical applications (Beckhoff et al. 2006). Within the last decade, however, advancements in technology and the availability of high-precision, field-portable XRF instrumentation has led to increasingly widespread use in archaeology for the elemental characterization of archaeological remains such as lithics (especially obsidian) and pottery (Arnold et al. 1991; Cecil et al. 2007; Glascock et al. 1998; Neff 1992, 1998; Parish 2009; Potts and West 2008; Shackley ed. 2011).

The advantages of using XRF for elemental analyses are a combination of both practical and economic factors (Shackley ed. 2011:8-9):

1. Non-destructive: This is perhaps the most important advantage that XRF offers. Other elemental analysis methods such as Instrumental Neutron
Activation Analysis (INAA) require the sample to be ground and homogenized for analysis. With XRF, artifacts are unmodified in sample prep. In addition the artifacts are unchanged by exposure to X-rays. Therefore, museum grade artifacts can be analyzed without harm. Additionally, portable-XRF instrumentation allows for *in-situ* analysis of artifacts which may or may not be removed (e.g. rock art) (Potts and West 2008).

2. Minimal preparations of samples: As indicated in the above point, techniques like INAA require sample preparation before analysis. Various types of preparation procedures can ultimately be costly and generally time-consuming. With XRF, samples can be analyzed with little or no pre-treatment. Due to the penetration depth of X-rays, gently washing the sample with water to remove any archaeological sediment will suffice for most artifacts (e.g. the surface of metals can yield erroneous results, see Hall 1960).

3. Fast analysis: Raw chemical composition data can be obtained in a matter of minutes depending on the mass of the specimen and elements under analysis (e.g. 180-300 live seconds per sample). The ability for fast analysis is also supplemented by the relative ease of use. Software aids in the measurement, set-up and the calculation of results.

These advantages culminate in the capability to provide a high precision analysis for many elements within a single sample. Results that are sensitive and virtually non-destructive that can be produced in the laboratory and in field settings (Banks and Hall 1963; Potts and West 2008; Rapp 2002).
There are some limitations of this technique that exist and must be taken into consideration prior to analysis. First and foremost is the size of the sample. Some samples may be eliminated from analysis due to inadequate size dimensions. Depending upon what XRF instrumentation is used, the optimal size for analysis will vary (i.e. size of aperture, emitting X-rays, varies with instrumentation). For example, samples >10mm in their smallest dimension and >2mm thick are considered to be optimal for obsidian artifacts (see Davis et al. 1998). XRF is also restricted in its ability to acquire certain elements, specifically those with low atomic numbers or with very low concentrations within the sample. Lastly like INAA, XRF is a mass analysis, meaning it cannot isolate small components within the sample; rather every component in the irradiated sample is included in analysis (Shackley 2011). This last point can have severe implications for the analysis and interpretation of nonhomogeneous materials.

**XRF Theory**

The theory and underlying concept behind XRF is conceptually quite simple. X-rays are a form electromagnetic radiation of short wavelength (high energy-high frequency) residing between gamma rays and ultraviolet radiation (Jenkins 1974; Jenkins and De Vries 1967; Shackley 2010, 2011). Every element has a characteristic electron structure and it is the way in which atoms behave when they interact with radiation that makes the analysis of major and trace elements possible (Shackley 2010):

The spectrometer operates in the X-ray region where characteristic emission wavelengths originate from removal of inner orbital electrons, followed by de-excitation to the ground state by transference of outer shell electrons to the inner shell vacancies. In each case, the emission wavelengths are dependent upon the electronic configuration of the excited atom and hence each atom will emit a characteristic emission spectrum [Jenkins 1974: 2].
Essentially XRF utilizes a beam of X-rays to effectively irradiate the surface of a sample. If the energy of the incoming radiation is sufficient to dislodge a tightly-held inner electron, the atom becomes unstable and an outer shell electron will fill the vacancy (Figure 16). This transference of an electron from an outer shell to an inner shell releases energy called fluorescent radiation or *fluorescence* in the vernacular (Bishop et al. 1982; Jenkins 1974, 1999; Jenkins and De Vries 1967; Shackley 2010; 2011).

Figure 16: Schematic view of orbital transitions due to X-ray fluorescence (adapted from Shackley 2011:2).
The energy differences between electron shells are known and fixed. Individual atoms are made up of a nuclei surrounded by electrons equal to the atomic number of the atom (e.g. Hydrogen (H) has an atomic number of 1, thus 1 electron). These electrons are configured around the nucleus in a definite pattern and simple rules can be applied to predict their states (Jenkins 1974:10). The process of the displacement of an electron from its normal, ‘ground state’ is called excitation (Jenkins 1974; Jenkins and De Vries 1967; Shackley 2011). Once an atom becomes excited, it can return to its ground state by various processes, the most important in XRF being when an electron from an upper level falls to the excited level or shell (Jenkins 1999:55). This transference will *always* be accompanied by the emission of radiation. This fluorescence yield depends upon the atomic number and the shell in which the “hole” occurred (Figure 17).

![Figure 17](image.png)

*Figure 17: Fluorescence yield ($\omega$) is low for elements that possess a low atomic number and almost reaches a value of 1 for heavier elements (from Bruker elemental).*
The most frequent transition is when an L shell e-transition fills a vacancy in the K shell emitting Kα1/Kα2 radiation. This produces the most intense and easily measured peak, the Kα peak. Therefore, it is possible to determine the composition and proportional concentrations of elements in a sample by bombarding the sample with radiation that exceeds the binding energy of the electrons in the atom and detecting the energy and characteristic X-rays emitted from each element.

**Instrumentation**

The two most common methods of X-ray spectroscopy are Wavelength Dispersive XRF (WD-XRF) and Energy Dispersive XRF (ED-XRF), the main difference being how the emitted X-rays are measured. In ED-XRF the detector measures one X-ray at a time by collecting X-rays of all energies and sorting them by the amount of electrons each X-ray knocks free in the silicon detector and converting them ultimately to a digital signal. The instrument used for the compositional analysis of pottery from the Griffin Rockshelter and Uzzelles Sites is a TRACeR III-V+ portable XRF (Bruker AXS Company) (see Figure 18 for laboratory setup). This is a handheld energy-dispersive (ED-XRF) machine with silicon based detectors allowing for the advantage of determining multiple elements at the same time (Rice 1987: 393-394).

The functional main components of this instrument are the X-ray tube system, collimator, filters, detector and signal processing hardware and software. It is in the X-ray tube that electrons are accelerated then shot into a piece of metal or target composed of a pure metal (e.g. Ti, Cr, Cu, Mo, Rh). Upon reaching the target, electrons either interact and ionize the target creating characteristic X-rays, or are decelerated creating a broad bremsstrahlung continuum or spectrum (Shackley 2011). Filters are
placed between the tube and the sample in order to remove undesirable background radiation below a certain voltage. Any element that can be formed into a stable solid or film can be made into a filter; however, the level of radiation filtered out is dependent on the filter composition and thickness. The collimator restricts the size or shape of the source beam for exciting smaller areas. Once the sample begins to fluoresce the detector is used to convert incoming X-rays into electronic signals which can then be read and displayed as a spectrum by a computer.

