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Cover: View of the Shrull Lime Kiln, Logan County.

PREFACE

Since its creation in 1966, the Kentucky Heritage Council has taken the lead in preserving and protecting Kentucky's cultural resources. To accomplish its legislative charge, the Heritage Council maintains three program areas: Site Development, Site Identification, and Site Protection and Archaeology. Site Development administers the state and federal Main Street programs, providing technical assistance in downtown revitalization to communities throughout the state. It also runs the Certified Local Government, Investment Tax Credit, and Restoration Grants-in-Aid programs.

The Site Identification staff maintains the inventory of historic buildings and is responsible for working with a Review Board, composed of professional historians, historic architects, archaeologists, and others interested in historic preservation, to nominate sites to the National Register of Historic Places. This program also is actively working to promote rural preservation and to protect Civil War sites.

The Site Protection and Archaeology Program staff works with a variety of federal and state agencies, local governments, and individuals to assist in their compliance with Section 106 of the National Historic Preservation Act of 1966 and to ensure that potential impacts to significant cultural resources are adequately addressed prior to the implementation of federally funded or licensed projects. They also are responsible for administering the Heritage Council's archaeological programs, which include the agency's state and federal archaeological grants; organizing this conference, including the editing and publication of selected papers; and the dissemination of educational materials, such as the Kentucky Before Boone poster. On occasion, the Site Protection and Archaeology Program staff undertakes field and research projects, such as emergency data recovery at threatened sites.

This volume contains papers presented at the Twenty-First Annual Kentucky Heritage Council Archaeological Conference, which was held at Cumberland Falls State Resort Park, Corbin, Kentucky. Heritage Council staff that assisted with conference proceedings included Site Protection Program Manager Thomas N. Sanders, as well as Staff Archaeologists David Pollack, Sarah E. Miller, and Charles D. Hockensmith, and administrative assistant Yvonne Sherrick.

Of the 25 papers presented at the Twenty-First Annual Heritage Council Archaeological Conference, seven are included in this volume. The eighth paper was contributed by Charles D. Hockensmith. As in years past, these papers provide a cross-section of archaeological research conducted in Kentucky. Some of the papers are the products of the research interests of the participants, such as those by Hockensmith, Hammerstedt, and Schroeder. Other papers were produced as part of Section 106 related compliance projects or state funded undertakings. These include papers by Pullins and O'Conner, Miller, Wetzel, Bergman et al. and Martin. Figure 1 illustrates the general locations of major sites and project areas discussed in this volume.

I would like to thank everyone that participated in the Twenty-First Heritage Council archaeological conference as well as other Heritage Council archaeological conferences. Without your continued support, these conferences would not have been as successful as they have been. Finally, I would like to thank E. Nicole Mills, Richard V. Williamson, and Richard D. Davis for agreeing to edit this volume. There efforts are greatly appreciated.

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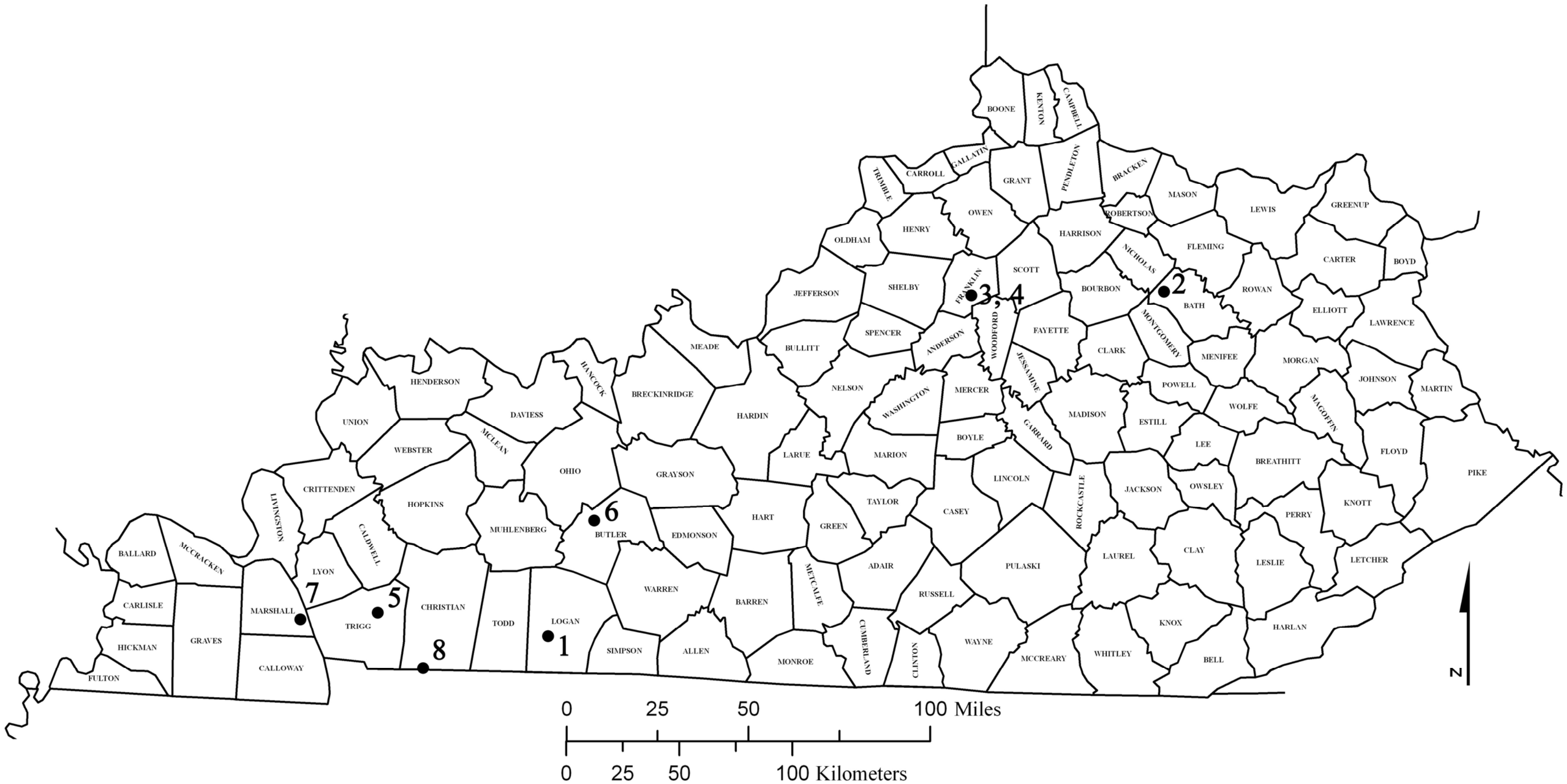

Figure 1. Location of Sites Discussed in this Volume: 1) Shrull Lime Kiln; 2) Duckworth Farm; 3 and 4) Old Frankfort Cemetery; 5)15Tr289; 6) Annis Village; 7) Jonathan Creek, and 8) Fort Campbell.

TABLE OF CONTENTS

ARCHAEOLOGICAL INVESTIGATIONS AT THE SHRULL LIME KILN NEAR RUSSELLVILLE, LOGAN COUNTY, KENTUCKY

By

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ABSTRACT

The Shrull Lime Kiln is located southwest of Russellville in Logan County, Kentucky. This rectangular stone kiln probably dates to the 1860s. Initially, a brief overview of the manufacture of lime and its uses is provided. The kiln appears to be associated with the Russellville Stone Quarry Company. The primary focus of this paper is a description of the Shrull Rudd Lime Kiln and associated quarry. The paper concludes with a brief discussion and some summary remarks.

INTRODUCTION

The Shrull Lime Kiln (15Lo210) is located about 2 km southwest of the western edge of Rusellville in Logan County, Kentucky. Situated in western Kentucky, Logan County is located in the Pennyrile region. Property owner Dale Shrull of Russellville, Kentucky, brought the kiln to the attention of the Kentucky Heritage Council. Mr. Shrull discovered the kiln during early October of 2000 after he built a road into the remote tract that he had previously purchased. The Shrull Lime Kiln is located at the southern base of the oval shaped knob between U.S. Highway 79 and the Louisville and Nashville Railroad track. On April 18, 2002, the author visited the site with Dale Shrull. The Shrull Lime Kiln was measured and was drawn in both plan view and profile. Also, the quarry and associated stone piles were recorded. The site was also documented with black and white photographs.

Little information is available about the lime industry in Logan County. Between 1800 and 1830, Russellville was an important manufacturing town (Coffman 1931:25). Among the many businesses operating in Russellville during this period were two lime kilns (Coffman 1931:25). Unfortunately, no additional information is available concerning the location of these kilns or their operators. The Shrull Kiln is the first lime kiln to be recorded in this area of Kentucky. Hopefully, future archival research will provide additional insight into the lime industry of this region.

Logan County contained the necessary limestone deposits to support a lime industry. Dever's (1996) map entitled "Principal Outcrop of Limestone and Dolomite Resources in Kentucky" indicates that most of Logan County contained limestone deposits. In Jillson's (1928:224) summary of Logan County, he stated that:

> The principal mineral resource of Logan County is limestone which is found in large quantity suitable for building construction, highway and railroad bed use. Certain horizons in the Chester (Upper Mississippian) series, particularly the Gasper limestone are high in calcareous content and are suitable for agricultural lime.

Agricultural lime (ground rather than burned) was also produced in Logan County. The Kentucky Stone Company on Morgantown Road at Russellville was producing agricultural limestone between ca. 1949 and 1996. The company was listed as a lime producer in manufacturing directories for the following years: 1949, 1953-1954, 1955-1956, 1969, 1975, 1980, 1985, 1990, 1992, 1996 (Agricultural and Industrial Development Board 1949:209, 1953:218, 1955:235; Kentucky Department of Commerce 1969:213, 1975:255, 1980:238, 1985:197, 1990:204, 1992:212, 1996:284). No agricultural lime producers were listed for Logan County in the 1998 and 2000 manufacturing directories (Harris InfoSource 1998, 2000).

Historic mineral extractive and processing sites such as lime kilns are not randomly scattered across the countryside. By necessity, these site types are located at or very near to the mineral resource being exploited. Minerals are often restricted to faults or geological deposits with very limited exposure on the ground surface. Also, these processing sites have to be close to an economical mode of transportation in order to make it feasible to ship the product to market. Consequently, researchers must consider these factors when trying to predict the locations of industrial extractive and processing sites.

This paper provides a general discussion of lime industry and describes the Shrull Lime Kiln. First, a brief overview is provided on how lime was manufactured. Next, information is briefly presented on the nature of lime and the various uses that have been found for it. Third, the results of archival research on the property and the Russellville Stone Quarry Company are presented. Fourth, the archaeological remains associated with the Shrull Lime Kiln are described. These remains include the kiln, a ramp, the quarry area, and associated features. A discussion section briefly compares the Shrull Lime Kiln with other lime kilns. The paper concludes with some summary remarks.

THE MANUFACTURE OF LIME

The first step in the manufacture of lime was quarrying the limestone. Following the removal of the overburden, holes were drilled and the limestone was blasted into large pieces (Emley 1914:1559-1562; Emley and Porter 1927:14-16; Orton and Peppel 1906:263). The larger blocks of limestone were blasted into smaller fragments, then they were sorted, loaded, and transported to the kiln (Emley and Porter 1927:16-19). The limestone was transported by wheelbarrow, horse and cart, or by tram cars to the kiln (Emley 1914:1562-1563; Emley and Porter 1927:18; Orton and Peppel 1906:264-265). At the lime kiln, the limestone was dumped or "charged" into the top of the kiln. Different types of kilns, transportation systems, and dumping strategies were used depending on local conditions and the amount of lime required. The method of charging was also dependent on whether a kiln was an intermittent or continuous type. Eckel (1928:100) stated that "intermittent kilns are those in which each burning of a charge constitutes a separate operation. The kiln is charged, burned, cooled, and the charge is drawn; then the kiln is again charged, and so on." On the other hand, in a continuous kiln, limestone and fuel were added as needed while the lime was drawn from the bottom (Eckel 1928:102). The continuous kiln permitted constant operation for an extended period of time.

Indiana State Geologist W. S. Blatchley (1904:225-226) provided a description of a "ground-hog" or early vertical shaft kiln in his study entitled "The Lime Industry in Indiana":

> The kilns used at local points for burning lime for neighborhood use are or were intermittent kilns of stone. In them the fire was allowed to go out after each burning, to be started again after the kiln was recharged with stone. These cheaper, temporary or "ground-hog" kilns were rudely constructed of stone, and were located on the side of a hill, so that the top was easily accessible for charging the kiln with stone, and the bottom for supplying fuel and drawing out the lime. In charging, the largest pieces of limestone were first selected and formed into a rough, dome-like arch with large open joints springing from the bottom of the kiln to a height of five or six feet. Above this arch the kiln was filled with fragments of limestone from the top, the larger pieces being used in the lower layers, these being topped off with those that were smaller. A fire of wood was then started under the dome, the heat being raised gradually to the required degree in order to prevent a sudden expansion and consequent rupture of the stone forming the dome. Should this happen, a downfall of the entire mass above would take place, thus putting out the fire and causing a total loss of the contents of the kiln. After a bright heat was once reached through the mass of stone, it was maintained for three or four days to the end of the burning. This was indicated by a large shrinkage in the volume of the contents, choking up of the spaces between the fragments and the ease with which an iron rod could be forced down from the top. The fire was then allowed to die out and the lime was gradually removed from the bottom. It was in this manner that all the lime used in Indiana for many years was burned, and in some localities these temporary intermittent kilns are still in operation. The process of burning is simple and cheap, the only expense being for blasting the stone and preparing the fuel. Possibly but one or two kilns were necessary to supply a neighborhood for a year. These were burned in a week or two when required, the kiln remaining idle for the remainder of the time.

THE USES OF LIME

Lime has long been used as a building material, fertilizer, and an ingredient for various products. Different types of limestones produce limes with distinct chemical properties. The Department of Commerce and Labor (1911:6) characterized the general properties of lime as follows:

> lime is merely limestone from which the carbon dioxide has been removed by heat... The wide variation in the chemical and physical properties of limestones necessitates a similarly great difference in the kinds of lime. Therefore, some system of classification becomes necessary. The National Lime Manufacturers Association has officially adopted a classification based on the content of magnesia ...[high-calcium lime, magnesian lime, dolomitic lime, and super-dolomitic lime]...There are, however, several properties which are common to all limes in a greater or less degree. Thus it may be said that lime is a white or nearly white substance which will slake when water is added to it. When lime slakes, it enters into chemical combination with water. This reaction generates heat, and is accompanied by an increase in volume.

Once the lime is ready for sale, it sold as lump lime or ground lime. The Department of Commerce and Labor (1911:7) noted that "lump lime is shipped in bulk, or in wooden barrels holding from 100 pounds to 300 pounds. Ground lime is lump lime which has been ground and screened generally through 60 mesh. It is shipped in air-tight iron casks holding about 400 pounds." After the lime has been slaked, it is sold under the name "hydrated lime" which is "...a fine, dry powder, consisting of calcium hydrate and magnesium oxide..." (Department of Commerce and Labor 1911:9). Hydrated lime was sold in bags ranging from 40 to 100 pounds and various grains sizes between 10 and 200 mesh (Department of Commerce and Labor 1911:9). The advantages to using hydrated lime included a lack of danger of spoiling during slaking, better preservation, no danger of fire, and it is immediately ready to use after adding water (Department of Commerce and Labor 1911:9).

Many different industries used the various types of limes available. In the building trade, lime was used in mortar, plaster, Portland cement, natural cement, and as a major ingredient in sand-lime bricks (Department of Commerce and Labor 1911:10-14; Emley 1914). Many industries used lime as an ingredient or an additive to cause chemical reactions in their products. Products and industries using lime include glass, ceramics, water purification, soda ash, caustic soda, bleaching powder, calcium carbide, illuminating gas, ammonia, calcium cyanamide, calcium nitrate, fertilizer, insecticides, sugar, distillation of wood, paper, paints, glycerin, lubricants, candles, and leather tanning (Department of Commerce and Labor 1911:13-20; Emley 1914).