Figure 18: Laboratory bench-top setup for the Bruker TRACeR III-V portable X-Ray Fluorescence Spectrometer.

Analytical Methodology

By selecting the appropriate combination of parameters, specific elements can be isolated, identified, and yield important information about the overall character of the
sample under analysis. Coupled with XRF analytical software the user can perform qualitative, semi-quantitative and quantitative analyses. For the chemical characterization of prehistoric pottery pastes; Rubidium (Rb), Strontium (Sr), Yttrium (Y), Zirconium (Zr) and Niobium (Nb) were the primary elements of interest. These are trace elements which possess a strong geochemical heterogeneity, meaning that significant variation in these elements comprising the paste of pottery will indicate differences in their source areas (Rice 1987:419-420). These five elements can be found in the earth's crust or the lithosphere and can become distributed within the igneous, metamorphic and sedimentary rocks from which clay is formed. Elements such as Potassium (K), Calcium (Ca), Iron (Fe) and Zinc (Zn) were not included in the analysis because these elements are ubiquitous in all contexts. Rubidium, Strontium, Yttrium, Zirconium and Niobium are all trace elements found within clays and their distribution ratios will indicate different source regions from the parent material.

In order to appropriately optimize for an elemental group analysis, the correct filters and settings must be chosen that “position” the X-ray energy impacting the same just above the absorption edges of the element (s) of interest. Pottery sherds were analyzed at 40kV with the highest current setting available and no vacuum attachment. These settings were chosen due to the fact that it enables all X-rays from 17kV-40kV to reach the sample and efficiently excite elements from Iron (Fe) to Molybdenum (Mo). For further optimization a 0.006” Cu, 0.001”TI, 0.012 Al filter was used.

Pottery sherds were first gently cleaned with water and allowed to air dry, to remove any surface buildup and were selected for analysis based on two criteria: 1) those possessing a distinguishable surface treatment and temper additive and 2) sherds
large enough to fit over the instrument’s aperture (3 by 4 mm beam spot size). For each sample, three independent assays were taken, each for a duration of 300 seconds (5 minutes). The spot of analysis for each assay was selected at the best possible location upon the body of the sherd meaning the sherd was placed over the aperture such that temper was not being analyzed and to ensure the sample laid flush with the aperture. Once the assay is complete for each point, an individual spectrum is displayed where peaks represent concentration of each constituent element (Figure 19).

![Figure 19: Example of a spectral image for pottery at 40kV, the highest current setting and no vacuum attachment.](image)

Once all sherds were analyzed by pXRF instrumentation, spectra were deconvoluted and converted to raw data using Spectra ARTAX software 7.2.0.0. The net intensities, or area under the elemental peaks were calculated by Gaussian curve fitting and transformed into workable raw data, ready for semi-quantitative analysis.
Since three assays were obtained per sherd an average net intensity for each element and corresponding sherd were used in the final analysis. Additionally since three assays were obtained per sherd, standard error percentages were calculated to see if significant error was present between the assays. This was accomplished by first taking the standard deviation of the three assays and dividing by the average net intensity of each representative element. These numbers were then multiplied by 100 to acquire percentages. Once this was done for each of the five element data per sherd, an overall average error percentage was analyzed. Error percentages were considered to see if significant error was introduced by reading at three different spots on the pottery sherd. An error percent rate of 20% was established as a threshold; any sherd with error higher than this was not used in statistical analyses. Out of the 110 sherds analyzed from Uzzelles, no specimens were rejected. However at Griffin two out of 525 were rejected from the analysis. A majority of the sherds only contained up to a 15% standard error rate indicating consistent raw data among the three assays.

In order to explore the elemental composition of pottery pastes, two dimensions of classification were first established, type and paste. Pottery sherds were placed into a type according to tempering agent (e.g., crushed limestone) and surface treatment both of which were observed on a macro-scale. Thus, type refers to standard archaeological usage in pottery analysis. The term “paste” is used to refer to the elemental composition of individual pottery gleaned from the analytical technique. Physically sourcing paste (identifying the location where the clay was obtained) requires that we know the chemical composition of precisely located clay deposits, and this has not been established for the southern Plateau. Rather than focusing on determining the
geographic origins of the pastes themselves; I will explore whether or not there is statistical variability in the pastes between the two functionally different rockshelter sites on the landscape. The operating assumption is the Provenience Postulate or that “there exist differences in chemical composition between different natural sources that exceed, in some recognizable way, the differences observed within a given source” (Weigland, et al. 1977:24) (see Figure 20). Therefore, compositional variations will be greater between sources than within sources and thus significant variation in paste reflects different sources even if those sources cannot be precisely positioned on the landscape.

![Figure 20: Units in provenance investigations (adapted from Neff 1998:116).](image)

Therefore, significant differences among pottery pastes indicate varying geographic locales for the parent material, or clay, while homogeneous paste compositions indicate a narrow, localized area of clay resource. While we will not be able to say where the pastes came from, we will be able to say how many sources are represented in an assemblage.
Qualitative Methods for Comparing XRF Spectra

Although the measurement of fluorescent peaks may seem straightforward, several inherent (and thus potentially misleading) phenomena, based on x-ray physics, contribute to the spectra and must be taken into consideration. The three main contributors to the spectral output of a sample are 1) interactions in the detector, 2) X-rays contributed by interactions in the analysis system and 3) phenomena in the sample (Kaiser and Wright 2008). It is of course the third contributing source that is of interest in materials analysis.

Both sum peaks and escape peaks can be caused by interactions in the detector. Sum peaks occur when two or more X-rays enter the detector at the same time and are converted into one pulse with the energy equal to the two pulses combined. When this phenomenon occurs enough times, a visible peak can appear on the spectra. Although they may be small, sum peaks can be mistaken as trace elements causing spectral interference with other characteristic peaks. Escape peaks are the effect of partial loss of energy due to fluorescence in the detector, “as X-rays strike the sample and promote elemental fluorescence, some Si fluorescence at the surface of the detector escapes, but it is not collected by the detector” (Shackley 2011:22). While this does result in a peak that is visible in the spectrum, escape peaks are virtually eliminated as an issue when automatically corrected by computer algorithms and software revealing the true character of the sample.

The influence of the ‘scatter’ or the background radiated is also important when evaluating the overall spectra. Compton scattering is an important portion of the spectra and can be influenced by interactions in both the detector and phenomena in the
sample. In these interactions, often called inelastic scattering, an x-ray strikes an atom and loses energy, exciting only an inner-shell electron. Rayleigh scatter on the other hand is elastic or coherent scatter occurring when no energy is lost when an x-ray reflects off the atoms in a sample.