ARCHIVAL OVERVIEW OF THE SHRULL TRACT

The precise age of the Shrull Lime Kiln is currently unknown. Mr. Dale Shrull feels that this tract is the location of the stone quarry used to obtain building stone for the Rev. James McGready's house built in the 1790s (Finley 1878:178) that was located nearby. Deeds for the tract indicate the property was once owned by the Russellville Stone Quarry Company. The lime kiln may have been built during their ownership to utilize the waste rock produced from quarrying building stone. It is also possible the kiln was built by earlier quarry operators. On March 11, 1865, F. A. Harvey and her children conveyed 25 acres to William P. Faullin by order of Logan Circuit Court following a law suit by Faullin (Logan County 1865). Two years later on January 15, 1867, William P. and Mary E. Faullin deeded 5.98 acres of this tract to the Russellville Stone Quarry Company for $914.40 (Logan County 1867a). This deed indicated that H. B. Tully, C. P. Burgher, C. H. Harrison, John Haly, and C. L. Stancliff were the stockholders of the Russellville Stone Quarry Company (Logan County 1867a). Further, this deed mentioned "quarry buildings" which suggest that the Russellville Stone Quarry Company acquired an existing or former quarry operation (Logan County 1867a). On June 4, 1867, C. H. Harrison and his wife deeded $6\frac{2}{3}$ acres to the Russellville Stone Quarry Company for $400 (Logan County 1867b). Three months later, on September 16, 1867, C. H. Harrison sold his interest in the Russellville Stone Quarry Company to H. B. Tully for $1,500 (Logan County 1867c). On March 3, 1869, H. B. Tully sold John B. Tully $^{2}/_{5}$ interest of the 15 $^{24}/_{100}$ acre tract of the Russellville Stone Quarry Company (Logan County 1869). Erastus B. Tully and his wife conveyed the property to Rufus Tully on April 5, 1876 (Logan County 1876). The following year, on February 17, 1877, E. B. Tully and Martha E. Tully sold $^{2}/_{5}$ interests in the Russellville Stone Quarry Company to Rufus S. Tully for $15 (Logan County 1877a). Later that year on August 20, 1877, Rufus S. Tully sold his $^{2}/_{5}$ interests in the Russellville Stone Quarry Company (15 $^{24}/_{100}$ acre tract) to T. M. Tully and Mary E. Tully for $60 (Logan County 1877b). The Russellville Stone Quarry Company tract (16 acres) was conveyed to G. W. Ryan by Logan County Sheriff V. H. Stewart because Ryan paid the back taxes for 1911, 1912, and 1913 (Logan County 1920). Ryan obtained the tract for the $5.86 of taxes owed by Ryan Burgner (Burgher?) and Tully (Logan County 1920). The property was recently acquired by Dale Shrull and Joyce Shrull on February 25, 1997 (Logan County 1997). The Shrulls bought 12.06 acres for $15,000 from family members George W. Ryan, III and his wife Jenelle Ryan, Mary Lee Tatum, as well as Joseph B. Hill, Jr. and his wife Louise Hill (Logan County 1920).

The Russellville Stone Quarry Company was incorporated by the Commonwealth of Kentucky in 1867 (Acts of Kentucky 1867:396). The act read as follows:

> AN ACT to incorporate the Russellville Stone Quarry Company.
>
> *Be it enacted by the General Assembly of the Commonwealth of Kentucky:*
>
> 1. That C. L. Stancliff, John Haly, C. P. Burgher, C. H. Harrison, and H. B. Tully, their successors and assigns, be, and they are hereby, constituted a body corporate and politic, by the name and style of the "Russellville Stone

> Quarry Company," for the purpose of carrying on a general stone business, quarrying, working, buying, selling, and such other use of stone as may be necessary, for the interest of the company.
>
> 2. By and in the name of "Russellville Stone Quarry Company" shall be authorized to sue and be sued, to contract and be contracted with, purchase, hold, sell, and convey, by deed, mortgage, and otherwise, any real or personal estate; to have a common seal, which may be changed at pleasure: *Provided*, That said company shall not hold at one time real estate exceeding in value twenty thousand dollars, and this charter shall be for thirty years.
>
> 3. The capital stock of said company shall be not less than five thousand ($5,000) dollars, and not more than twenty-five thousand ($25,000).
>
> 4. The company shall have the power to make rules, regulations, and by-laws for the management of said company for the government of their stockholders, officers, and agents, and for the management and protection of the corporate property, rights, and interest from loss or injury, and for the welfare and prosperity of the company: *Provided*, They are not in violation of the laws of Kentucky and the United States of America.
>
> 5. This act shall take effect from the day of its passage.
>
> *Approved February 14, 1867.*

Several archival sources were consulted to obtain information on the individuals who chartered the Russellville Stone Quarry Company. The men included C. L. Stancliff, John Haly, C. P. Burgher, C. H. Harrison, and H. B. Tully. No biographical sketches were located for any of these individuals. For an unknown reason, Tully had the only individual listing in the Atlas of Logan County (Locke and Hunt 1877:39). The absence of the other names suggests that people had to pay in order to be included. Several published newspaper abstracts were checked for entries that mentioned the stockholders. Unfortunately, the newspaper abstracts checked were oriented towards genealogy and did not include references to businesses. Further, microfilm copies of these newspapers were not available in Frankfort. In the records checked, no information was found for C. L. Stancliff or John Haly. It is assumed that they were investors residing outside of Logan County. It is also possible that C. L. Stancliff or John Haly had some expertise in the stone business and briefly lived in Russellville to operate the quarry. The following paragraphs present the information found for H. B. Tully, C. P. Burgher, and C. H. Harrison.

The 1850 Population Census listed 15 year old Henry Tully as living with 41 year old Benjamin Tully (Hammers 1978:109). Henry B. Tully was listed in the 1860 Population Census as a 23 year old white male with $13,000 of property residing with his father, 51 year old B. K. Tully (Willhite n.d.:95). The 1870 Population Census listed Henry B. Tully as a 35 year old farmer and tradesman born in Kentucky married to 30 year old Kentucky native

Nancy (Vanderpool n.d.:437). The Atlas of Logan County (Locke and Hunt 1877:8) listed H. B. Tully as a Kentucky native residing in Russellville and working as a farmer. Tully died the following year and the subsequent information was included in the Logan County records (Logan County Genealogical Society 1994:125):

> Tully, Henry B., Equity box 133, case number 3555. He died intestate in November of 1877. Widow was N. A. Tully. Children: Carrie; Kate; Elizabeth; Charles; Lucy; Mary. Katie married John Bostick. Adm.: C. Harrison. Filed: 16 Sept. 1878.

Tully's business partner, C. H. Harrison, was the administrator of his estate. The Logan County cemetery records indicate that H. B. Tully was born May 8, 1835, died December 8, 1877, and was buried in the Maple Grove Cemetery at Russellville (Logan County Genealogical Society 2000:29). The cause of Tully's early death at the age of 42 years is not currently known.

Charles. P. Burgher was listed in the 1850 Population Census as a 21 year old farmer living with his father William, a 63 years old man from Virginia (Hammers 1978:143). In the 1860 Population Census, Charles P. Burgher was listed as a 31 year old white male working as a brick mason with $1,630 and $600 of property (Willhite n.d.:97). Burgher was married to a 25 year old woman named Elizabeth who was born in Kentucky (Willhite n.d.:97). The 1870 Population Census listed Charles P. Burgher as a 41 year old farmer born in Kentucky (Vanderpool n.d. :393). No further details were found concerning Burgher.

Carter H. Harrison was listed in the 1850 Population Census as a 22 year old merchant born in Louisiana and married to a 20 year old woman named Sophronia from Tennessee (Hammers 1978:75). The 1860 Population Census listed C. H. Harrison as a 32 year old white male working as a merchant with $1,200 and $8,000 of property (Willhite n.d.:61). In the 1870 Population Census, Carter H. Harrison was listed as a 42 year old furniture dealer (Vanderpool n.d.:424). The Atlas of Logan County (Locke and Hunt 1877:39) included a drawing of the Logan County National Bank that had C. H. Harrison's name shown on one of the buildings. The June 13, 1902 edition of the *Logan County News* contained a reference to Sophronia Harrison, wife of C. H. Harrison, dying at the age of 72 years (Vanderpool 1987:26). The Logan County cemetery records indicate that Carter H. Harrison (1828-1913) and Sophronia Harrison (1830-1902) were buried together in the Maple Grove Cemetery at Russellville (Logan County Genealogical Society 2000:29).

THE SHRULL LIME KILN ARCHAEOLOGICAL REMAINS

The archaeological remains associated with the Shrull Lime Kiln (15Lo210) consist of the kiln, a ramp, the quarry, stone piles, and a possible office or farmstead (Figure 1). Remains are distributed across an area about 160 m (528 ft) east-west and 70 m (231 ft) north-south. No artifacts were recovered from the site during the investigations.

Mr. Shrull previously collected four iron feathers from the site that were used in conjunction with wedges. Feathers were placed on each side of a drill hole and a wedge was inserted between them. Feathers and wedges were placed in each drill hole and carefully tapped with a hammer until the rock split in a line following the holes. Mr. Shrull reported that the feathers were $^7/_8$ of an inch wide, 8 inches long, and half round in cross-section. Several limestone samples and a small quantity of lime were collected for future analysis. The following paragraphs describe the various features comprising the site.

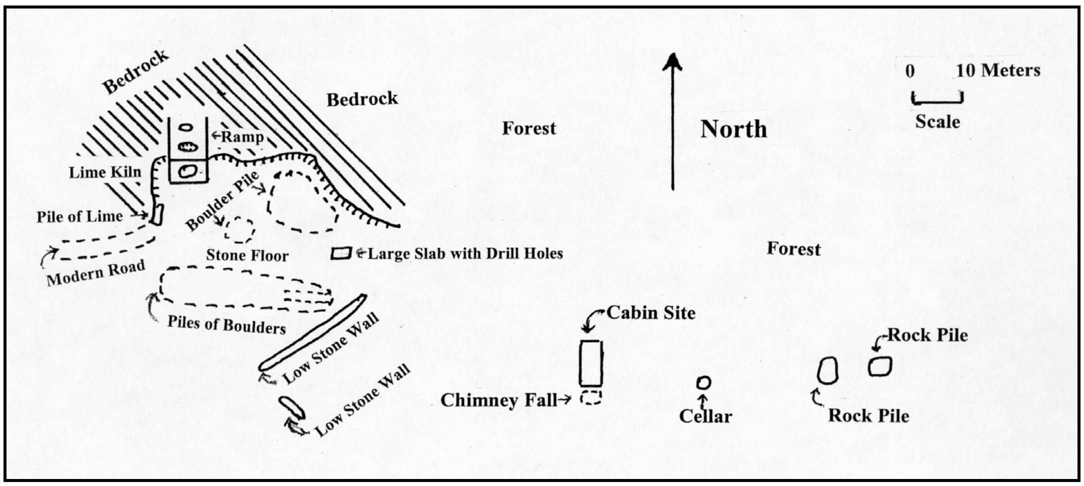

Figure 1. General Sketch Map of the Shrull Lime Kiln, Quarry, and Associated Features.

THE SHRULL LIME KILN

The Shrull Lime Kiln is located at the western end of the quarry (Figure 2). The north side of the kiln was built into a low cliff to facilitate loading the structure. A ramp extending to the north provided easy access to the top of the kiln. The area northeast of the kiln is an unmodified cliff 4 to 5 m (13.2-16.5 ft) high. The area south and immediately east of the kiln contains a relatively flat stone floor created by quarrying the limestone. At the east end of the stone floor is the quarry face that contained drill holes and a large pile of boulders. The areas beyond the stone floor to the south and southeast contain boulders of various sizes with drill holes. An old roadbed is present south of the piles of boulders. Each of these areas will be described in greater detail in the following paragraphs.

The rectangular lime kiln was built in the northwest corner of the quarry on the flat quarry floor. As previously noted, the north side of the kiln abuts against a low limestone cliff. The kiln measures 5.5 m (18 ft) north-south and 7.46 m (24.5 ft) east-west. The west side of the kiln is only 3 m (9.9 ft) from a quarried stone face. This low wall is 2 to 3 m (6.6 to 9.9 ft) high and slopes to the south. The low cliff, 4 to 5 m (13.2-16.5 ft) high, continues to the east and then projects southward about 4 m (13.2 ft) east of the kiln. Mr. Shrull removed the debris (stone and soil) from around the kiln with heavy equipment. The debris stains are clearly visible on the kiln's exterior walls. Mr. Shrull reported that a pile of fist-sized limestone was stockpiled just east of the kiln. He placed these stones in a large metal container for safe keeping. Southwest of the kiln (on the stone floor) is an *in situ* pile of lime about 4 m (13.2 ft) north-south and 1.5 m (4.95 ft) east-west. Also, Mr. Shrull placed additional lime in a large container near the kiln. The boulder piles south of the kiln also include some quarried stone blocks that had fallen from the top of the lime kiln. These stone blocks were moved as part of Mr. Shrull's cleanup efforts.

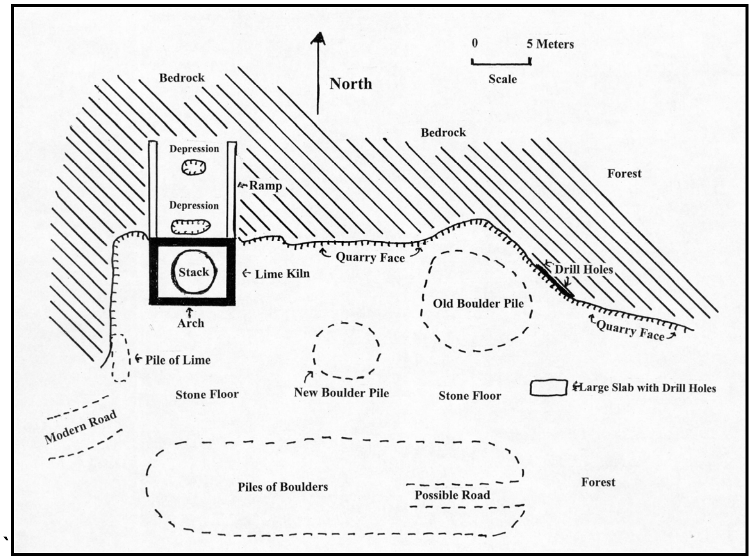

Figure 2. Detailed Sketch Map of the Shrull Lime Kiln and Quarry.

The front facade (south side) of the lime kiln (Figure 3) has a maximum height of 4.34 m (14.32 ft). The southwest corner is 3.4 m (11.22 ft) high while the southeast corner is 4.09 m (13.5 ft) high. This side of the kiln is 7.46 m (24.5 ft) wide at the base. This facade has 10 main courses of large limestone blocks. Portions of the surviving sandstone lining extending several courses higher than the limestone blocks near the center. The kiln was built from large limestone blocks that had been shaped. Eight slabs from the front corners of the kiln were measured to provide information on the size of the slabs used in the construction. These slabs have the following measurements: 97 x 34 x 47 cm (38.8 x 13.6 x 18.8 in), 70 x 45 x 50 cm (28 x 18 x 20 in), 135 x 70 x 60 cm (54 x 28 x 24 in), 70 x 55 x 47 cm (28 x 22 x 18.8 in), 100 x 35 x 34 cm (40 x 14 x 13.6 in), 105 x 67 x 47 cm (42 x 26.8 x 18.8 in), 70 x 42 x 37 cm (28 x 16.8 x 14.8 in), and 85 x 32 x 34 cm (34 x 12.8 x 13.6 in). The 34-35 cm (13.6- 14 in) and 70 cm (28 in) measurements appear to be common dimensions used stone blocks for the kiln construction. In addition, five arch stones were measured. These stones have the following measurements 40 x 25 x 20-28 cm (16 x 10 x 8-11.2 in), 40 x 43 x 13-23 cm (16 x 17.2 x 5.2-9.2 in), 31 x 35 x 16-23 cm (12.4 x 14 x 6.4-9.2 in), 35 x 55 x 21 cm (14 x 22 x 8.4 in), and 36 x 42 x 24-27 cm (14.4 x 16.8 x 9.6-10.8 in).