Influences collectively referred to as matrix effects occur when the constituent parts and elements in a substance serve to effect the photons in highly complex ways. These effects can be further subdivided into overlap effects and mass absorption effects because the “matrix effects on element $i$ are the combination of mass absorption effects and overlap effects exerted on element $i$, by all coexisting elements $j$” (Shackley 2011:18). Overlapping or interference effects are resolved in the spectra through deconvolution. The invisible mass absorption effects are caused primarily when the fluorescence of one atom emits a characteristic x-ray which is then reabsorbed by another atom in the sample, thus misrepresenting the counts of elements detected in a sample. However, these effects can be corrected through the same stripping routines carried out by software which calculate the intensity of each individual element and ‘strip’ them from any overlapping elements (Shackley 2011).

A purely qualitative analysis was conducted on all analyzed pottery sherds. This was achieved by directly observing and comparing spectral overlays. This method is only effective at comparing a given element from sample to sample, not element to element within a sample. As mentioned above, three assays were obtained per pottery sherd. Once completed, all three spectral images were overlaid and normalized at the Rhodium (Rh) peak to assess spectral plots of the elements. Rhodium is a backscattered x-ray from the instrument and is monitored as a standard to assure that
the material is consistent, e.g. same backscatter, same material type. While this type of analysis does not yield much information singularly, it is used in combination with a series of semi-quantitative explorations outlined below.

*Semi-Quantitative Methods for Analyzing XRF Spectra*

The X-ray intensity represented by the spectrum peaks is directly proportional to the concentration of the elements in the sample; therefore, net areas of the respective analyzed peaks are reported in order to assess variability among elemental compositions within the pottery assemblages. The net areas under the elemental lines are acquired by means of Gaussian curve fitting which allows for a semi-quantitative evaluation of the spectral data.

To test for geochemical heterogeneity of the pottery paste among types, a MANOVA (multiple analysis of variance) was implemented due to its efficiency in comparing multiple variables (Zar 2009). Correlations between the analyzed elements are common, and therefore statistical tests employed must make use of correlational properties. Univariate tests such as ANOVA simply ignore the presence of those correlations resulting in gross errors in the interpretation of data received. All five elements, Rubidium (Rb), Strontium (Sr), Yttrium (Y), Niobium (Nb), and Zirconium (Zr) were compared among the pottery types in order to understand the variance around the means and to ascertain whether or not elemental groupings are different or not among pottery wares. In order to more clearly identify pottery types or “groups” among the analyzed samples a Canonical Discriminant Analysis (CDA) was also employed. This statistical method contrasts to that of principle components analysis (PCA) in that is
“extracts a new set of variables that maximize the differences between two or more groups rather than maximizing the total variance of the data set” (Glascock 1992:18).
Chapter V: Results & Discussion

Pottery Analysis Results

The Griffin Rockshelter (40FR151)

Within the shelter confines, a surprising 752 pottery sherds were recovered. I have analyzed pottery from numerous rockshelters across the Cumberland Plateau, both large and small in size, and have not encountered this amount of pottery at a single site before. The pottery collection was initially analyzed by Charles Faulkner at the University of Tennessee, Knoxville, following the completion of the excavation. His expertise has remained an integral part of the classification process during the re-examination of the collection. The abovementioned total does not include general surface material recovered during initial excavation or those recovered during a re-visit to the shelter in winter 2011. The Griffin Rochshelter sherds can be placed into five categories or series according to tempering materials (limestone tempered, limestone mix tempered, quartz tempered, sand, grit, and/or quartz tempered, and other tempered). Series categories are then further subdivided into type according to surface treatment, rim shape and other manufacturing characteristics. Of the 752 sherds recovered during the excavation, only 63 were found within the singular feature deposit with the remainder being located within arbitrary levels outside the feature. There was a substantial number of sherds (n=147) recovered within the uppermost Level A, 0.0-0.5’ below surface.
Interestingly, when the entire distribution of pottery is viewed by excavation square, it is evident that sherds cluster around the northern central portion of the shelter (units 3E0, 3E3, 3E6, 6E0, 6E3, and 6E6) which includes the feature. This pattern of spatial organization was also observed for the faunal and lithic artifacts, suggesting specific activity loci; however, it is important to remember the size and general shape of the shelter. Little floor space coupled with a sloping roof line almost certainly contributed to the distribution of artifacts within the shelter. The southern portion of the shelter has considerably less room than the central and northernmost portions, and it is not surprising that a majority of artifacts were found in the portions that were more easily accessible and “roomier”.

The pottery assemblage is dominated by limestone tempering, with 97.20% of the total assemblage or a total of 731 sherds. Within the limestone-tempered group the following surface treatments are represented: fabric-marked, cord-marked, simple stamped, check stamped, plain, plain/scraped, knot-roughened, punctate, and residual. In addition there are few designated simply as “other”. Various degrees of temper disintegration are present within this group. Leaching was noted; however, the data are not presented due to the fact that temper can leach from sherds due to a variety of factors, namely an acidic depositional environment. Therefore, sherds with evidence of voids can still be used to determine temper and thereby, cultural affiliation. A total of 133 sherds or 17.7% of the assemblage was classified as limestone tempered, residual due to the inability to accurately identify surface treatment due to either extreme erosion, or size insufficiency.
Limestone-tempered, fabric-marked sherds comprise 37 sherds constituting 4.92% of the total inventory. This sample includes 36 body sherds and 1 rim sherd. The rim has an exterior, flattened lip. All limestone tempered, fabric-marked sherds were recovered from Levels C-I at 1.0-2.4 ft. below surface. Only one body sherd was recovered within the feature at 0.7-0.8 ft. below surface in unit 3E3. Four body sherds exhibit a heavy warp and fine weft elements of a woven fabric and could be classified as Long Branch Fabric-Marked (Haag 1939:10; Heimlich 1952:17). A few sherds exhibit a combination of fabric-marking with other surface treatments. Three are classified as smoothed-over fabric-marked due to the appearance of smoothing the vessel after impressing, one appears to be fabric-roughened due to its similarities with both traditional fabric-marking and knot-roughened varieties typical of Mason Phase assemblages. Lastly, two sherds have been classified as fabric-marked/net impressed and appear to be a later variety of fabric-marking (Faulkner, personal communication).

Cord-marked sherds, including smoothed over cord-marked, number 3 and 18, respectively. Two variants are distinguished 1) a fine, tightly twisted cord and 2) a coarse, loosely twisted cord (Figure 21). All are body fragments, save one cord-marked rim sherd. The rim form was indeterminate, with a rounded lip configuration. Only one smoothed over cord-marked body sherd was found within the feature in unit 3E3, level F at 1.7-1.8 ft. below surface.
Figure 21: Example of limestone tempered cord-marked pottery sherds representing both a tight (large sherd on left side) and loose twisted cordage impression (both on right side).

Limestone tempered stamped varieties only comprise 0.93% of the assemblage. Only simple stamped and check stamped surface treatments are present. Four simple stamped and 3 check stamped body sherds are represented. The check stamped sherds are similar to the Wright Check Stamped described by Haag (1939) for northern Alabama. This variety is also common during the McFarland Phase in the Duck and Elk River valleys. Simple stamped sherds appear to have been produced by a grooved paddle, or a rawhide wrapped paddle with very uniform ridges.

Limestone tempered plain and plain/scraped types are the most types represented in the Griffin pottery assemblage with 203 and 271 respectively (Figure 22). Plain surface treatments occur throughout the Woodland period with a marked increase
of both plain and plain/scraped surfaces appearing in the Late Woodland Period. For plain surface treatments, 8 rim sherds, 2 basal sherds and 194 body sherds were recovered. These surfaces vary from somewhat rough to a well-smoothed surface and can occur throughout the Middle and Late Woodland periods becoming more frequent in the latter. One of the basal sherds was a small pode, likely from a tetrapodal vessel, while the other represents a rounded or conoidal base. A variety of rim forms and lip configurations are present: 2 indeterminant, rounded and flattened lips, 2 incurvate, flattened lips, and 2 excurvate, flattened lips. Limestone tempered, plain sherds recovered from the feature context include 21 body sherds and one rim sherd.

Sherds classified as limestone tempered, plain/scraped comprise 12 rims, 3 basal and 256 body sherds. These sherds are distinguished from smoothing treatments due to scraping frequently observed on the interior of pottery vessels, to scraping occurring on the outer surface of the vessel as a surface treatment. These sherds do not exhibit any regularity in scraping which is rather haphazardly applied, and often covered the entire vessel. In the Chickamagua Basin, this type of finish is never found on limestone tempered pottery from earlier Woodland occupations (Lewis and Lewis 1996:89). All three basal sherds are semi-conoidal in form while the rim sherds are primarily represented by excurvate or incurvate forms with either flattened or rounded lip configurations. A total of twenty-three plain/scraped sherds, 21 body and 2 rims, were located within the feature.
The limestone tempered, knot-roughened type includes 43 specimens (Figure 23). This type was first defined at excavations in the Elk River, Tim’s Ford Reservoir by the characteristically deep haphazard knot impressions pressed into the vessel surface with a knotted net weave. Quartz (chert) tempered, knot-roughened types appear to be
restricted to the upper Elk River drainage associated with primarily Late Woodland Mason Phase occupations. However, the knot-roughened surface treatment has also been recognized in East Tennessee (Faulkner personal communication). A total of 40 body sherds are represented with three rim sherds. All three have incurvate forms with a flattened lip configuration. These likely represent bowls with estimated diameters of 12-16 cm. Two body sherds were recovered within the feature contexts. Of these knot-roughened sherds, a few also exhibit scraping, smoothing, and a combination of knot-roughening and net impressing.

Figure 23: Limestone tempered, knot-roughened pottery sherd from the Griffin Rockshelter.

Eight sherds from the Griffin Rockshelter have been classified as limestone tempered, punctate. One incurvate, flattened rim is present with a diameter of 10-12 cm indicating a small bowl form. The rest comprise body sherds. One body sherd exhibits cord-marked over punctate decoration. This design has also been identified on sherds on the Upper Cumberland Plateau (Tom DesJean and Jay D. Franklin, personal communication). Two of the sherds refit and display a circular arrangement of punctations (see Figure 24). While the traditional assumption is that a jagged reed or
hollow stick was used to make the punctations, other implements could have been utilized (further discussed in Chapter VI).

Figure 24: Example of limestone tempered, punctate decoration. Punctations arranged in a circular pattern.

Pottery sherds classified as limestone, other were placed into this category due to the inability to ascribe to other defined surface treatment categories. Eight body sherds represent this group. While most were classified due to inability to accurately assign a discernible surface treatment, one sherd was placed within this category due to its uniqueness. This sherd appears to be an early red filmed sherd (Faulkner, personal communication). While it does not possess the bright red quality of Mississippian red filmed types, this sherd does show a wash or film of ferric oxide pigment (Figure 25). Bacon (1982:177-180; see also Faulkner 1988:80) describes several limestone
tempered Red-filmed pottery sherds from the Parks Site (40CF5) and described them as being “exotic” artifacts, possibly a trade vessel.

![Limestone tempered, red filmed pottery sherd from the Griffin Rockshelter.](image)

The limestone mix tempered series represents 1.6% of the total pottery assemblage with 11 body sherds and 1 rim sherd. This series is categorized by pottery sherds that possess limestone mixed with clay, quartz, sand, or grit as tempering agent. Surface treatment types include plain, plain/scraped, and knot-roughened. Seven sherds are limestone mixed with clay only, one is limestone mixed with what appears to be coal, while the remainder is limestone mixed with grit and quartz inclusions.

The remainder of pottery at the Griffin Rockshelter is categorized as quartz-tempered, a mixture of sand/ grit/ quartz tempered, and “other” tempered series. Quartz-tempered pottery sherds comprise only four specimens, 0.53% of the assemblage. Surface treatments consist of two plain, one knot-roughened, and one residual sherd.
The quartz tempered, knot-roughened type is diagnostic of the Late Woodland Mason Phase in the Eastern Highland Rim. Only one plain, body sherd was classified as possessing a mixture of sand, grit, and/or quartz as tempering agents. Lastly, four sherds were categorized as being “other”. Two appear to have no additive or only clay as a tempering agent. One is a clay pode ca. 16mm in diameter with no visible or plain surface treatment, and the other is a residual sherd. Also indicative of the Mason Phase is one body sherd tempered solely with chert.

Throughout the above discussion, one thing is apparent: a wide diversity of pottery types are represented in the Griffin assemblage (see Table 3); especially given the small size of the shelter.

It is during the Woodland Period that pottery types and vessel form changes reflect regional differences among cultures (Chapman 1985). The negligible sample of Early/Middle Woodland types such as fabric-marked, cord-marked and stamped varieties at the Griffin Rockshelter is suggestive that this period is not well represented at the shelter. The most intensive occupation at the shelter occurs during the Late Woodland Period and into the Emergent Mississippian. This is based on the high frequency of types such as plain, plain/scraped, and knot-roughened. This chronological focus is supported by the single C14 age of the shelter.
Table 3: Pottery Distribution for the Griffin Rockshelter.