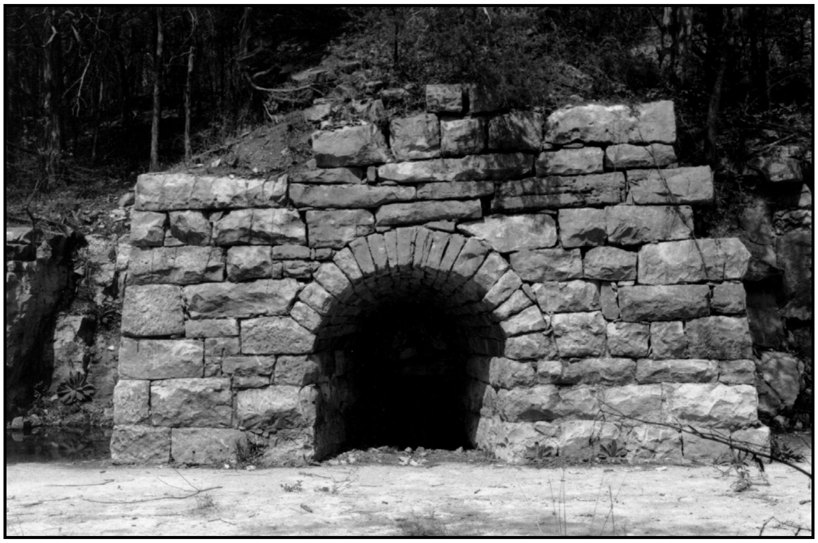

Figure 3. Photograph of the Front Façade of the Shrull Lime Kiln Facing North.

An arch extending into the kiln (Figure 4) is located near the center of the south facade (2.32 m [7.65 ft] from the southwest corner). The arch is 2.26 m (7.5 ft) high in the front and 2.2 m (7.26 ft) wide at the base. The passage from the front of the arch to the rear extends a distance of 2.55 m (8.4 ft). At the rear of the arch, the passage terminates at a vertical wall 1.9 m (6.27 ft) high and 1.2 m (3.96 ft) wide at the base. It should be noted that the arch passageway becomes lower and narrower towards the rear. The top of the rear wall contains a piece of 16 gauge sheet metal with a 2 x 5 cm (0.75 x 2 in) horizontal iron bar attached (Figure 5). The iron bar is attached to the sheet metal with rivets. The sheet metal covers the 28 cm (11.2 in) above the iron bar and extends below the bar in an irregular manner from to 10 to 41 cm (4 to 16.4 in). About 58 cm (23.2 in) below the first iron bar is a second 2 x 5 cm (0.75 x 2 in) horizontal iron bar with rivets. It appears that the sheet metal was originally attached to this bar as well. The missing sheet metal permits a view into the kiln's interior. Red clay insulation is visible in the top left area. The sandstone lining and the some remaining lime are also visible. Twenty-two centimeter (8.8 in) below the second iron bar are two parallel segments of railroad rails (5cm [2 in] wide on top, 8.75 cm [3.4 in] wide at the base, and 8.75 cm [3.4 in] high). About 6 cm (2.4 in) below the first rails are two additional parallel segments of railroad rails. Below the second set of rails is a 67 cm (26.8 in) high space that has a void extending back ca. 80 cm (32 in). This zone appears to be a hard packed mixture of lime, limestone, ashes, and charcoal. There was probably a metal door at the rear of the arch that could be opened to remove the lime.

The west facade of the kiln is very interesting. The southwest corner is 3.4 m (11.22 ft) high while the northwest corner is ca. 3.9 m (13 ft) high. This wall is 5.5 m (18 ft) long. A layer of dirt is present on top of the kiln wall. Above the dirt layer is about seven courses of exposed sandstone (Figure 6). These sandstone blocks appear to function as a fire proof lining for the kiln. A cedar tree (27 cm [10.8 in] in diameter) is growing on top of the sandstone blocks.

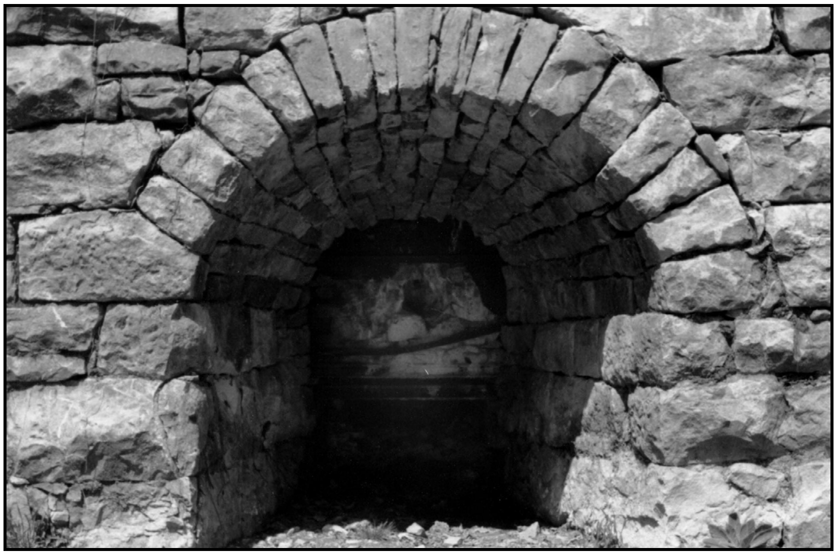

Figure 4. Photograph of the Arch Passageway Extending into the Front Façade of the Shrull Lime Kiln Facing North.

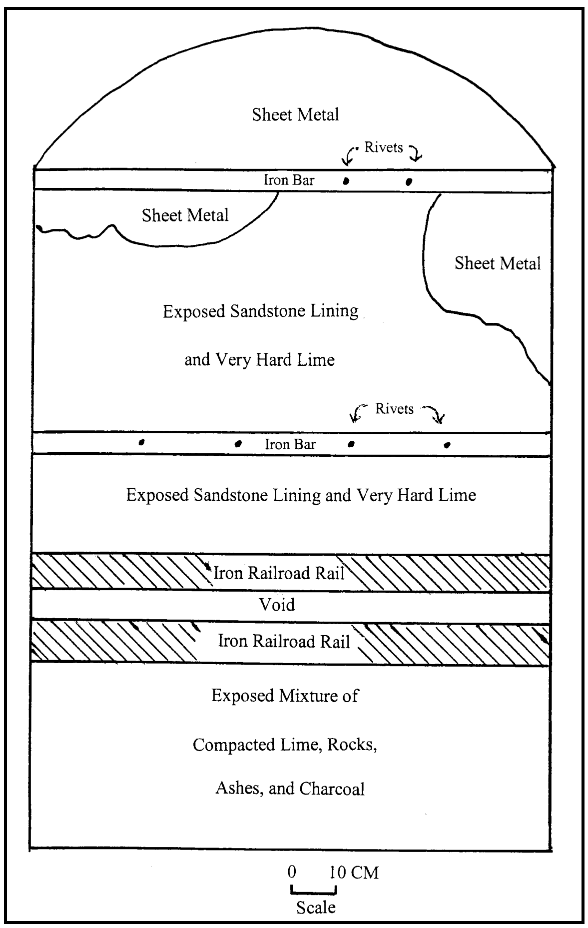

Figure 5. Drawing of the Rear of the Arch Passageway Showing the Details, Facing North.

Figure 6. Photograph of the Top of the West Façade of the Shrull Lime Kiln Facing East Showing the Sandstone Interior Lining.

The east side of the kiln is built into an irregular cliff face (Figure 7). The southeast corner is 4.09 m (13.5 ft) high while the northeast end of the wall is 5.23 m (17.25 ft) high. The lower 2.95 m (9.73 ft) is straight and the remaining 2.26 m (7.5 ft) of wall is slightly inset. The top of the kiln wall is about 5.8 m (19 ft) long while the base is only 4.1 m (13.53 ft) long where it meets the irregular cliff wall. The remaining north profile is not visible since it is against the cliff face.

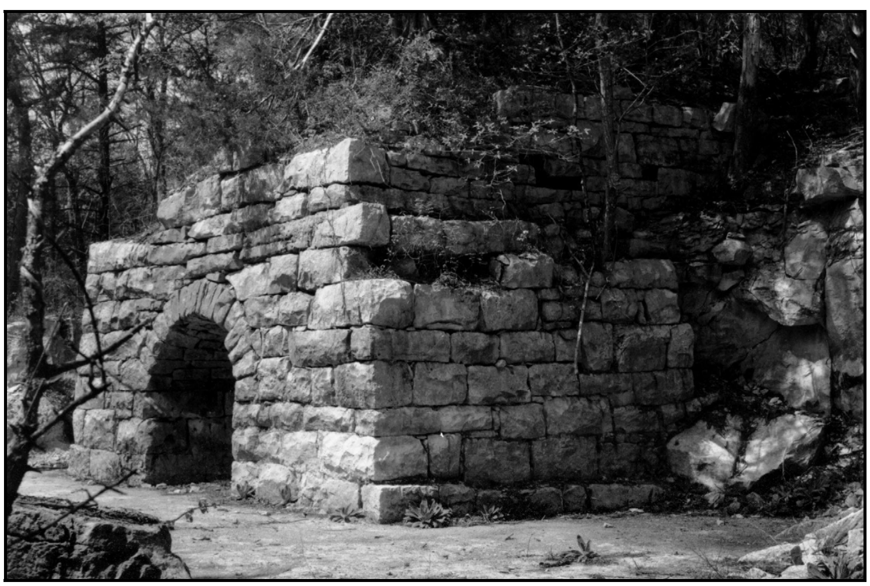

Figure 7. Photograph of the East Façade of the Shrull Lime Kiln Facing West (Note the ramp joining the kiln at the top right in the photograph).

The top of the kiln provides additional construction details. The outer walls are constructed from quarried limestone blocks. The interior of the kiln has round shaft that is lined with sandstone slabs. The interior diameter of this filled in shaft is 3.4 m (11.22 ft). The sandstone is a light grayish brown in color with some samples being burned to a reddish brown. A sample of five exposed sandstone blocks have the following measurements: 30 x 22 x 11 cm (12 x 8.8 x 4.4 in), 37 x 28 x 14 cm (14.8 x 11.2 x 5.6 in), 18 x 24 x 15 cm (7.2 x 9.6 x 6 in), 30 x 27 x 14 cm (12 x 10.8 x 5.6 in), and 30 x 21 x 14 cm (12 x 8.4 x 5.6 in). Between the outer limestone wall and the inner sandstone lined shaft, the void was filled with red clay or soil. It appears that the red clay served as insulation to protect the outer wall from the intense heat and also help hold heat inside the kiln. Since the interior of the shaft was filled with debris, it could not be examined.

THE SHRULL LIME KILN RAMP

A ramp with retaining walls on each side extends from the kiln northward to the top of the cliff (see Figure 2). The ramp is ca. 8.8 m (29 ft) long and 6.6 m (22 ft) wide from the edge of one retaining wall to the other. The area between the retaining walls has been filled with limestone rubble to create a floor. Two depressions are visible on the ramp floor. An oval depression adjacent to the kiln measures 2.7 m (8.9 ft) east-west, 1.5 m (5 ft) north-south, and 90 cm (3 ft) deep. The second depression is located at the north end of the ramp and measures 1.38 m (4.6 ft) east-west, 1.2 m (4 ft) north-south, and 65 cm (2.16 ft) deep. It is assumed that these depressions are either weak areas that have collapsed or modern disturbances. The west retaining wall is 8.8 m (29 ft) long and 50 cm (20 in) wide. At the southern end, the wall is 1. 2 m (4 ft) high and at the northern end 65 cm (2.16 ft) high. The east retaining wall is 7.9 m (26 ft) long and 50 cm (20 in) wide. At the southern end it is 1.5 m (5 ft) high and near the northern end 52 cm (20.8 in) high. The ramp functioned as a roadway for transporting limestone and wood to charge the kiln.

THE SHRULL LIMESTONE QUARRY

The quarry area measures approximately 50 m (164 ft) east-west and 21 m (69 ft) north-south. The area east and immediately north of the kiln has been excavated to the same level as the base of the kiln. The "stone floor" (Figure 8) covers an area 38 m (125.4 ft) east-west and 16 m (52.5 ft) north-south. This area probably represents the first area quarried and subsequently became a work area. Some horizontal drill holes were observed at the southeast end of the "stone floor" demonstrating that this level area was created by quarrying activities. A depression 50 cm (20 in) deep and 3 m (9.9 ft) is present along the southern edge of the quarry floor.

The section of the cliff at northeast end of the quarry appears to be the last area worked (Figure 9). A vertical cliff section 1.9 m (6.3 ft) high section contains rows of horizontal drill holes at three different levels (Table 1). The upper level of a ca. 6 m (19 ft 8.5 in) long section has a horizontal drill hole scar where a large block or blocks were removed. Sixty-one centimeters (2 ft) below this break was a second row consisting of over 20 horizontal drill holes in a straight horizontal line. Below the second row were two additional horizontal drill holes 73.3 cm (2.5 ft) below the upper holes. The quarry ceased operation before the last two rows of drill holes could be used to blast additional stone from the quarry face. These drill holes suggest that the quarry operators were trying to remove the limestone in layers between 61 and 73.3 cm (2 and 2.5 ft) in thickness. Using this method they were quarrying the bedrock, layer by layer, down to the working floor. A large pile of boulders are located southwest of the quarry face. These boulders may represent the last blasting episode before the quarry closed.

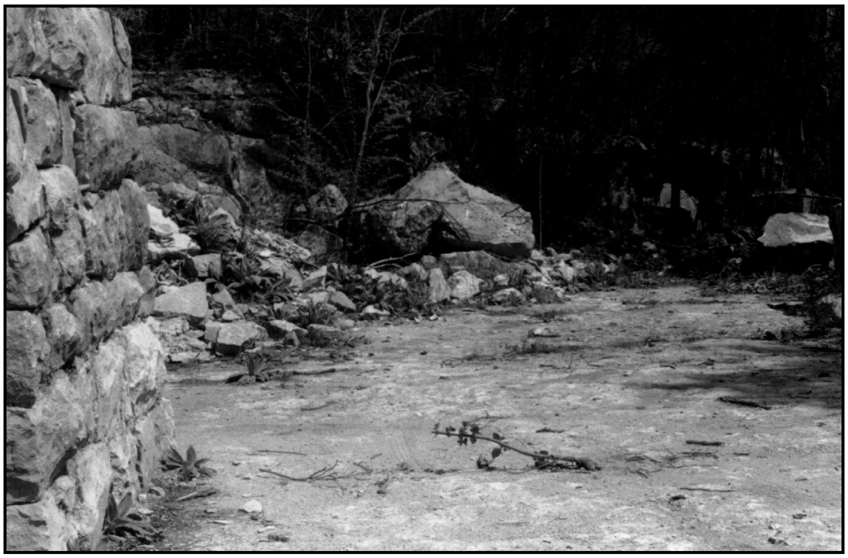

Figure 8. Photograph of the Stone Floor of the Quarry Facing East. Note the front façade of the Shrull Lime Kiln at the left edge of the photograph.

Figure 9. Eastern Working Face of the Shrull Quarry With Stone Rubble in Foreground (Note the drill hole scars across the top of the rock ledge and the row of complete drill holes located horizontally across the center of the rock ledge).

Table 1. Measurements for Horizontal Drill Holes Located on the Quarry Face at the Shrull Lime Kiln.

Diameter (cm)	Shape	Depth (cm)	Spacing (cm)
3.5	Round	18	16.5
3.5	Round	15	18
3.5	Round	19	16
3.5	Round	18	14
3.5	Round	17	13
3.5	Round	18	18.5
3.5	Round	16	21
3.5	Round	15	14.5
3.5	Round	11	14
3.5 x 3.5	Triangular	10	11
3.5 x 3.5	Triangular	8	11
3.5 x 3.5	Triangular	10	21
3.5 x 3.5	Triangular	10	11
3.5 x 3.5	Triangular	15	12
3.5 x 3.5	Triangular	15	12
3.5 x 3.5	Triangular	17	13
3.5	Round	19	16
3.5	Round	22	17
3.5	Round	24	20
3.5	Round	19	12
3.5 x 3.5	Triangular	18	10
3.5	Round	10	13
3.5	Round	17	17
3.5	Round	15	End of Rock

Using the drill hole data collected, some general observations about quarrying can be made. Both round and triangular drill holes were documented. The round holes were probably made with a standard hand drill hit with a hammer while the triangular holes were probably produced by a pick. The round holes were 3.5 cm (1 ⅜ in) in diameter and the triangular holes measured 3.5 cm (1 ⅜ in) across each axis. When looking at the drill holes as a whole, they ranged in depth from 8 cm (3.12 in) to 24 cm (9.5 in) with depth clusters at 10 cm (4 in), 15 cm (6 in), 17 cm (6.75 in), and 19 cm (7.5 in). Hole spacing ranged from 10 cm (4 in) to 21 cm (8.5 in) apart. Hole spacing clustered at 11 cm (4.4 in), 12 cm (4.75 in), and 13 cm (5.12 in) apart.