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<th>Provenience</th>
<th>0.0-0.5’ B.S.</th>
<th>0.5-1.0’ B.S.</th>
<th>0.5-0.8’ B.S.</th>
<th>0.8-1.0’ B.S.</th>
<th>1.0-1.2’ B.S.</th>
<th>1.2-1.4’ B.S.</th>
<th>1.4-1.6’ B.S.</th>
<th>1.6-1.8’ B.S.</th>
<th>1.8-2.0’ B.S.</th>
<th>2.0-2.2’ B.S.</th>
<th>2.2-2.4’ B.S.</th>
<th>between rocks</th>
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<td>cord-marked</td>
<td>smoothed over</td>
<td>check stamped</td>
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<td>plain/scraped</td>
<td>punctate</td>
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<td>plain</td>
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<td>3</td>
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84
The Uzzelles Site (40FR267)

The Uzzelles Site has comparatively few pottery types represented in the pottery assemblage. A total of 199 pottery sherds consisting of 191 body sherds, 7 rims and one pode were recovered from excavations (Table 4). The assemblage is entirely composed of limestone tempered sherds with surface treatments exemplified by fabric-marked, plain and plain/scraped, check stamped, residual sherd and those designated as ‘other’. Not surprisingly, a total of 52 pottery sherds were recovered from disturbed contexts. These sherds were collected while cleaning up the looter’s damage during the 2009 field season. Sherds recovered from this context include numerous residual sherds, plain and plain/scraped types in addition to a single fabric-marked and check stamped sherd.

Figure 26: Limestone tempered fabric-marked pottery sherds from the Uzzelles Site.
Limestone tempered, fabric-marked types represent 6.03% of the assemblage with 10 body sherds and two rim sherds (Figure 26). Both rim sherds have a straight or vertical form with a flattened and undecorated lip configuration. These sherds are stylistically similar to the defined and ubiquitous Long Branch Fabric-Marked type for the Early Woodland Period. Half of these sherds were recovered from Units 7, 13 and 14 along the opening of the shelter or the southern portion. Sherds from Units 13 and 14 were recovered from levels consistent with the Early Woodland radiocarbon date within the Upper Midden. The two sherds recovered from Unit 14 at 40-45 cm BS refit. A total of three body sherds were recovered from disturbed contexts.

Table 4: Pottery distribution for the Uzzelles Site. Inconsistencies in level depths are due to the presence of looter spoil piles in some of the test units.

<table>
<thead>
<tr>
<th>provenience</th>
<th>fabric-marked limestone</th>
<th>check stamped limestone</th>
<th>plain limestone</th>
<th>plain/scraped limestone</th>
<th>residual limestone</th>
<th>other limestone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screened Looter Pile</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>16</td>
<td>29</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Level 1 0-10 cmbs</td>
<td>5</td>
<td>15</td>
<td>4</td>
<td></td>
<td></td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Level 2 10-20 cmbs</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>2</td>
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<td>4</td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Level 3 20-30 cmbs</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Level 4 20-25 cmbs</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
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<td></td>
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<td></td>
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<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Level 5 40-45 cmbs</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Level 7 35-40 cmbs</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>43</td>
<td>36</td>
<td>51</td>
<td>57</td>
<td>1</td>
<td>200</td>
</tr>
</tbody>
</table>
Limestone tempered, check stamped types are represented by 42 body sherds and 1 basal sherd, all recovered from stratigraphic context save one from the looter pile. This pottery type characterizes 21.61% of the total pottery assemblage at Uzzelles and is stylistically equivalent to the Wright Check Stamped formal pottery type (Figure 27).

Figure 27: Wright Check Stamped body sherds and one podal support from the Uzzelles Site. These sherds were located in the same test unit and level and represent the same vessel.

This formal type is the most popular stamped type in the area and appears early in the Woodland period during the McFarland Phase. More than half of the check stamped sherds were recovered at a depth of 40-50 cm BS primarily within Unit 9 in the north-eastern portion of the shelter. These sherds exhibit square to rhomboid grid patterns,
and based upon similarity in the stamps, may have been produced by the same well
carved paddle or generation/tradition of pottery makers. Although no whole vessels
were recovered, large sherds indicate the likelihood of rather large jars (see sherd B
and C in Figure 27). Given that the Uzzelles Site served as an economic procurement
site, these vessels perhaps served as cooking or more likely storage vessels. One basal
sherd with a single pode was recovered with evidence of check stamping (see sherd D
in Figure 27). Wright Check Stamped vessels commonly have both flat and tetrapodal
supports for the vessel base.

Figure 28: Example of limestone tempered, plain pottery with notched rim from the Uzzelles Site.

The assemblage is dominated by limestone plain sherds with 36 examples and
plain/scraped, with 51 sherds, at 18.09 and 25.63% of the assemblage, respectively. Of
this type, two excurvate, notched rims which refit and 18 body sherds were recovered in
context. Several of these plain sherds (Figure 28) can be refitted, comprising five
groups. One straight or vertical rim with a flattened or undecorated lip configuration was
found within the looter pile along with 15 other plain body sherds.
Of the 51 plain/scraped sherds, only two are rim sherds. Both of these have a straight or vertical form with a flattened or undecorated lip configuration, one of which was located within the looter pile. Fifteen other body sherds were recovered from this disturbed context. Similar to those from Griffin, the plain/scraped sherds exhibit deliberate and haphazardly scraped lines across the pottery surface (Figure 29 & 30). A variety of scraping is also represented from heavy and frequent to a more brushed or light scraping. One body sherd in particular possessed frequent and deep scraping seeming to converge into a “v” shaped pattern (Figure 30). While many surface treatment productions are understood, the object used to produce this particular type of surface treatment is unclear.
Within the main deposits both plain and plain/scraped types are distributed across almost all of the test units. Additionally they are primarily located within the upper levels between 0-20cm below surface, less common at 30cm, and are virtually absent after 40cm. Both of these surface treatments can co-occur together in the Middle and Late Woodland period (Faulkner 2001). Generally, though, plain types are more common in the Middle Woodland with an increase in frequency of plain/scraped types during the Late Woodland, and are particularly common toward the end of this subperiod on the southern portion of the Cumberland Plateau.

A total of 59 sherds were impossible to classify as to surface treatment and thus were classified as limestone tempered, residual. Comprising 28.14% of the total assemblage, residual sherds are the most frequent types at the Uzzelles Shelter, followed closely by limestone tempered, plain/scraped types. Residuals occur mostly in the looter spoil pile. Only one body sherd was classified as limestone tempered, other.
The surface treatment appears to be of the knot-roughened variety; however some surface erosion complicates the interpretation.

All of the pottery types at Uzzelles (in spite of the relatively small sample size) represent a chronological sequence spanning the Early-Late Woodland periods based on the frequency of certain pottery types. Interestingly, cord-marked (including smoothed-over cord marked) wares are not present within the assemblage.

The spatial occurrence of pottery styles can help archaeologists indicate the loci of pottery production. The “criterion of relative abundance” essentially states that where pottery is most frequently found, it was manufactured in the same region and moved out of that location by trade (Rice 1987: 177). The pottery from the Uzzelles Site appears to support the idea that most of this pottery was made locally and likely by the same group based on similarities in manufacturing techniques. This is particularly true for the limestone tempered check stamped types; the check designs and shape are alike. While some of the sherds refit and most likely are from the same vessel, other check stamped sherds do not, and are further differentiated by fabric attributes indicating a difference in the firing process.

Based on the above discussion of pottery types from the Griffin Rockshelter and Uzzelles Site, it is apparent that there are differences between the two assemblages. The Griffin pottery assemblage is comprised of five different temper categories and fifteen types while the Uzzelles Site possesses only one temper category and four pottery types. These typological differences will now be examined for paste differences through XRF analysis. The following chapter will discuss in detail the analytical results.
of the XRF analysis conducted on pottery from the Griffin Rockshelter and Uzzelles Site.

**X-Ray Fluorescence Analysis Results**

I aim to determine whether or not statistical differences are present between the two archaeological sites based on the underlying assumption of the “provenience postulate”. Typological differences between the two assemblages have been expressed, and the following elemental analysis will explore whether or not those differences are borne out elementally. Primary emphasis in this chapter is on the results of the semi-quantitative analyses conducted and offers a discussion of those results.

**Semi-Quantitative**

A total of 698 pottery sherds (110 from the Uzzelles Site and 525 from the Griffin Rockshelter) was analyzed with the pXRF instrument for the compositional analysis. While a smaller sample size could have sufficed, another aspect of this research is to build a foundation for a compositional dataset of pottery types representative of the region. These numbers easily satisfy a statistically meaningful sample size for post-hoc analyses.

A MANOVA statistical test was initially performed to test for geochemical heterogeneity of the paste compositions among types represented in both assemblages. Essentially, this approach looks at elemental data to determine groupings of pottery types. However, before these two shelter assemblages can be analyzed, it must be determined whether or not both sites can be pooled together. An initial MANOVA was conducted to address whether or not a significant interaction between
archaeological sites and pottery types was present among the five elements. There is a significant interaction between site and type ($p<0.05$). Types from one site are different from types in the other with respect to the five elements. In the end, the test shows that an effect between type and site is present with regards to the elements, and therefore sites cannot be pooled together for analysis.

A total of 499 limestone tempered pottery sherds was included in the analysis for the Griffin Rockshelter (Table 5).

**Table 5: Pottery types included in MANOVA analysis from the Griffin Rockshelter.**

<table>
<thead>
<tr>
<th>Type</th>
<th>Value Label</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ls, f-m</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>ls, c-m</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ls, smoothed over c-m</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>ls, ss</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>ls, cs</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>ls, plain</td>
<td>151</td>
</tr>
<tr>
<td>7</td>
<td>ls, plain/scraped</td>
<td>241</td>
</tr>
<tr>
<td>8</td>
<td>ls, knot-roughened</td>
<td>40</td>
</tr>
<tr>
<td>9</td>
<td>ls, punctate</td>
<td>8</td>
</tr>
</tbody>
</table>

Only limestone tempered sherds were included due to the fact that it is the only temper type represented at Uzzelles, and by only selecting limestone tempered sherds controls for misleading results due to differences in tempering material present at Griffin. Certain tempering agents have the potential to increase the range and variability of elemental concentrations in certain elements (e.g. calcium from calcium carbonate present in shells) (Wilson 1978:224). Additionally, sherds classified as “others” and residuals were not included as they do not provide much chronological information. The first MANOVA will compare the five elements among pottery types for the Griffin Rockshelter only; results for the Griffin Rockshelter can be seen in Table 6. Pilai’s Trace was used for
assessing the MANOVA due to unequal variances in sample sizes and its robusticity and statistical conservativeness. The main interaction effect results show that pottery types are significantly different among elements ($p < 0.05$). Therefore, combinations of the elements under analysis are significantly different among pottery types within the Griffin assemblage.

In order to understand what is driving this difference among elements, an examination of the univariate tests of the elements among types shows that only Strontium (Sr), Yttrium (Y) and Niobium (Nb) are significantly different within pottery types while Rubidium (Rb) and Zirconium (Zr) are not at $p = .126$ and $p = .449$ respectively (Table 6). Based on these results, Strontium, Yttrium and Niobium are all driving the differences seen within the pottery types from Griffin.

A post-hoc analysis is used in order to determine which pottery groups differ from each other. The Games-Howell post-hoc test gives an indication that for some of the elements, pottery types are significantly different, thus implying that the composition of the pottery pastes for different types are heterogeneous. A MANOVA test, however, can only compare each dependent variable on its own, one at a time. Therefore, a more complex method to compare types such, discriminant analysis, was used to compare combined dependent variables among pottery types. This test simply allows for further understanding of how these elements interrelate in distinguishing pottery types and paste groupings. The result is presented graphically in Figure 31.
Table 6: Between-subjects effects for the Griffin Rockshelter

<table>
<thead>
<tr>
<th>Effect</th>
<th>Pilai’s Trace</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>.194</td>
<td>2.475</td>
<td>40.000</td>
<td>2450.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effect</th>
<th>Dependent Variable</th>
<th>Sum of Squares</th>
<th>V</th>
<th>Mean Squares</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Rb</td>
<td>4642528.190</td>
<td>8</td>
<td>580316.024</td>
<td>1.586</td>
<td>.126</td>
</tr>
<tr>
<td></td>
<td>Sr</td>
<td>3.663E7</td>
<td>8</td>
<td>4578950.691</td>
<td>4.425</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>2.520E7</td>
<td>8</td>
<td>3150116.064</td>
<td>3.157</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Zr</td>
<td>2.380E7</td>
<td>8</td>
<td>2975126.775</td>
<td>.983</td>
<td>.449</td>
</tr>
<tr>
<td></td>
<td>Nb</td>
<td>181447.376</td>
<td>8</td>
<td>22680.922</td>
<td>2.181</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
When viewing the standardized plot in Figure 31, it is clear that types are arranged in a relatively tight cluster with function 1, loaded primarily by Strontium and Niobium, and function 2, loaded by Yttrium and Niobium, both equally driving the differences among pottery types from the Griffin Rockshelter (i.e. the cluster is centered at 0). There are also two outliers of limestone tempered, fabric-marked pastes and one limestone
tempered, knot-roughened paste which are also both accounted for by these two functions (i.e., as variants of Strontium, Yttrium and Niobium).