Comparisons of the round and triangular drill holes revealed some minor differences. Round holes ranged in depth from 10 cm (4 in) to 24 cm (9.5 in). The round hole depths clustered at 15 cm (6 in), 17 cm (6.75 in), 18 cm (7.15 in), and 19 cm (7.5 in). The triangular holes ranged in depth between 8 cm (3.12 in) and 18 cm (7.25 in). Triangular hole depths clustered at 10 cm (4 in) and 15 cm (6 in). The spacing of the round holes ranged between 12 cm (4.75 in) and 21 cm (8.5 in) apart. Most of the round holes had spacing that ranged between 13 cm (5.12 in) and 18 cm (7.12 in) apart. Triangular holes had spacing that ranged between 10 cm (4 in) and 21 cm (8.5 in) apart but most holes clustering between 11 and 12 cm (4.4 and 4.75 in) apart.

One large slab containing drill holes was located at the southeast corner of the quarry. This slab is 2.55 m (8.5 ft) long, 1.2 m (4 ft) wide, and 0.90 cm (3 ft) thick. Vertical drill holes were documented along one end and one side of the slab (Table 2). Five drill holes were present on the east end of the slab and nine drill holes were located along the north side of slab. Some additional drill hole scars were also present near the middle of the west end of the slab but not documented. All of the drill holes were round in cross-section. These holes were 3.5 cm (1 ⅜ in) in diameter at the top and tapered to ca. 3 cm (1 3/16 in) in diameter at the base. The difference in the diameter indicates that a smaller drill was used to complete the hole. The depths of these holes ranged from 14 to 26 cm (5.5 to 10.25 in) with clusters occurring at 17 cm (6.75 in), 18 cm (7.25 in), 20 cm (8 in), and 22 cm (8.75 in). In terms of spacing, holes ranged between 14 cm (5.5 in) and 22 cm (8.75 in) apart. Hole spacing clusters at 15 cm (6 in), 17 cm (6.75 in), and 20 cm (8 in) apart. Since this large slab was carefully quarried it may have been intended for use as building stone.

Table 2. Measurements of Vertical Drill Holes on a Large Quarried Slab at the Shrull Lime Kiln Quarry.

Diameter (cm)	Side of Slab	Depth (cm)	Spacing (cm)
3.5	East	26	17.5
3.5	East	22	17
3.5	East	22	20
3.5	East	20	15
3.5	East	19	19
3.5	North	21	14
3.5	North	14	22
3.5	North	18	17
3.5	North	17	15
3.5	North	20	15
3.5	North	18	17
3.5	North	18	17
3.5	North	17	20
3.5	North	17	End of Slab

A low stone wall was located at the southeast corner of the quarry. This wall was about 11 m (36.3 ft) south of the stone floor of the quarry. The wall was ca. 28 m (92.4 ft) long, 50 cm (20 in) wide, and 15 to 40 cm (6 to 16 in) high. A huge slab of quarried stone was located at the east end of this wall. Several meters to the south (of the west end of the wall), a short alignment of rocks (at a 90 degree angle from the first wall) was present. The function of the low stone walls is not currently known.

THE STONE PILES

The southern end of the site contained a series of stone piles. Sufficient time was not available to record these stone piles in detail. In terms of size, these large piles of stone are scattered along the southern boundary of the quarry. The boulders are a variety of sizes. Larger boulders ranged in size from approximately 1 to 3 m (3.3 to 9.9 ft) in length and up to 1 m (3.3 ft) thick. These piles may represent temporary storage areas where quarried stone was stockpiled out of the way until it could be broken into suitable sizes for the lime kiln. It is also possible that some of the stone could represent discarded slabs that were unsuitable for building stone or from geological strata that were undesirable for lime production. Finally, a linear east-west clearing extends through part of the area containing boulders piles. Since this linear area is clear of boulders it may be the location of an old road bed associated with the quarry.

THE OFFICE/CABIN LOCATION

Approximately 41 m (135.3 ft) east (from the eastern edge) of the Shrull Quarry was the remains of a possible quarry office or log cabin. An area 10 m (33 ft) north-south and 5 m (16.5 ft) east-west had been artificially leveled. The northern edge and the northern half of the east edge, have been excavated into the natural ground surface leaving a dirt wall ca. 60 cm (2 ft) high. At the south end of the leveled area is a pile of rocks ca. 4 m (13.2 ft) north-south and 5 m (16.5 ft) east-west, and 80 cm (2.6 ft) high. These rocks include some slabs, some of which were burned and appear to be the remains of the chimney. Since no foundation was present, the structure was probably built on stone piers or wooden posts. A single fragment of blue glass was observed on the slope near the northeast corner. No other artifacts were observed but there was little surface visibility due to dense leaf cover.

About 20 m (6.6 ft) east of the cabin site was the ruins of a possible cellar. This stone pile measured 3 m (9.9 ft) north-south, 4 m (13.2 ft) east-west, and 1.2 m (4 ft) high. Several courses of intact stone work were visible within the rounded interior depression. Twenty-two meters (72.6 ft) east of the cellar is a rock pile. It measured 6 m (19.8 ft) north-south, 4 m (13.2 ft) east-west, and about 1 m (3.3 ft) high. Five meters (16.5 ft) beyond the first stone pile is a second rock pile. This rock pile measures 4.5 m (14.85 ft) north-south, 4.5 m (14.85 ft) east-west, and 1.5 m (5 ft) high. It is not known whether these stone piles are field clearing piles or represent some other type of feature.

DISCUSSION

This section briefly compares the Shrull Lime Kiln with the Upper Rudd Lime Kiln, the Lower Rudd Lime Kiln, the Cowherd Lime Kiln, the Pace Lime Kiln, and some other documented examples. Due to space restrictions, this discussion will only make comparisons with documented Kentucky lime kilns or some other kilns of similar design. Readers interested in a more detailed review of the lime literature should see the author's earlier paper (Hockensmith 2004b).

Victor Rolando's (1992) study of lime kilns in Vermont is the most comprehensive study undertaken to date. Between 1984 and 1992, Rolando (1992:226) documented 71 kiln sites containing 93 fully or partially standing ruins of lime kilns. In an earlier publication, Rolando (1990:24) developed a very useful classification of Vermont lime kilns. These include farm type kilns (ca. 1800-1860s), early-commercial type kilns (ca. 1850-1900s), later-commercial type kilns (ca. 1870s-1920s), and modern type kilns (1900s-1950s). Only two of these types are pertinent for the present study. First, the farm type kilns:

> ...are primitive in appearance, round in shape, built of field stone with field stone or sandstone linings that are only slightly glazed (low-temperature burning). They measure about 4 to 6 ft inside diameter with 1- to 2-foot thick stone walls, 6 to 8 ft high. Built into low embankments in remote areas near small limestone outcrops, the kiln walls are sometimes mounded up with earth to insulate and seal holes. Farm type kilns were fueled by wood and burned limestone for local needs (Rolando 1990: 24).

Second, Rolando (1990:24) noted that early-commercial type kilns:

> ...are idyllic in appearance and are generally round. Some ruins contain decorative components (Gothic arches) and are built of field stone or cut blocks with refractory stone or fire brick linings that are somewhat glazed. They measure 6 to 8 ft inside diameter, 2 to 3 foot thick stone walls, and 8 to 10 ft high. Ruins of early-commercial type kilns have usually been found near small quarries, and alongside old roads or abandoned railroads. These ruins are more obvious than farm kiln ruins. They were fueled by wood and burned limestone for local and regional markets.

The Shrull Lime Kiln appears to be more complex than Rolando's (1990:24) farm kilns and early-commercial type kilns. However, the Shrull Lime Kiln is not as advanced as Rolando's later-commercial type kiln. In terms of its cut stone construction, the sandstone lining, the nice arch, and the association with the quarry, the Shrull Lime Kiln compares with Rolando's early-commercial type kilns. The Shrull Lime Kiln has a much larger interior diameter and greater height than the early commercial kilns. Fire brick may not have been readily available in rural Logan County. Thus, the kiln builders decided to line the Shrull Lime Kiln with sandstone block since they were more readily available.

Only two other rectangular lime kilns have been documented in Kentucky. First, the Cowherd Lime Kiln (15Gn41) is located in Green County, southwest of the community of Bengal. This kiln was documented by the author on November 19, 2001 (Hockensmith 2004c). This rectangular lime kiln was constructed from quarried limestone slabs and built into the side of a low cliff. The kiln is 3.7 m (12.21 ft) tall and measures 5.8 m (19.14 ft) by 4.9 m (16.17 ft) at the top. A small curved arch is present on the lower side of the kiln, which is 82 cm (2.73 ft) high and 1.44 m (4.75 ft) wide at the base.

The second kiln, the Pace Lime Kiln, was documented by the author on March 7, 2003 (Hockensmith and Brown 2004). The kiln is located just west of Brandenburg in Meade County. This rectangular stone structure is located at the base of a high bluff adjacent to the Ohio River. The kiln is 6.4 m (21.12 ft) long and 6 m (19.8 ft) wide with a maximum height of ca. 2 m (6.6 ft). An arch is present on the down hill side of the Pace Lime Kiln which was wider at the base and became increasingly narrow towards the top. The arch is 40 cm (1.32 ft) wide at the top and 98 cm (3.23 ft) at the bottom.

The Cowherd and Pace Lime kilns both share similarities and differences with the Shrull Lime Kiln. In terms of size, the massive Shrull Lime Kiln (7.46 x 5.5 m [24.5 x 18 ft]) is larger than the Pace Lime Kiln (6.4 x 6 m [21.12 x 19.8 ft]) and the Cowherd Lime Kiln (5.8 m x 4.9 m [19.14 x 16.17 ft]). The Shrull Lime Kiln is 4.34 m (14.32 ft) high while the Cowherd Lime Kiln is 3.7 m (12.21ft) high, and the collapsed walls of the Pace Limekiln are only 2 m (6.6 ft) high. The arch style of the three kilns is very different. The Shrull Lime Kiln has a large arch (2.26 m [7.5 ft] high) that a wagon could be backed into to load the lime. The Pace Kiln has a roughly pyramidal arch while the Cowherd Kiln has an arch that is concave across the top. The arch height of the Pace Lime Kiln is 92 cm (3 ft) and the Cowherd Lime Kiln is 82 cm (2.73 ft). Likewise, Shrull Lime Kiln arch (2.2 m [7.26] wide) has a much greater width than the Cowherd Lime Kiln (1.44 m [4.75 ft] wide) and the Pace Kiln (98 cm[3.23 ft]). When comparing size, the Shrull Lime Kiln is obviously a large commercial kiln. The Pace Lime Kiln is a smaller commercial lime kiln while the Cowherd Lime Kiln is a family lime kiln. Functionally, all three kilns were vertical shaft type kiln, designed for intermittent use.

The only other documented lime kilns in western Kentucky are the Upper and Lower Rudd Lime Kilns (Hockensmith 1996, 1999). Both of the kilns are round in shape as opposed to the Shrull Lime Kiln's rectangular shape. The Lower Rudd Lime Kiln was constructed primarily from clay while the Upper Rudd Lime Kiln was constructed from sandstone blocks. The Shrull Lime Kiln has a greater capacity than the Upper Rudd Lime Kiln (4.9 to 6 m [16.1 to 19.7 ft] in diameter and 3.7 m [12.1 ft] high) and the Lower Rudd Lime Kiln (4 m [13.1 ft] in diameter and 2.78 m [9.1 ft] high). Bricks were used in the construction of the fire boxes at the Rudd kilns but not the Shrull Lime Kiln. The sandstone lining at the Upper Rudd Lime Kiln is a similar to that of the Shrull Lime Kiln.

When examining the lime kiln literature in other states, both rectangular and circular kilns are recorded (Hockensmith 2004b). Rectangular or square lime kilns have been recorded in Alabama, California, Connecticut, Illinois, Michigan, Ohio, Pennsylvania, South Carolina, Tennessee, Utah, and Vermont. Circular lime kilns have been recorded in Indiana, Michigan, Ohio, and Vermont. In some states lime kilns have been reported but no information is available on their shape. Unfortunately, researchers other than archaeologists have described many of the lime kilns, which has often resulted in a lack of specific details. Without general measurements and construction details for lime kilns, it is nearly impossible to accurately discuss the similarities and difference in American lime kiln construction techniques. Hopefully, future researchers will collect sufficient information to allow comparison between lime kilns in different regions of the United States.

Undoubtedly, support structures were associated with the Shrull Lime Kiln. Other studies have mentioned such structures. At the Tyrone Forge Lime Kiln associated with the American Lime & Stone Company in Blair County, Pennsylvania, wooden structures were shown on an insurance map (Fitzsimons 1990). Fitzsimons (1990:91) noted the presence of "...a one-story kiln-shed of wood construction (which provided shelter for the removal of the calcined lime from the kilns), a one-story slaking shed, also of wood construction, where the calcined lime was permitted to cool, and a series of conveyors and storage sheds for handling and storing the chunks of slaked lime." The Shrull Lime Kiln probably had some type of wooden structures to provide protection for the lime until it could be shipped to intended markets. Likewise, structures were required for the storage or manufacture of wooden barrels used in shipping the lime. The quarry would also have required one or more derricks for lifting and moving large blocks of stone,

CONCLUSIONS

The Shrull Lime Kiln is the third lime kiln to be documented in western Kentucky. While it shares some similarities with other reported lime kilns, it is somewhat unique when compared to other Kentucky kilns. It is the largest, tallest and most massive lime kiln yet documented in the Commonwealth. The Shrull Lime Kiln appears to be a commercial kiln associated with the Russellville Stone Quarry Company. Since Russellville was a commercial center for southwest Kentucky and had an abundant supply of limestone, it was an excellent location for lime production.

The lime industry in Russellville was apparently short lived. It is not mentioned in the documents that usually contain information on the lime industry. In an effort to obtain specific information on the lime industry in Logan County, a variety of sources were consulted. The hand written 1850, 1860, 1870, and 1880 Manufacturing Census records were consulted (United States Federal Census 1850, 1860, 1870, 1880). Also, the published versions of Logan County Population Censuses for 1850, 1860 and 1870 (Hammers 1978; Vanderpool n.d.; West Central Kentucky Family Association 1978; Willhite n.d.) were checked for lime producers. Further, business directories and statewide gazetteers were checked for lime producers in Logan County for the years 1865, 1870, 1876, 1879, 1881, 1883, 1887, and 1895 (Hodgman 1865, 1870; Polk 1887, 1895; Polk and Danser 1876, 1879, 1881, 1883). Finally, available early geological reports for Logan County were consulted for information on the lime industry. None of the above sources yielded any information on lime producers in Logan County. The absence of information in the consulted sources suggests that Logan County was never a major area of lime production. Undoubtedly, the industry produced lime for local consumers.

All areas of Kentucky containing high calcium limestone have potential for lime kilns. Thus, archaeologists should be aware of the potential for encountering lime kilns during Phase I surveys. Lime kilns may occur in areas that most archaeologists consider to have low potential for sites such as slopes and the bases of hills. These kilns may range from very primitive structures built by farmers for producing agricultural lime to more substantial early commercial lime kilns to advanced commercial lime kilns. Current research suggests that most lime kiln kilns will not be shown on historic maps (Hockensmith 2004a). Because Kentucky was not a major lime producing state, the history of the industry is very poorly known. In most cases, very little archival information will be available for these kilns. Only through archaeological investigations can we locate lime kilns and begin to understand the development, diversity, and distribution of Kentucky's lime industry. By being aware of the characteristics and settings of lime kilns, archaeologists can ensure that another aspect of our industrial heritage is preserved for future generations.

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1869 Transfer of 15 24/100 acres from H. B. Tully and wife to John E. Tully on March 3, 1869. Deed Book 42, Page 378-379, Logan County Courthouse, Russellville.

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EXCAVATIONS AT THE DUCKWORTH FARM, A NINETEENTH-CENTURY FARM IN BATH COUNTY, KENTUCKY

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ABSTRACT

The Duckworth Farm (15Bh212) is located on the old Maysville and Mount Sterling Turnpike (now Route 11) just outside of Sharpsburg, Kentucky. Three structures and features that include sub-floor pits, a stone-lined cellar, and other landscape features were identified at this early to mid nineteenth-century farmstead. The following discussion is primarily descriptive, and presents the results of Phase III data recovery excavations conducted for the Kentucky Transportation Cabinet. Though documentary records are scant and provide almost no direct information about the Duckworth family or their slaves, careful integration of archaeological and historical data can reveal important information regarding nineteenth-century farm landscapes on the edge of the Outer Bluegrass region of Kentucky.

INTRODUCTION

Phase III archaeological data recovery excavations were conducted at the Duckworth Farm, an early to mid nineteenth-century farm with a small barn, an earthfast house, and a possible slave cabin. The excavations were conducted by Cultural Resource Analysts, Inc. (CRAI) for the Kentucky Transportation Cabinet (Pullins, et al. 2005), and the following discussion combines the results of these excavations with the results of earlier Phase II excavations conducted in 2001 and 2002 by the Program for Archaeological Research at the University of Kentucky (UKPAR) (Peres 2003). The historical research for the archaeological data recovery was conducted by Lori O'Connor, and the faunal research was conducted by Jessica Allgood, both of Cultural Resource Analysts, Inc.

The Duckworth Farm is located in Bath County, Kentucky, within a portion of the Outer Bluegrass region of Kentucky known as "The Knobs." This area is characterized by deeper valleys than the Inner Bluegrass, little flat land, and limestone bedrock. The site is situated at an intersection less than a mile southwest of Sharpsburg on Route 11, an historic route once known as the Mount Sterling and Maysville Turnpike. Portions of the property have been regularly cultivated, including the sideslope bench on which this project was conducted. The hillsides above the tributary paralleling Route 11 are in grassy pasture, and the only trees now standing near the site are situated in a small grove on top of the hill overlooking the sideslope bench.

HISTORY

Archival research conducted by historian Lori O'Connor indicates that the Duckworth occupation of the property began on May 15, 1817, when George Duckworth bought a 100-acre tract from Archibald Harbison for $1800. George Duckworth married a woman named Kathy in Mecklenburg County, North Carolina around 1785, and they had six surviving children: William (the eldest), Ezekiel, Sally, Simon, George W., and John S. (the youngest) (Family Search 2003).

By 1826, George Duckworth, called "old Mr. George Duckworth", had sold 45 acres of his property to his second-youngest son George W. Duckworth (Bath County Deed Book E:418-419). This deed is important, because it describes a boundary line "opposite to the Mantion [sic] brick house where old Mr. Duckworth now lives, and running thence through an orchard." The Phase I survey of the project area by Cultural Horizons, Inc. (Stallings, et al. 1995) identified a brick scatter on the hill above the project area and outside of the right-of-way. Peres (2003) reports that the current landowner, Patsy Ratliff, confirmed the presence of a brick house at that location. This deed represents the earliest reference to the brick house, and helps to place the portion of the site that was the subject of these excavations in a larger landscape context, greatly aiding our understanding and interpretation of the site.

The senior George Duckworth died in 1829 and left his estate to his wife Kathy. The inventory of his estate shown in Table 1 reflects his status as a self-sufficient middle class farmer. It appears that his son John S. Duckworth took over operation of the farm at this time, even buying back the 45 acres from his brother George that was mentioned in the earlier deed.

John S. Duckworth was the younger brother of George W. Duckworth, and the youngest son of the elder George Duckworth (Family Search 2003). John S. Duckworth was the executor of his father's estate; at some point, he may have lived with his family and his mother on the Duckworth farm, possibly in the brick house mentioned in his father's 45 acre deed to his brother George W., while George W. continued to live in another house located on the tract. John S. Duckworth did own property of his own prior to his father's death in 1829, but it is not clear whether he moved onto his father's property upon becoming executor of his estate, or whether he moved onto the property in the early 1830s when he became the official owner of the entire 100-acre tract.

Table 1. Inventory of George Duckworth (elder), 1829.

Item	Value
7 common chairs	$3.50
1 desk and table and sundry articles	$7.75
1 pair of hand irons	$2.00
1 axe, 2 clips, and 1 iron wedge	$2.25
1 cutting box and steel	$1.50
Sundry pot mettle and bailes	$3.00
3 sugar kettles	$5.00
2 pots, 1 oven, and 1 pan of hooks	$2.00
1 shovel plow, and 1 hoe	$1.62
2 scythes	$1.00
Sundry empty barrels and some timothy seed	$1.20
1 washing tub, churn, and pickling tub	$1.00
2 fat cans and lard	$1.25
1 meat axe, 3 planes, 1 shovel plough	$7.35
1 grindstone, 2 spinning wheels, and reel	$5.00
Flour, old sickles, 1 loom	$4.75
1 saddle, 2 oats stacks, 1 blade stack	$11.50
2 ox and yoke	$30.00
1 cow and 2 calves	$6.00
197 pounds bacon	$7.88
One lot of corn in crib	$28.30
23 geese and 7 ducks	$5.18
1 heifer, 11 hogs, 4 goats	$17.00
1 roan mare	$60.00
1 sorrel filly	$25.00

John S. Duckworth brought slavery and cattle to his father's property after taking over the farm in 1829. For the next twelve years, John was taxed for at least one and as many as four slaves during each of the ten years for which we have records; the last four years included one adult slave and three slaves under the age of 16, perhaps a woman and her children (Table 2). Neither John's father George nor his brother George W. owned slaves while living on this property; it is not known whether they owned slaves when they lived elsewhere. After 1841, John S. Duckworth no longer held slaves but he did acquire more acreage (Bath County Tax Assessment 1819-1847).

According to the 1840 Census of Bath County, John S. Duckworth was between the ages of 50 and 60, while his wife Catharine was between 30 and 40. John and Catharine had seven children: one son under five (William), three sons between five and ten (Presley, George H., and James), two daughters under five (Ann Eliza and Elizabeth D.), and one daughter between 15 and 20 (one of his daughters from his previous marriage) (United States Population Census, Bath County 1840).

The records show that John expanded on the modest success of his father, eventually owning as many as five town lots in Sharpsburg. After his death in 1847, his wife Catharine acted as the manager of the 25 acres that she eventually inherited from her husband after disputing the will (Bath County Will Book E:383-384; 470-471), but it is not clear whether she lived on the farm, or whether she lived in one of the properties in town and leased the farm to someone else. The 1850 Agriculture Census lists her as "owner, agent, or manager of the farm," and lists her holdings as 25 acres worth $750.

Table 2. Listing of Tax Assessments for John S. Duckworth, 1819-1847.

Year	Acres	White Males Over 21	Adult Slaves	Slaves Under 16	Total Slaves	Value of Slaves	Horses	Value of Horses	Land Value	Total Value	Mules	Value of Mules	Cattle	Notes
1819	49	1					3			$1298				
1820	49	1	1		1		4			$1573				
1821	49	1	1		1		6			$1285				
1822	50	1								$1220				1 child
1823	50	1					6			$1050				Land on Flat Creek
1824	49	1					3			$885				
1825	50	1					3			$1200				
1826	50	1					5			$800				
1827	50	1					5			$750				
1828	50	1		1	1		3			$700				
1829	50	1	2	2	4		12			$1680				town lot in Sharpsburg; taxed for 55 acres as executor for George Duckworth
1830	50	1	1	1	2		5			$1320				town lot in Sharpsburg
1831	50	1	1	1	2		6			$2100				five town lots in Sharpsburg
1832	45	1	1		1		6			$1885			13	five town lots in Sharpsburg
1835	100	1		1	1		9			$3934			12	five town lots in Sharpsburg
1837	100	1	1	3	4	$1300	6	$300		$5700				
1838	100	1	1	3	4		9			$5246			12	five town lots in Sharpsburg
1839	100	1	1	3	4	$1300	9	$450		$5885	1	$25	6	five town lots in Sharpsburg
1840	100	1	1	3	4	$1250	8	$280	$3000	$5415	1	$30	10	five town lots in Sharpsburg $800 each; three children between 7 and 17
1841	100	1	1	2	3	$900	8	$190	$3500	$5415			9	three town lots in Sharpsburg $800 each; two children between 7 and 17
1842	100	1					10	$260	$2800	$3960			10	three town lots in Sharpsburg $800 each; four children between 7 and 17; one carriage $175
1843	125.5	1					2	$125	$3055	$4380			6	five town lots in Sharpsburg $600 each; five children between 5 and 16; one carriage
1844	125.5	1					3	$200	$2953	$4305			3	five town lots; five children between 5 and 16; 16.5 acres on Long Branch
1845	125.5	1					5	$110	$3051	$3955			8	three town lots $300 each; six children between 5 and 16
1846	125.5	1					6	$200	$3122	$4132			6	three town lots $800 each; one buggy; six children between 5 and 16
1847	125.5	1					6	$225	$3765	$4655			11	two town lots $640 each; five children between 5 and 16

The value of farm implements and machinery was $10. She owned seven horses, one mule, three milk cows, two cattle, 18 sheep, and 18 swine all valued at $365. The farm produced 39 bushels of wheat, 40 pounds of wool, eight bushels of sweet potatoes, 75 pounds of butter, and 1000 bushels of Indian corn (United States Census of Agriculture, Bath County 1850).

In 1852, Catharine and her children began conveying their interests in the property to Andrew Boyd, a Sharpsburg merchant, farmer, slave owner, and neighbor of the Duckworths. The final share of the Duckworth Farm was sold to Andrew Boyd's son-in-law William Withers by Lavinia Bowman of Indiana, granddaughter of Catherine Duckworth, in 1880. The Withers house, presumably George Duckworth's brick house on the hill above the project area, appears on an 1884 Bath County atlas (Figure 1), but is no longer standing (Lake 1884).

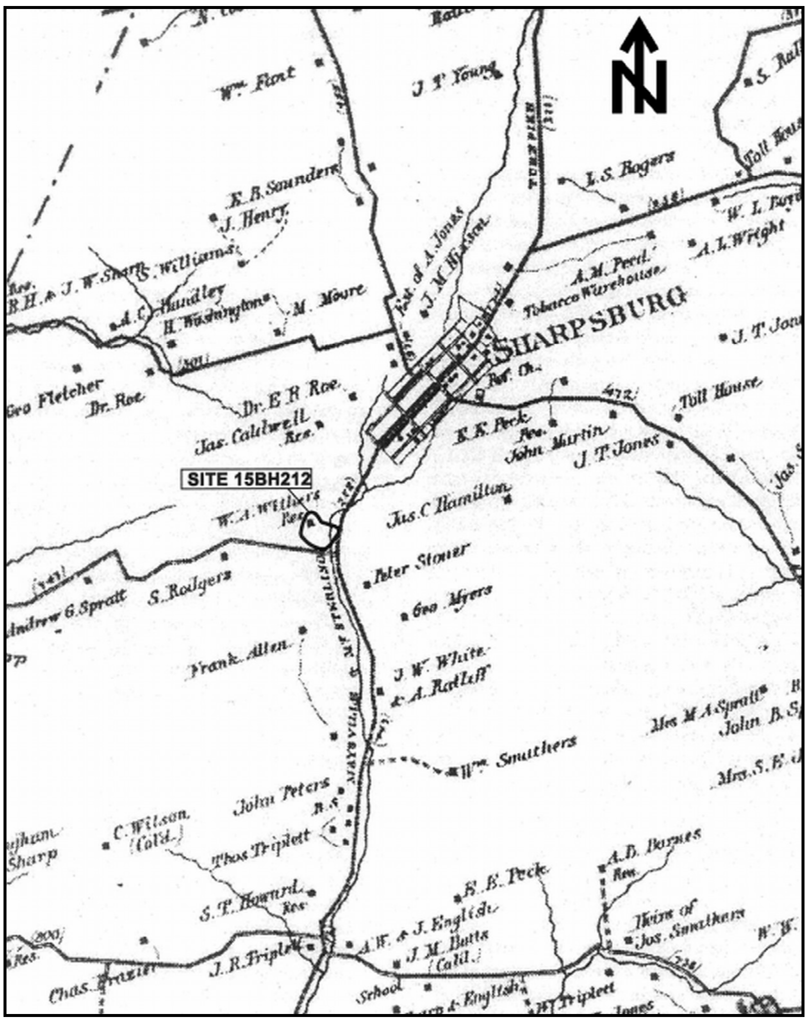

Figure 1. Atlas of Bath County, Location of W.A. Withers Residence (Lake 1884).

EXCAVATION RESULTS

The Phase III investigations focused on the area where previous testing had identified 12 cultural features and surface artifact concentrations (Figure 2). The plowzone was machine-stripped from about 2400 square meters of the site, revealing an additional 55 cultural features and 30 non-cultural features (Figure 3). The features depicted in Figure 5 define a landscape of three buildings oriented either parallel or perpendicular to the slope above the small creek below, including an earthfast house, a small cabin, and a small barn.

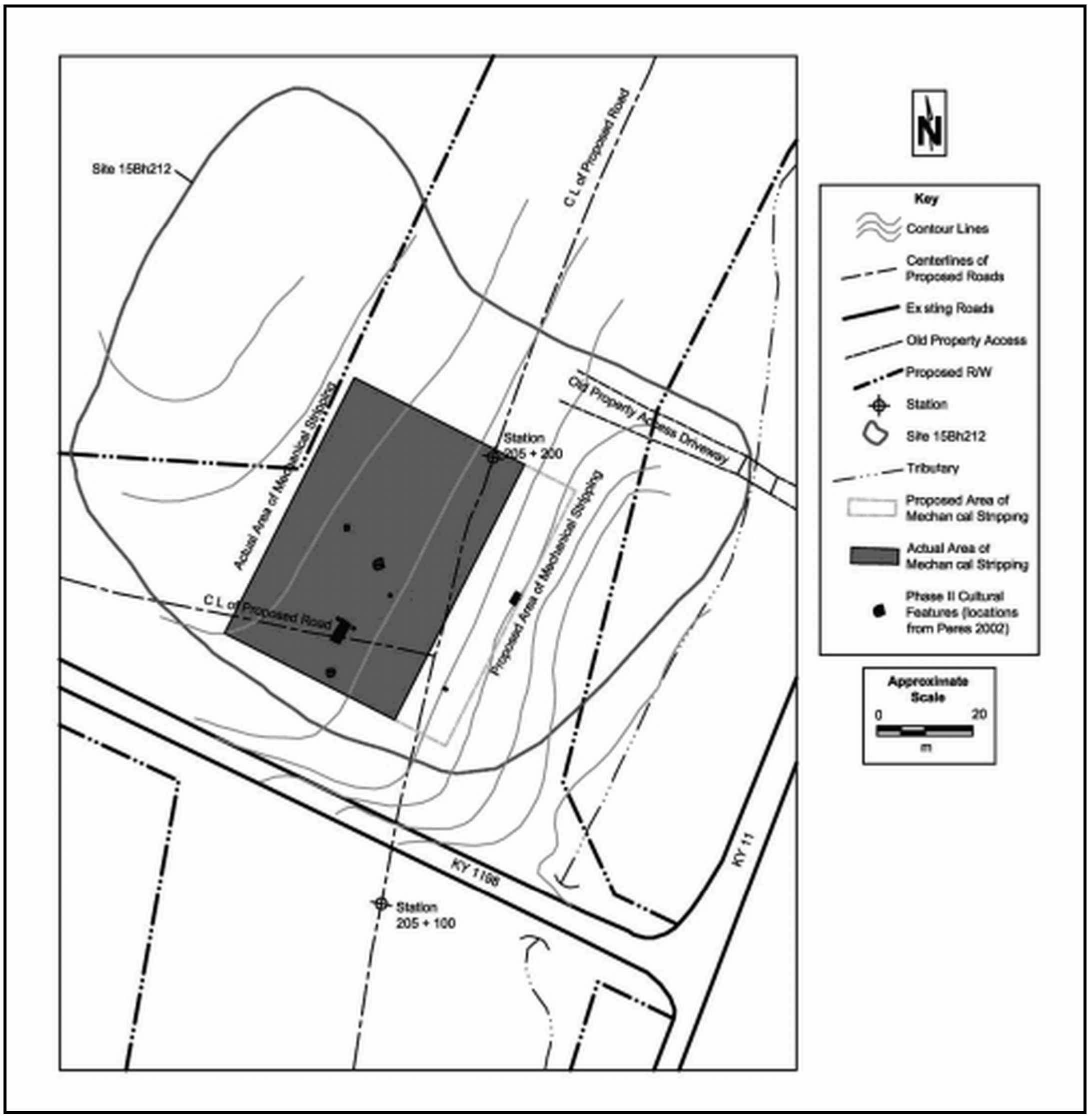

Figure 2. Duckworth Farm Site, Location of Portion Mechanically Stripped During Phase III Archaeological Investigations (Pullins, et al. 2005).