Table 7: Pottery Types included in the MANOVA analysis for the Uzzelles Site.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value Label</th>
<th>N</th>
</tr>
</thead>
<tbody>
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<td>10</td>
</tr>
<tr>
<td>2</td>
<td>ls, cs</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>ls, plain</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>ls, plain/scraped</td>
<td>41</td>
</tr>
</tbody>
</table>

For the Uzzelles Site a total of 109 sherds was included in the analysis including all chronology yielding types (Table 7). A total of 10 fabric-marked, 26 plain, 32 check stamped and 41 plain/scraped sherds comprise the sample. MANOVA analysis also reveals that types are substantially different. The main interaction effects show all five elements are significantly different among pottery decoration types (Table 8). Again, a discriminant analysis was conducted to simplify the interplay between types and elements and to look at the combinatory effect of the five elements and pottery types. In Figure 32, Function 1 is loaded by Niobium whereas Function 2 is primarily loaded by Niobium and Rubidium. It is immediately clear that, in contrast to the Griffin Rockshelter, three main clusters are present. The cluster of limestone, fabric marked is explained by both functions. Function 2 is contributing slightly more than 1 for limestone check stamped, and for plain and plain/scraped, function 1 explains most of the compositional variability.
Table 8: Between-subjects effects for the Uzzelles Site.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Pilai’s Trace</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>1.212</td>
<td>13.957</td>
<td>15.000</td>
<td>309.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effect</th>
<th>Dependent Variable</th>
<th>Sum of Squares</th>
<th>V</th>
<th>Mean Squares</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Rb</td>
<td>4452513.638</td>
<td>3</td>
<td>1484171.213</td>
<td>39.846</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Sr</td>
<td>7937798.760</td>
<td>3</td>
<td>2645932.920</td>
<td>6.873</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>426151.144</td>
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<td>142050.381</td>
<td>4.903</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Zr</td>
<td>2.148E7</td>
<td>3</td>
<td>7159127.233</td>
<td>9.687</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Nb</td>
<td>198639.481</td>
<td>3</td>
<td>66213.160</td>
<td>17.415</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
Figure 32: Canonical Discriminant Function for the Uzzelles Site.

Discussion

When Griffin and Uzzelles discriminant function plots are set to the same scale and viewed simultaneously a clear difference is evident between the sites. The assemblage from Griffin is tightly clustered regardless of surface treatment whereas the Uzzelles assemblage is scattered and discrete groupings can be perceived (Figure 33).
Figure 33: Scaled Discriminant Functions.
Therefore, the paste configurations at Griffin appear to be more homogeneous than Uzzelles. On the face of it, this seems to be logical for Uzzelles. This shelter has Early, Middle and Late Woodland pottery types of fabric-marked, check-stamped, plain and plain/scraped wares respectively. When pottery is made during different time periods, different clay resource areas may have been and likely were exploited. Contrary to Uzzelles, the Griffin Rockshelter has a much greater variety of pottery types, and the analysis of the pastes reveals it to be more homogeneous. Although Griffin does have a few types from Early and Middle Woodland, the assemblage is dominated by Late Woodland types. Regardless of chronology, the spread of pottery in the Griffin discriminant function plot is more compact. Although Griffin has a smaller assemblage of earlier pottery types than Uzzelles, the stark contrast of variability in paste remains evident.

These initial analyses into the paste composition from pottery at both sites, however, do include all chronological types. Perhaps time or chronology is a factor contributing to the difference documented between the two sites. With regards to the Uzzelles Site, the clusters that are present also correspond to temporal pottery types with limestone tempered fabric-marked (an Early Woodland type) segregated from limestone tempered check stamped, a Middle Woodland type. Both of these are differentiated from limestone tempered plain and plain/scraped types, representing the Middle to Late Woodland periods, which overlap with one another. In reference to the Griffin Rockshelter, all types spanning the Early to Late Woodland period are clustered with one another. Based upon these results another set of MANOVA’s and discriminant function analyses were conducted in which chronology was controlled.
Since Uzzelles primarily consists of Early and Middle Woodland types, the MANOVA focused on these periods for both sites. With the resulting reduction in sample sizes and types, another MANOVA was used to assess whether a significant interaction effect was present between types selected and the two sites with respect to elements. Early types for Griffin comprised 55 specimens, including both limestone tempered, fabric-marked and cord-marked types. The Middle Woodland category for Griffin includes 166 sherds comprised of limestone-tempered plain, simple stamped and check stamped. For the Uzzelles site, 10 early types include only fabric-marked while 58 examples of Middle Woodland types include limestone tempered, plain and check stamped varieties. Although plain surface treatments persist into the Late Woodland in this region, it is included as a “Middle” type because this is when it first emerges and is most common.

Based upon the presence of unequal variance within the samples being analyzed, Pilai’s Trace was again the multivariate test consulted, and no significant effect between site and types at $p=7.41$ is indicated. Therefore, in this analysis, sites can be grouped together and provide meaningful data. When viewed with regards to the discriminant function, Wilk’s Lambda indicates that functions 1 through 3 are significant (all at $p<0.05$). Function 1 is most significantly loaded by Rubidium, function 2 being loaded by Niobium and function 3 primarily loaded by Yttrium.
When the standardized plot is referenced, again some distinguishable clusters are apparent (Figure 34). Middle Woodland pottery types are significantly differentiated between the Griffin Rockshelter and Uzzelles Site indicating a difference within the paste composition of these two groups. Furthermore, Early Woodland types from Griffin are separated from both Early and Middle Woodland types from Uzzelles. It is clear
from this plot that pottery paste compositions do significantly differ between the two sites. That is to say that pottery types from the same chronological period are significantly different at the Uzzelles Site compared to the Griffin Rockshelter.

Griffin's high diversity of pottery types and homogeneity in paste composition is clear evidence that there is a difference in pottery assemblages between Griffin (a ceremonial site), and Uzzelles (an economic procurement site), suggesting their different function or utilization within a contemporary prehistoric landscape. The pattern of high diversity in pottery types, seen here for the Griffin Rockshelter, has also been observed at two other regional rock art sites. This may therefore be a defining characteristic of ceremonial sites. Further analysis is needed, however, in order to see if similar compositional results characterize these other rock art shelters in order to support arguments for general patterns in how paste assemblages differ between art and non-art archaeological sites.

In sum, a first statistical analysis was conducted to explore significant differences among the Griffin and Uzzelles pottery assemblages. This series of tests revealed that both assemblages exhibited significant differences between paste composition and pottery types. However, the Griffin Rockshelter assemblage was overall more homogeneous in paste composition than pottery from the Uzzelles Site. Since this perceived difference could be attributed to the difference in chronology represented at the two sites, another series of statistical tests were employed to control for the variable of time. The resulting tests concluded that in fact pottery types from the same chronological period are different with respect to paste composition between Griffin and Uzzelles. Therefore, while function of these two shelters can be determined through
artifacts, it is also supported by the elemental characterization of pottery pastes. The following chapter offers some final concluding remarks and avenues for future research.
Chapter VI: Conclusions

In the introductory chapter, a statement of the problem and the aims of this thesis project were outlined. Those objectives will now be briefly evaluated in light of the statistical results.