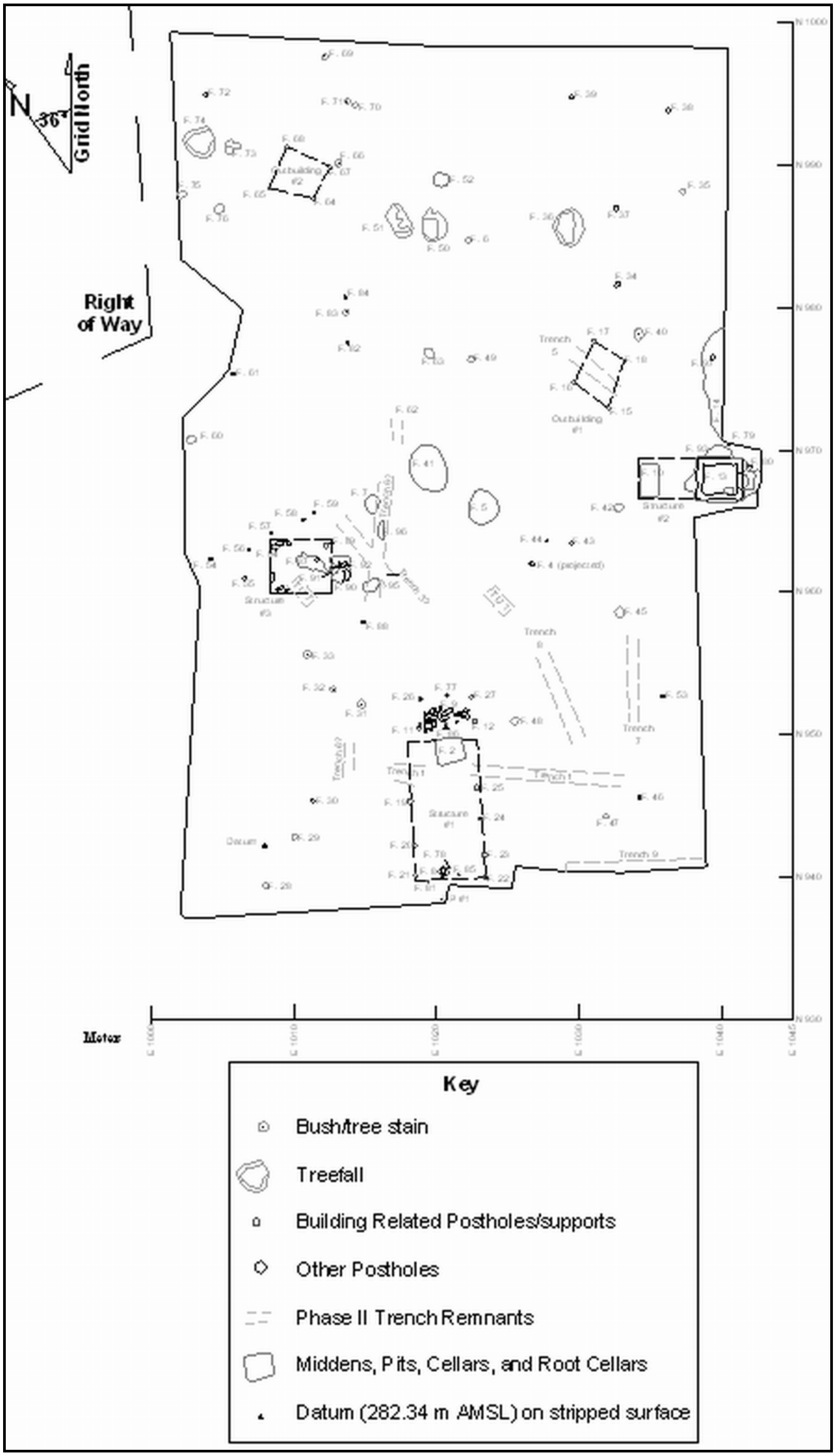

Figure 3. Duckworth Farm Site, Plan Map of Features Identified During Phase III Data Recovery.

STRUCTURE 1

Structure 1 is an earthfast house oriented parallel to the slope of the landform and almost perpendicular to the other two buildings. A series of postholes and other supports define a building that measures about 4.9 x 9.8 m, making it the largest structure on the site (Figure 4). An off-center chimney foundation had been previously identified at the northern gable end of the building, and it was framed by five posts that likely represent scaffold posts for chimney construction (Figure 5). A large sub-floor pit, previously excavated by UKPAR (Peres 2003), was located in front of the hearth. It measured about 1.7 x 2.0 m in plan, and about 0.7 m deep. The limestone remnants of the chimney foundation measure just under a meter thick, with an interior hearth space of a little over 1.2 x 1.5 m.

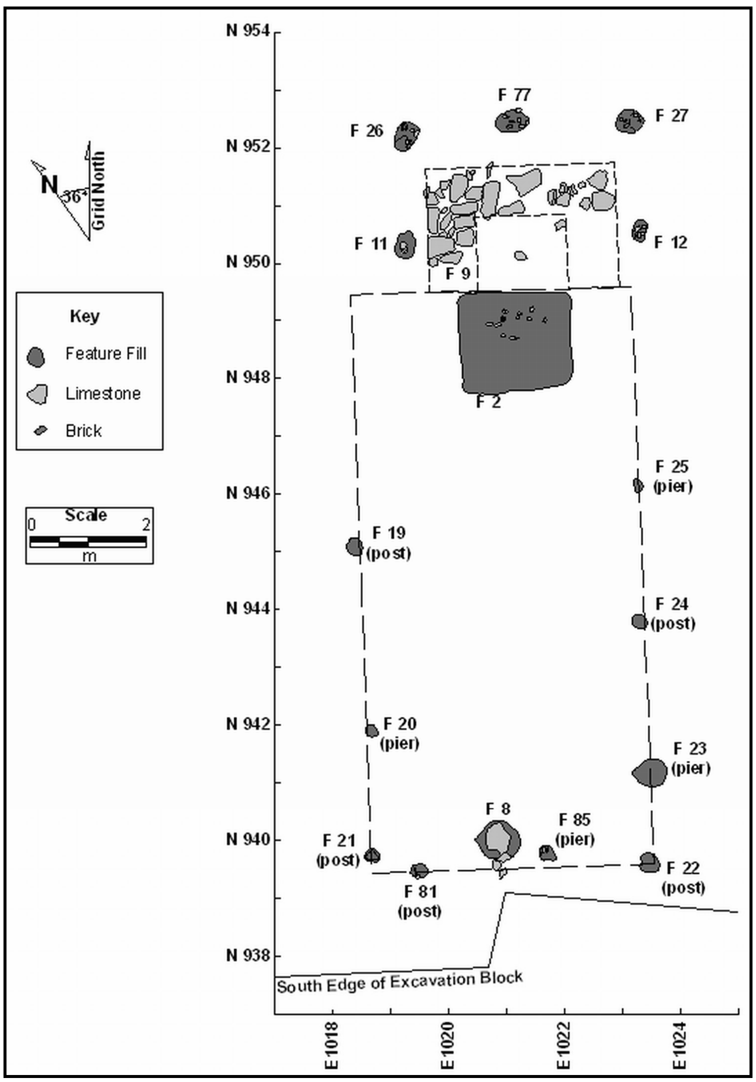

Figure 4. Duckworth Farm Site, Structure 1 Plan View of Phase II and Phase III Features.

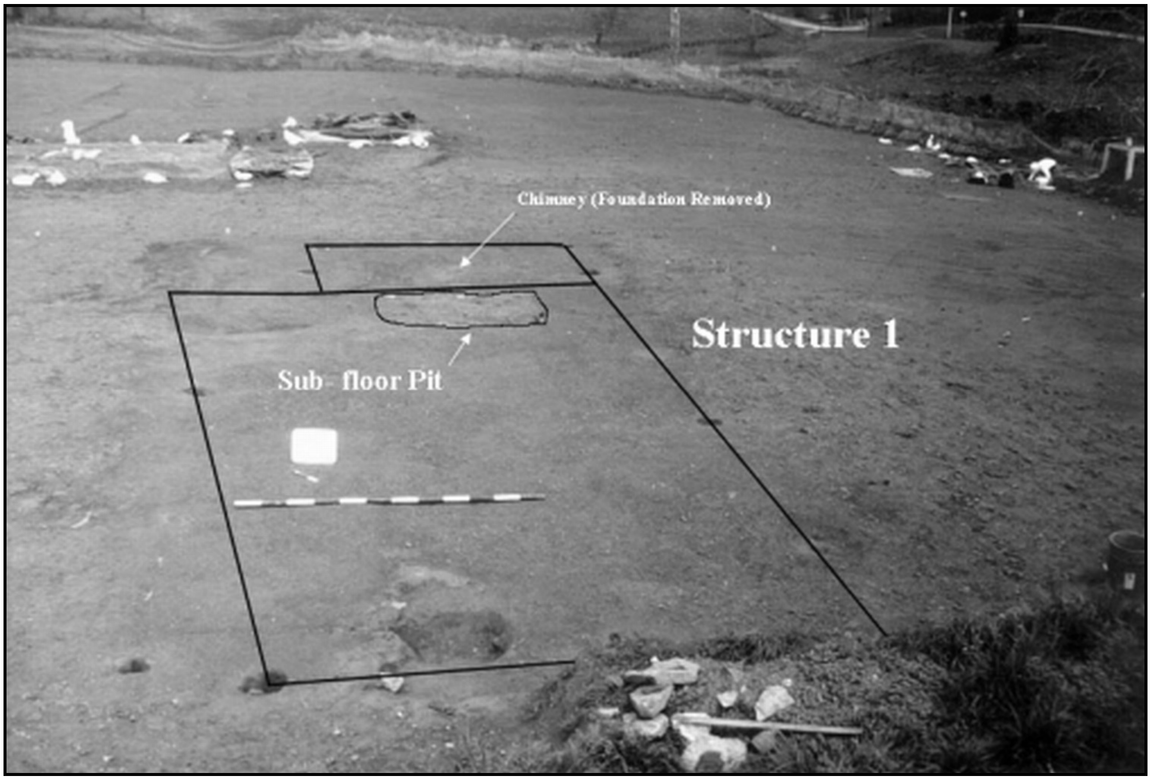

Figure 5. Duckworth Farm Site, Structure 1 Photograph, View to the Northeast. Structure 3 is in Left Background, and Structure 2 is in Right Background.

Table 3 summarizes the artifacts assemblage recovered from both the Phase II and Phase III archaeological investigations in association with Structure 1. A total of 3276 historic artifacts were recorded, as well as 47.72 kg of limestone, 7.08 kg of handmade brick, and 0.22 kg of mortar not included in Table 3. Brick and mortar were not weighed during the Phase II investigations, and neither counts nor weights of limestone (including limestone from the chimney pad) were reported. Nearly all of the nails are cut nails (96%, n=217); only two wrought nails and six wire nails were recovered in association with Structure 1.

Most of the artifacts associated with Structure 1 were recovered from the subfloor pit (Feature 2), including 454 ceramic vessel fragments (Table 3). The most common ware types recovered from Feature 2 are whiteware, pearlware, and porcelain, which account for 87% of the ceramic assemblage in Feature 2 (Table 4). Vesselization of these ceramics resulted in the identification of a minimum of 59 unique vessels in the subfloor pit, including creamware, pearlware, porcelain, redware (coarse earthenware), and whiteware (Tables 5, 6, 7, 8, and 9). Identifiable tableware includes cups, saucers, plates, bowls, and a mug.

Table 3. Artifacts Recovered from Contexts Associated with Structure 1.

Structure 1	Feature 2 (Subfloor Pit)	Structure and Chimney Supports	Total	%
Nails	224	1	225	6.9
Window Glass	41	0	41	1.3
Ceramics	454	14	468	14.3
Container Glass	118	0	118	3.6
Glass Tableware	20	0	20	0.6
Utensils	19	0	19	0.6
Faunal	2175	3	2178	66.5
Pipes	9	0	9	0.3
Marbles	14	0	14	0.4
Graphite Pencil Fragment	1	0	1	0.0
Buttons/Fasteners	48	0	48	1.5
Buckles	6	0	6	0.2
Jewelry/Jewelry Findings	2	0	2	0.1
Needle/Straight Pin	29	0	29	0.9
Thimbles	2	0	2	0.1
Iron	1	0	1	0.0
Furniture Hardware	3	0	3	0.1
Horseshoe Nails	4	0	4	0.1
Fishing Sinker	0	1	1	0.0
Whetstone	1	0	1	0.0
Unidentified Burned Material	0	4	4	0.1
Unidentified Tools	1	0	1	0.0
Gunflints	2	0	2	0.1
Misc. hardware	17	0	17	0.5
Metal Container Fragments	1	0	1	0.0
Unidentified Metal	55	0	55	1.7
Misc. Materials	5	1	6	0.2
Total	**3252**	**24**	**3276**	**100.0**

Note: table does not include Phase II floral materials or brick/mortar counts; during the Phase III investigations, limestone, brick, and mortar were weighed, and counts do not appear in this table.

Table 4. Ceramic Vessel Fragments Recovered from Feature 2 (Structure 1), Feature 10 (Structure 2), Feature 13 (Structure 2), and Feature 87 (Structure 3).

Ceramic Fragments	F. 2 (Subfloor Pit)	F. 10 (Subfloor Pit)	F. 13 (Cellar)	F.87 (Subfloor Pit)
Coarse Earthenware	22	273	459	7
Total Coarse Earthenware	*22*	*273*	*459*	*7*
Creamware	25	116	154	1
Creamware: Annular (banded)	4	1	1	0
Creamware: Painted	6	7	1	0
Creamware: Molded/Embossed Border	0	0	1	0
Total Creamware	*35*	*124*	*157*	*1*
Pearlware	54	134	379	25
Pearlware: Annular (banded, rouletted, mocha, dipped)	14	19	7	0
Pearlware: Polychrome (bright polychrome)	14	22	55	1
Pearlware: Shell Edged (blue or green)	6	15	18	3
Pearlware: Embossed edge (blue, green)	0	2	47	0
Pearlware: Borderlined (green)	0	0	1	0
Pearlware: Painted (blue or green)	38	126	98	0
Pearlware: Transfer Printed (blue, other)	32	10	186	0
Pearlware: Decaled	4	0	0	0
Total Pearlware	*162*	*328*	*791*	*29*
American porcelain	0	1	0	0
Porcelain	18	0	42	1
Porcelain: Decaled	4	1	0	0
Porcelain: Hand Painted (polychrome, monochrome)	18	1	46	0
Porcelain: Lustre	2	0	0	0
English porcelain	6	1	0	0
Chinese porcelain	7	0	0	0
Total Porcelain	*55*	*4*	*88*	*1*
Refined Earthenware (Unidentifiable)	2	32	141	0
Total Refined Earthenware	*2*	*32*	*141*	*0*
Stoneware	0	0	13	0
Stoneware (colored slip, American Grey, Albany)	0	0	2	0
Total Stoneware	*0*	*0*	*15*	*0*
Whiteware	65	22	25	4
Whiteware: Annular (banded, mocha)	26	0	30	1
Whiteware: Decaled	4	0	0	0
Whiteware: Shell Edged	1	1	0	0
Whiteware: Embossed edge (blue, green)	18	2	0	0
Whiteware: Painted	22	2	21	1

Table 4. Continued.

Ceramic Fragments	F. 2 (Subfloor Pit)	F. 10 (Subfloor Pit)	F. 13 (Cellar)	F.87 (Subfloor Pit)
Whiteware: Transfer Printed (red, blue, purple, polychrome)	42	0	15	0
Whiteware: Spattered/Sponged Purple	0	0	1	0
Whiteware: Transfer Printed (flow blue)	0	0	14	0
Whiteware: Solid Color Glaze	0	0	1	0
Total Whiteware	*178*	*27*	*107*	*6*
Ironstone: Painted	0	0	1	0
Ironstone: Transfer Printed (blue)	0	0	2	0
Ironstone: Decal and Painted	0	0	1	0
Total Ironstone	*0*	*0*	*4*	*0*
Total Ceramic Fragments	**454**	**788**	**1762**	**44**

Table 5. Creamware Vessels Recovered From Selected Features Associated with Structures 1, 2, and 3.