The notion that a relatively high diversity of pottery types could typify ritual or ceremonial sites on the landscape is particularly intriguing. This pattern of a high diversity of types is documented at two other regional rock art sites in the Southern Cumberland Plateau, the McCollough and Moonshadow Sites. Given the sheer number of pottery types represented at Griffin compared to Uzzelles, the Griffin assemblage can be seen as taxonomically rich (Table 9). Taxonomic richness is a measure developed by ecologists and used by archaeologists that allows for comparison among different assemblages; it is most commonly used as a measure of diversity (Grayson 1984). Simply put, richness is measured by the number of taxa (types) represented in an assemblage. In this study, types are established based on distinguishable surface treatment and temper additives. Table 9 shows the contrasting numbers of types present between the Griffin Rockshelter and Uzzelles Site. The Griffin Rockshelter possesses a minimum of 15 different pottery types while Uzzelles only contains four.
Table 9: Number and diversity of pottery types from the Griffin Rockshelter and Uzzelles Site.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Griffin Rockshelter</th>
<th>Uzzelles Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LS tempered, fabric-marked</td>
<td>37</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>LS tempered, cord-marked/smoothed over cord-marked</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>LS tempered, plain</td>
<td>203</td>
<td>37</td>
</tr>
<tr>
<td>4</td>
<td>LS tempered, simple stamped</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>LS tempered, check stamped</td>
<td>3</td>
<td>43</td>
</tr>
<tr>
<td>6</td>
<td>LS tempered, plain/scraped</td>
<td>271</td>
<td>51</td>
</tr>
<tr>
<td>7</td>
<td>LS tempered, knot-roughened</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>LS tempered, punctate</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>LS mix, fabric-marked</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>LS mixed, plain</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>LS mixed, plain/scraped</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>LS mixed, knot-roughened</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Quartz tempered, knot-roughened</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Quartz tempered, plain</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sand/Grit/Quartz tempered, plain</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Other</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>Residuals</td>
<td>135</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>752</td>
<td>200</td>
</tr>
</tbody>
</table>

It is conceivable that the range of types at Griffin may represent more than aesthetic beauty or utilitarian treatments. The homogeneity in paste seems to support the possibility that multiple types of pottery, possibly serving different functions, were being made from the same clay resource and were brought to the Griffin Rockshelter. This would seem to suggest that the clay resources ending up at Griffin were being procured from a relatively small area for a specific ceremonial purpose, or because people always came to Griffin from the same preceding location, or some combination of both. The widely varied surface treatments at Griffin made from the same or at least similar clay may also indicate a ceremonial significance to at least some surface
treatments. This latter idea has important implications for studies in prehistoric religious symbols in the Southeast.

Let’s briefly consider punctate pottery; Whyte et al. (2011) postulate that tools used to produce punctuation marks could possess more significance than a purely technical purpose by pointing out that punctuation marks could have been created by a variety of implements (i.e., bird feathers). While it is uncertain what the vessels at the Griffin Rockshelter were being utilized for, these surface treatments could serve as special icons which carry both religious and ceremonial attributes (Dye 2007). Thus, religious causation must be addressed in archaeological context. Spiritualism, ritual, and ceremony are deeply and intimately ingrained in prehistoric cultures. For instance, describing pottery decorations or attributes and developing overarching typologies, “…is preclusive, as it tends to reduce potentially rich symbolism to something that is solely aesthetic” (Whyte et al. 2011: 390). Tilley (1999:57-59) has observed:

In small-scale societies technology is inseparable from ideas of spiritual or ancestral involvement in the production process… The “economic”, “social”, “ritual”, “magical” and “political” dimension of technological processes cannot be meaningfully separated out and put into discrete boxes. They form part of a process in which metaphors originating in one domain are activated to make sense of another, and vice versa, in continual dialectical interplay.

Thus, in order to fully understand an archaeological culture we cannot afford to divorce the archaeological artifacts from the religious or ceremonialism they might have held.

Another important point is illustrated in the statistical tests conducted and discussed earlier. Despite the fact that the Griffin Rockshelter does possess “statistically significant” differences in the paste compositions between types, the assemblage is much more homogeneous than that from the Uzzelles Site. What does this really mean?
Perhaps the variability in paste composition at Uzzelles indicates the shelter was utilized by significantly different groups of people. Or, since the site appears to have functioned primarily for utilitarian purposes, clay was acquired at different points across the landscape to make the vessels present at the site; in other words, people came to Uzzelles from different places. These types of inferences, however, depend upon the number and location of clay sources that could have been exploited in the area. The more homogeneous paste composition at Griffin could have resulted from the ceremonial or ritual functioning of the site itself or from its different relationship to other sites on the landscape. Frequency of visitation, regularity of use, etc. must be reflected in these intersite differences. Perhaps the acquisition of clay itself from the earth was a ritualistic process. If the Griffin Rockshelter served a ceremonial purpose, then maybe there was significance in the clay acquisition for the making of the pottery found there. The same clay bed could have been exploited repeatedly because that was important for vessel use at a religious site sometime time in the future.

These two sites are further distinguished based upon the number and diversity of pottery types within their assemblages. The Uzzelles Site only contained four distinguishable pottery types. This further supports the perceived function of the site. Since emphasis was placed primarily on the acquisition, processing, and possible storage of food stuffs at Uzzelles, the design or decoration of pottery was mundane and thus limited. In other words, the pottery was purely utilitarian and only needed to function in a profane context. It is important to note that Uzzelles was not fully excavated and taxonomic richness is sensitive to sampling (Grayson 1984). However, Griffin contains substantially more pottery types than Uzzelles despite its small size.
Both sites it should be remembered were recovered with modern recovery technique. For future research into the richness of pottery from sites, both the number and weights should be included in the analysis. The post-depositional environment could contribute to the differences in numbers recovered from archaeological sites (i.e. trampling or other taphonomic processes).

Overall, the XRF data presented here were fruitful and produced some intriguing results. However, there are still more questions to be answered. This analysis only looked at limestone tempered pottery types and by coupling XRF analyses with other analytical techniques such as petrography, important information might be obtained concerning the role of temper and natural inclusions, and how they may play in constructing variability. The analytical methodology employed in this thesis also provides a base-line for future XRF pottery analyses. Streamlining could be applied in two areas: number of assays per sherd and duration of X-Ray exposure. A total of 3 independent assays were obtained per sherd for a duration of 300 seconds. Based on the standard error rates, I would argue that two assays per sherd would suffice for an accurate representation of the pottery paste. However, for the analysis of non-homogeneous materials, standard error rates should always be conducted as a measure to control for variability introduced between assays of the same sample. With regards to the duration, more experiments are needed to address what differences (if any) in elemental concentrations would arise by shortening the duration from 300s (5 minutes) to 180s (3 minutes). Lastly, and likely most importantly, more sites must be analyzed and compared before we can begin to accurately define pottery composition profiles across the entire region. To establish these results as a pattern for the region,
more rockshelter sites must be analyzed including a variety of sites with different functions on the landscape.
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Smith, B.D.


Steponaitis Vincas P.


Swanton, J.R.


Tilley, Christopher Y.

Walthall, John A.


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Zar, Jerrold H.

Vita

Sierra M. Bow was born in Tallahassee, Florida on May 5, 1986. In spring 2008, she received a B.S. in Psychology with a double minor in Biology and Anthropology from East Tennessee State University, in Tennessee. She entered the graduate program at the University of Tennessee, Knoxville in the fall of 2009 where she received her M.A. in Anthropology. Sierra is currently pursuing her doctorate in Anthropology at the University of Tennessee, Knoxville.