Creamware	Feature 2 (Structure 1)	Feature 10 (Structure 2)	Feature 13 (Structure 2)	Feature 87 (Structure 3)
Plain Cup	1	0	0	0
Plain Plate	0	1	1	0
Plain Plate, Rolled Rim	0	0	0	1
Plain Hollowware Vessel	1	3	3	0
Plain Indeterminate Vessel	0	1	0	0
Embossed Plate	1	1	2	0
Embossed Soup Plate	0	1	0	0
Annular Polychrome Cup	0	0	1	0
Painted Red Bowl	0	1	0	0
Painted Red Hollowware	1	0	0	0
Painted Black Band Saucer	0	1	0	0
Total	**4**	**9**	**7**	**1**

Table 6. Pearlware Vessels Recovered From Selected Features Associated with Structures 1, 2, and 3.

Pearlware	Feature 2 (Structure 1)	Feature 10 (Structure 2)	Feature 13 (Structure 2)	Feature 87 (Structure 3)
Annular Polychrome Cup	0	1	0	0
Annular Polychrome Bowl	1	0	0	0
Annular Polychrome Hollowware	0	0	1	0
Annular Monochrome Hollowware	0	0	1	0
Painted Hollowware	0	0	0	0
Painted Monochrome Cup	3	2	0	0
Painted Monochrome Mug	0	2	0	0
Painted Monochrome Saucer	0	2	1	0
Painted Monochrome Bowl	0	0	3	0
Painted Monochrome Flatware	0	0	2	0
Painted Monochrome Hollowware	0	0	4	0
Painted Monochrome Indeterminate	0	1	1	1
Painted Polychrome Cup	1	0	0	0
Painted Polychrome Saucer	3	2	1	0
Painted Polychrome Bowl	0	0	1	0
Painted Polychrome Hollowware	0	1	7	0
Painted Polychrome Flatware	0	0	8	0
Painted Polychrome Indeterminate	2	1	0	0
Sponged Polychrome Hollowware	0	0	1	0
Embossed Shell Blue Soup Plate	1	1	2	0
Embossed Shell Blue Plate	7	0	3	0
Embossed Shell Blue Flatware	4	4	11	1
Embossed Shell Blue Indeterminate	0	1	1	0
Embossed Shell Green Soup Plate	0	0	0	0
Embossed Shell Green Plate	3	1	2	0
Embossed Shell Green Flatware	0	0	6	1
Embossed Shell Green Indeterminate	0	1	0	0
Transfer Print Cup	1	0	0	0
Transfer Print Saucer	1	1	2	0
Transfer Print Plate	1	0	7	0
Transfer Print Teapot Strainer	0	0	1	0
Transfer Print Flatware	0	0	7	0
Transfer Print Hollowware	0	0	2	0
Transfer Print Indeterminate	0	1	0	0
Total	**28**	**22**	**75**	**3**

Table 7. Porcelain Vessels Recovered From Selected Features Associated with Structures 1, 2, and 3.

Porcelain	Feature 2 (Structure 1)	Feature 10 (Structure 2)	Feature 13 (Structure 2)	Feature 87 (Structure 3)
Chinese, Painted Saucer	2	0	4	0
Chinese, Painted Flatware	0	0	1	0
Chinese, Painted Hollowware	0	0	2	0
Chinese, Banded Cup	3	0	2	0
Chinese, Banded Hollowware	0	0	2	0
Chinese, Plain Bowl?	0	0	3	0
Chinese, Plain Rice Bowl	0	0	2	0
Chinese, Plain Saucer	0	0	1	0
American. Plain Cup	0	0	1	0
American. Plain Saucer	2	0	0	0
American, Plain Indeterminate	1	0	1	0
American, Painted Cup	1	0	1	0
American, Painted Bowl	0	0	1	0
American, Painted Saucer	0	0	1	0
American, Painted Flatware	0	0	2	0
American, Banded Hollowware	0	0	1	0
American, Decal Saucer	1	0	0	0
American, Decal Cup	0	0	1	0
American, Decal Hollowware	1	0	0	0
Total	**11**	**0**	**26**	**0**

Table 8. Coarse Earthenware Vessels Recovered From Selected Features Associated with Structures 1, 2, and 3.

Redware	Feature 2 (Structure 1)	Feature 10 (Structure 2)	Feature 13 (Structure 2)	Feature 87 (Structure 3)
Bottle	0	1	0	0
Bowl	1	3	3	0
Bowl/pan	0	1	0	0
Bowl/pot	0	6	0	0
Mixing bowl	0	0	2	1
Utility vessel	0	0	12	1
Hollowware	0	4	10	0
Pan	0	2	9	0
Total	**1**	**17**	**36**	**2**

Table 9. Whiteware Vessels Recovered From Selected Features Associated with Structures 1, 2, and 3.

Whiteware	Feature 2 (Structure 1)	Feature 10 (Structure 2)	Feature 13 (Structure 2)	Feature 87 (Structure 3)
Plain	0	0	1	0
Annular Cup	1	2	1	0
Annular Bowl	1	0	1	0
Annular Hollowware	0	0	4	1
Annular Flatware	0	0	1	0
Painted Monochrome Mug	1	0	0	0
Painted Monochrome Indeterminate	0	1	0	0
Painted Monochrome Saucer	2	0	1	0
Painted Monochrome Cup	1	0	0	0
Painted Monochrome Hollowware	2	2	0	0
Painted Polychrome Saucer	2	0	1	0
Painted Polychrome Cup	1	0	0	0
Transfer Print Saucer	0	0	1	0
Transfer Print Hollowware	1	0	1	0
Transfer Print Flatware	2	0	2	0
Transfer Print Indeterminate	0	0	1	0
Flow Blue Plate	0	0	1	0
Flow Blue Cup/Bowl	1	0	0	0
Flow Blue Flatware	0	0	3	0
Dyed Yellow Glaze Creamer/Sugar	0	0	1	0
Total	**15**	**5**	**20**	**1**

STRUCTURE 2

Structure 2 is a small barn located on the eastern edge of the bench above the slope down to the creek (Figure 6). Features associated with the building include a sub-floor pit previously excavated by UKPAR and a stone-lined cellar (Figure 7). No hearth, chimney, or earthfast posts, or intact foundations were identified in association with Structure 2. The cellar has limestone walls, which may have extended above ground to form a partial foundation for the building. Over six tons of limestone rubble was removed from the cellar, not including the partially intact walls.

The barn measures about 3.7 x 7.3 m, making it smaller than the house (Structure 1), but larger than the more cabin-like Structure 3 described below. The subfloor pit beneath the west end of the barn measures about 1.8 x 2.7 m in plan, and roughly 0.8 m deep, about the same as the pit beneath Structure 1. Feature 93, a basin-shaped pit identified along the north wall of the cellar, is probably related to the destruction of Structure 2.

The interior of the cellar (Feature 13) was roughly square, measuring roughly 2.1 x 2.4 m. The remaining wall extended up to about 0.8 m above the floor, about six to seven limestone courses, and measured just over 0.3 m thick (Figure 8). A wooden door sill about 1.1 m wide was found mostly intact across the hillside entrance to the cellar.

Limestone steps led out of the cellar and onto the slope above the creek (Figure 9). The wood door sill is made of very durable locust wood, suggesting a need for a tight fit to the door to keep vermin out of the storage area.

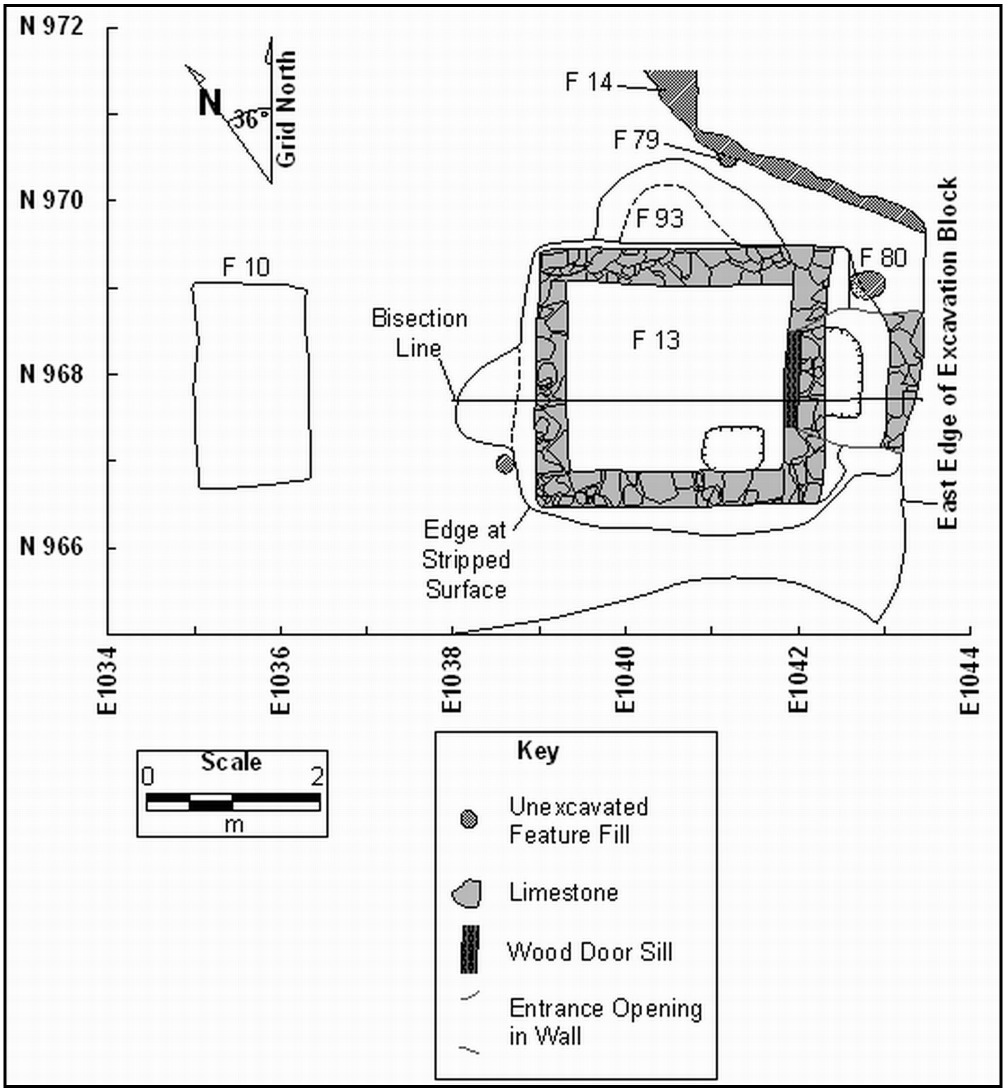

Figure 6. Duckworth Farm Site, Structure 2, Plan View of Phase II and Phase III Features.

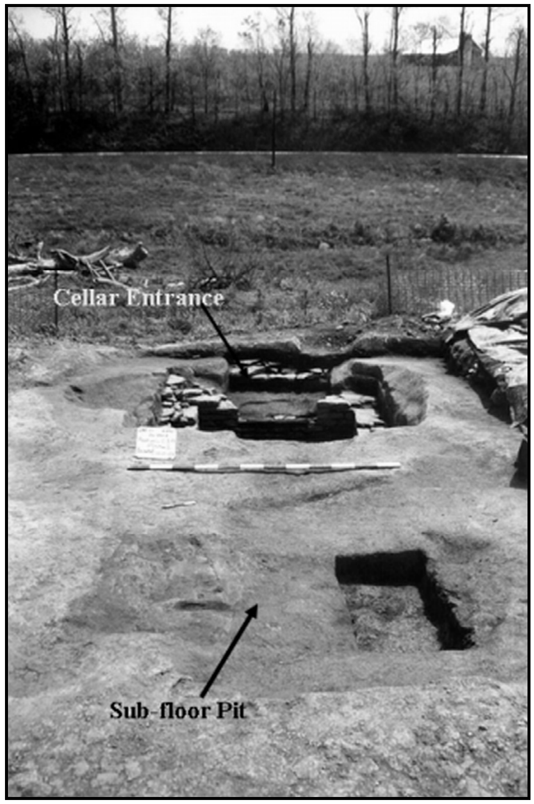

Figure 7. Duckworth Farm Site, Structure 2 Excavated, View to the East.

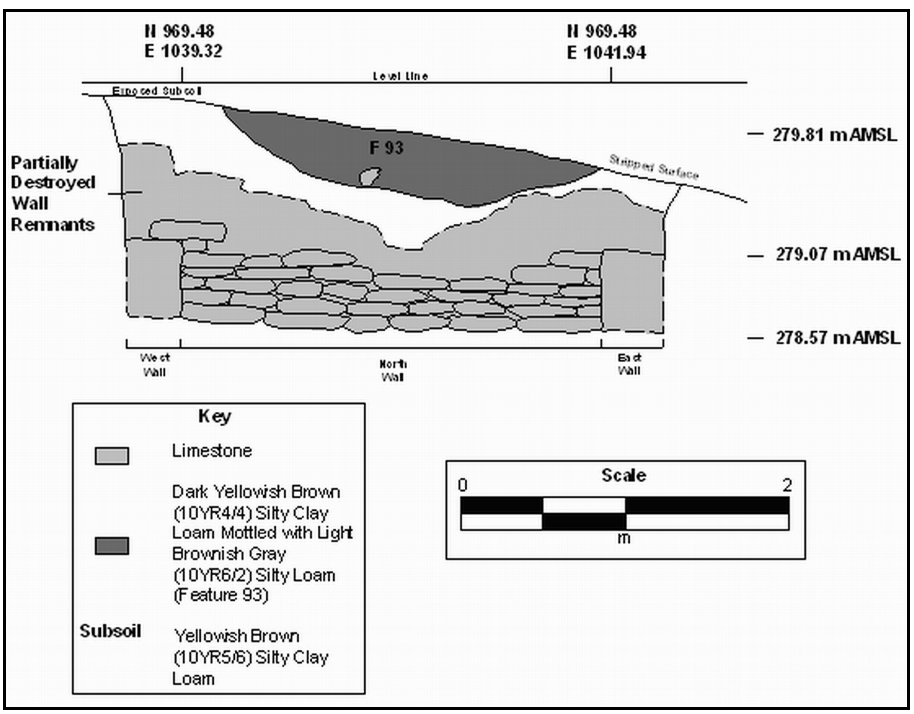

Figure 8, Duckworth Farm Site, Structure 2, Feature 13, North Wall Showing Feature 93.

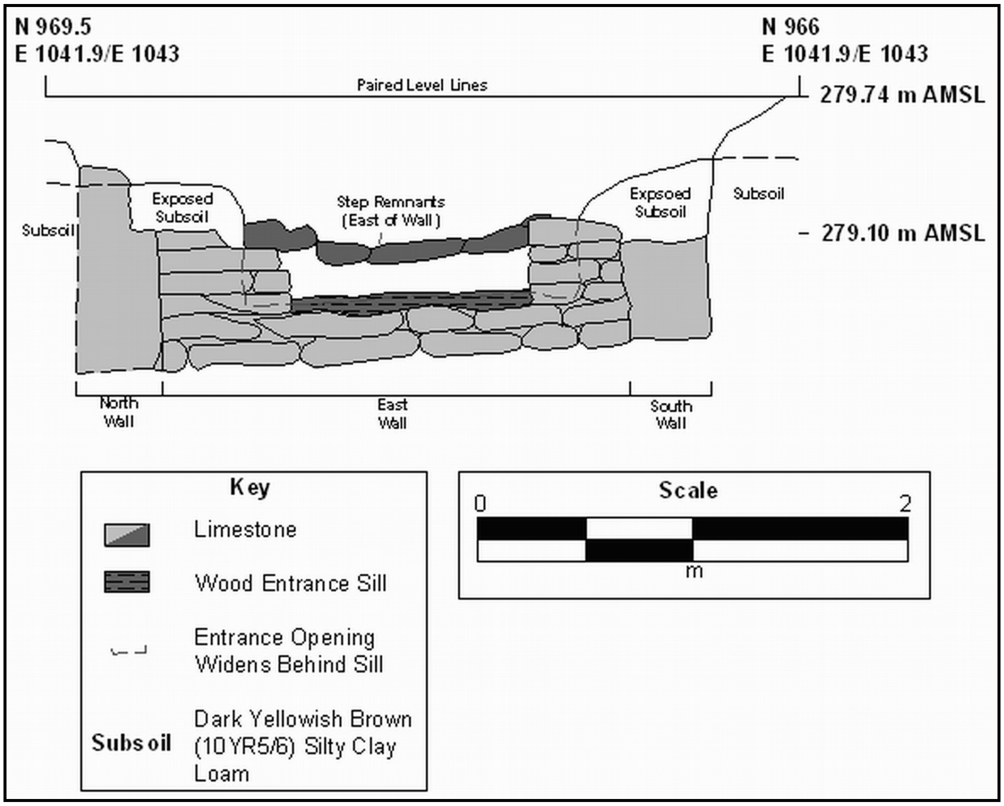

Figure 9. Duckworth Farm Site, Structure 2, Feature 13, East Wall Cellar Entrance.

Table 10 summarizes the artifacts assemblage recovered from contexts associated with Structure 2. A total of 7116 historic artifacts were recorded, as well as 6204.84 kg of limestone, 923.79 kg of brick, and 35.84 kg of mortar not included in Table 10. Nearly all of the nails are cut nails (99%, n=243); only three wire nails were recovered in association with Structure 2.

A total of 788 ceramic vessel fragments was recovered from the subfloor pit (Feature 10) associated with Structure 2 (Table 10). The most common ware types are pearlware, coarse earthenware, and creamware, which account for 92% of the ceramic assemblage in Feature 10 (Table 4). Vesselization of these ceramics resulted in the identification of a minimum of 53 unique vessels in this subfloor pit, including creamware, pearlware, redware (coarse earthenware), and whiteware (Tables 5, 6, 7, 8, and 9). Identifiable tableware includes cups, saucers, plates, bowls, and mugs. Cooking and storage vessels include bowls, pans, and a bottle. Unlike the subfloor pit beneath Structure 1 (Feature 2), coarse earthenware vessels were common. No unique Chinese or American porcelain vessels were recovered from Feature 10, in further contrast to Feature 2. Whiteware vessels are also rare in Feature 10.

A total of 1762 ceramic vessel fragments was recovered from the cellar (Feature 13) associated with Structure 2 (Table 10). The most common ware types are pearlware, coarse earthenware, and creamware, which account for 80% of the ceramic assemblage in

Feature 13 (Table 4). Vesselization of these ceramics resulted in the identification of a minimum of 172 unique vessels in the cellar, including creamware, pearlware, redware (coarse earthenware), whiteware, stoneware, and ironstone (Tables 5, 6, 7, 8, and 9.) Identifiable tableware forms include cups, saucers, bowls, rice bowls, plates, soup plates, and one teapot trainer. Cooking and storage vessels include mixing bowls, pans, and general utility vessels.

Table 10. Artifacts Recovered in Association with Structure 2.

Structure 2	Feature 10 (Subfloor Pit)	Feature 13 (Cellar)	Feature 14 (Midden)	Feature 93 (Pit)	Total	%
Faunal	2776	815	16	6	3613	50.77
Wood Door Sill	0	1	0	0	1	0.01
Nails	45	192	9	0	246	3.46
Window Glass	2	27	1	0	30	0.42
Ceramics	788	1762	35	7	2592	36.42
Container Glass	41	133	3	0	177	2.49
Glass Tableware	0	9	0	0	9	0.13
Iron Kettle Fragments	0	4	0	0	4	0.06
Kettle Hook	0	1	0	0	1	0.01
Utensils	8	6	0	0	14	0.20
Pipes	4	6	0	0	10	0.14
Marble	1	1	0	0	2	0.03
Pocket Knife	0	4	0	0	4	0.06
Jew's Harp	0	1	0	0	1	0.01
Buttons/Fasteners	8	5	0	0	13	0.18
Buckles	0	1	0	0	1	0.01
Needle/Straight Pin	20	4	0	0	24	0.34
Oil Lamp Chimney Glass	0	25	1	0	26	0.37
Metal Container Fragments	10	1	0	0	11	0.15
Screws, Tacks, Wire, Chain	3	6	0	0	9	0.13
Bridle bit, horseshoe nails	5	0	0	0	5	0.07
Lead Shot	1	0	0	0	1	0.01
Unidentified Metal Fragments	81	36	2	1	120	1.69
Eggshell	0	0	0	71	71	1.00
Mollusk Shell	0	0	0	2	2	0.03
Nutshell	0	1	0	0	1	0.01
Wood Fragments	0	7	0	0	7	0.10
Charcoal Fragments	79	5	0	0	84	1.18
Cinder/Slag/Coal	1	28	0	0	29	0.41
Fired Clay	2	0	0	0	2	0.03
Glass Slag	4	0	0	0	4	0.06
Unidentifiable rubber	1	0	0	0	1	0.01
Modern Artifacts	0	1	0	0	1	0.01
Total	**3880**	**3082**	**67**	**87**	**7116**	**100.00**

Note: table does not include Phase II floral materials or brick/mortar counts; during the Phase III investigations, limestone, brick, and mortar were weighed, and counts do not appear in this table.

A total of 87 historic artifacts and 113.85 kg of limestone was recovered from the basin-shaped pit (Feature 93) associated with Structure 2. Most of the historic artifact count consists of 71 pieces of eggshell and 2 mollusk shell fragments recovered from the flotation sample; other artifacts include 7 ceramic fragments, an unidentified metal piece that may be a blade or tool fragment, and 6 pieces of faunal material. Four of the ceramics are pearlware. Other ceramics include a redware fragment with a solid brown/black glaze and 2 pieces of burned white earthenware.

STRUCTURE 3

Structure 3 is a relatively small, cabin-like building located west of the barn (Figure 10). The building was oriented in precisely the same direction as Structure 2, with a single course of limestone foundation remnants at the west end and a small chimney at the east end (Figure 11). An informal subfloor pit (Feature 87) was identified inside the cabin. The chimney is comprised of shallow builder's trench in which the remnants of a c-shaped limestone chimney foundation were set (Feature 90), as well as a hearth (Feature 91) and a small ash pit (Feature 92). A small pit containing only burned earth, charred corncobs, and a piece of oil lamp chimney glass (Feature 54) was identified outside and behind the cabin, and in conjunction with two postholes (Features 55 and 56) may represent a fire pit that was once part of a small meat smoker. Features 89 and 94, situated in the northwest and northeast corners of the foundation, may represent the remnants of some kind of structural reinforcement or support. Feature 94 contained 6.8 kg of handmade brick. No other artifacts were recovered from either Feature 89 or 94.

The building measures about 4.0 x 4.9 m in plan, and the chimney measures about 1.4 x 1.7 m. The subfloor pit (Feature 87) extends in irregular fashion from the hearth and measures about 0.80 x 2.48 m in plan and only 0.2 m deep. In contrast, subfloor pits associated with Structures 1 and 2 were deeper (0.7 to 0.8 m) and formally constructed with vertical walls and flat floors.

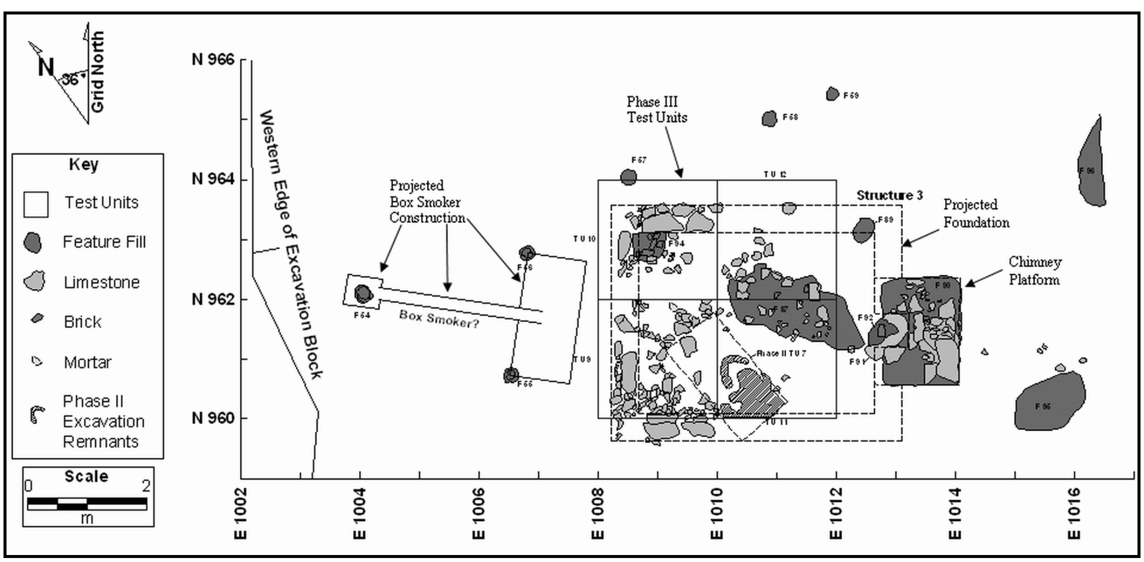

Figure 10. Duckworth Farm Site, Structure 3, Plan Map of Features.

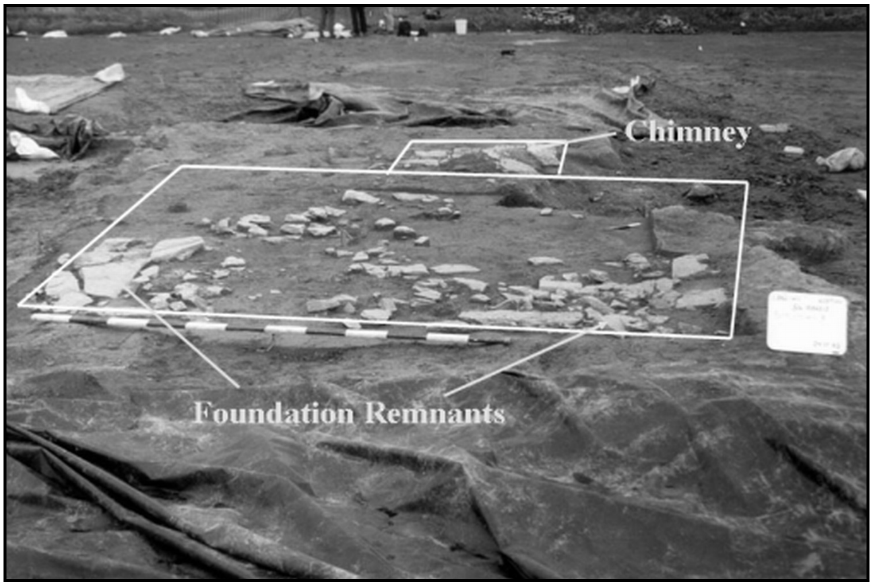

Figure 11. Duckworth Farm Site, Structure 3, View to the East.

Table 11 summarizes the artifacts assemblage recovered from contexts associated with Structure 3. A total of 167 historic artifacts were recovered from features associated with Structure 3 , as well as 109.09 kg of limestone, 31.57 kg of brick, and 0.43 kg of mortar not included in Table 11. All of the nails associated with Structure 3 are cut nails (n=191).

Table 11. Artifacts Recovered from Contexts Associated with Structure 3.

Artifacts	Feature 54	Feature 87	Feature 90	Feature 91	Feature 92	Total	%
Nails	0	80	1	3	0	84	50.30
Ceramics	0	44	2	1	0	47	28.14
Container Glass	0	0	7	0	0	7	4.19
Glass Tableware	0	1	0	0	0	1	0.60
Buttons/Fasteners	0	1	0	0	0	1	0.60
Faunal	0	18	0	0	1	19	11.38
Oil Lamp Chimney Glass	1	0	0	0	0	1	0.60
Nutshell	0	2	0	0	0	2	1.20
Charcoal	0	1	0	0	0	1	0.60
Unidentified Metal Fragments	0	4	0	0	0	4	2.39
Total	1	151	10	4	1	167	100.00

Most of these artifacts associated with Structure 3 (90%) were recovered from the subfloor pit (Feature 87). A total of 44 ceramic vessel fragments were recovered from Feature 87. The most common ware types are pearlware, coarse earthenware, and whiteware, which account for 95% of the ceramic assemblage in Feature 10 (Table 4). Vesselization of these ceramics resulted in the identification of a minimum of seven unique vessels in this subfloor pit, including pearlware, creamware, coarse earthenware, and whiteware (Tables 5, 6, 7, 8, and 9). The only unique creamware vessel identified is a plain rolled-rim plate. Pearlware vessels include flatware and an indeterminate form. A coarse earthenware mixing bowl and unidentified utility vessel were identified. The only unique whiteware vessel identified is a piece of annular hollowware.

CENTRAL YARD SPACE

The house, barn, and cabin are arranged around a central, open yard space. Most of the historic artifacts recovered by UKPAR during the Phase II investigations are concentrated either in the space between the structures, or on the slope down to the creek behind the barn (Figure 12). The central yard space is defined by the gable ends of the three major structures, and the entrances to the house and cabin do not face the central area. The central area is further defined by several soil anomalies created by the trees that encircled this central area (Figure13).

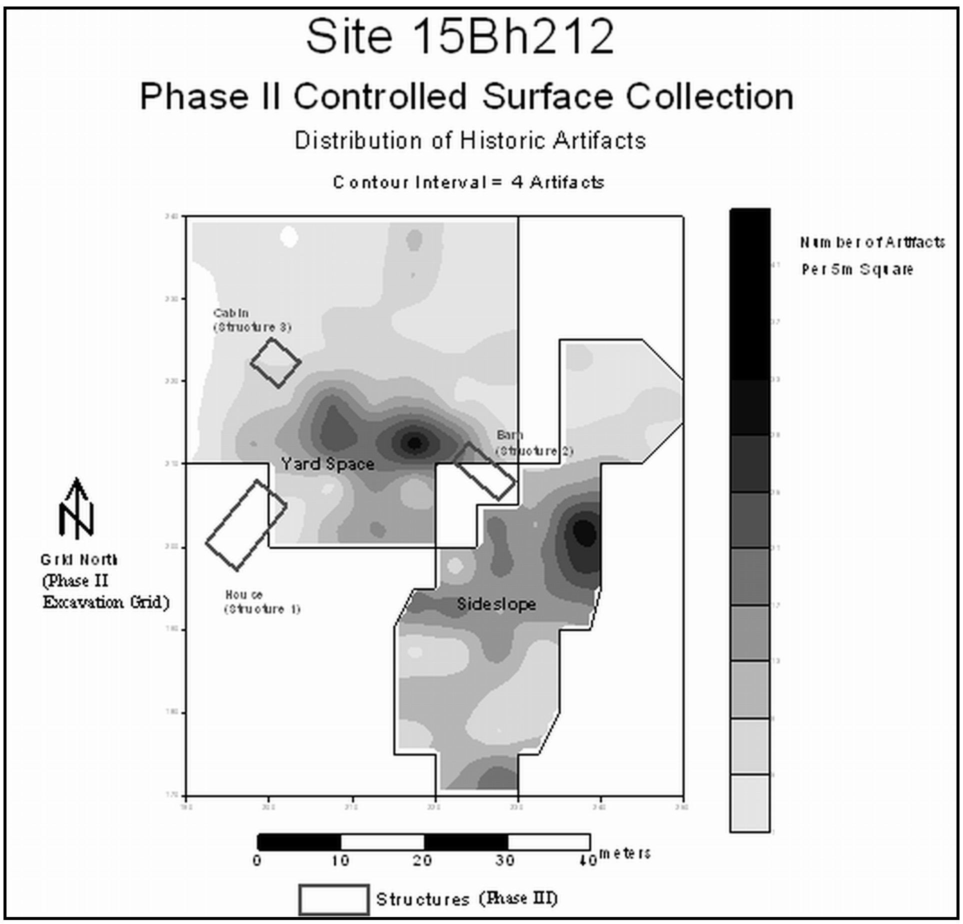

Figure 12. Duckworth Farm Site, Distribution of Historic Artifacts Recovered During Phase II Surface Collection (Peres 2003), Showing Structures 1, 2, and 3. Grid North is Relative to the Phase II Grid.

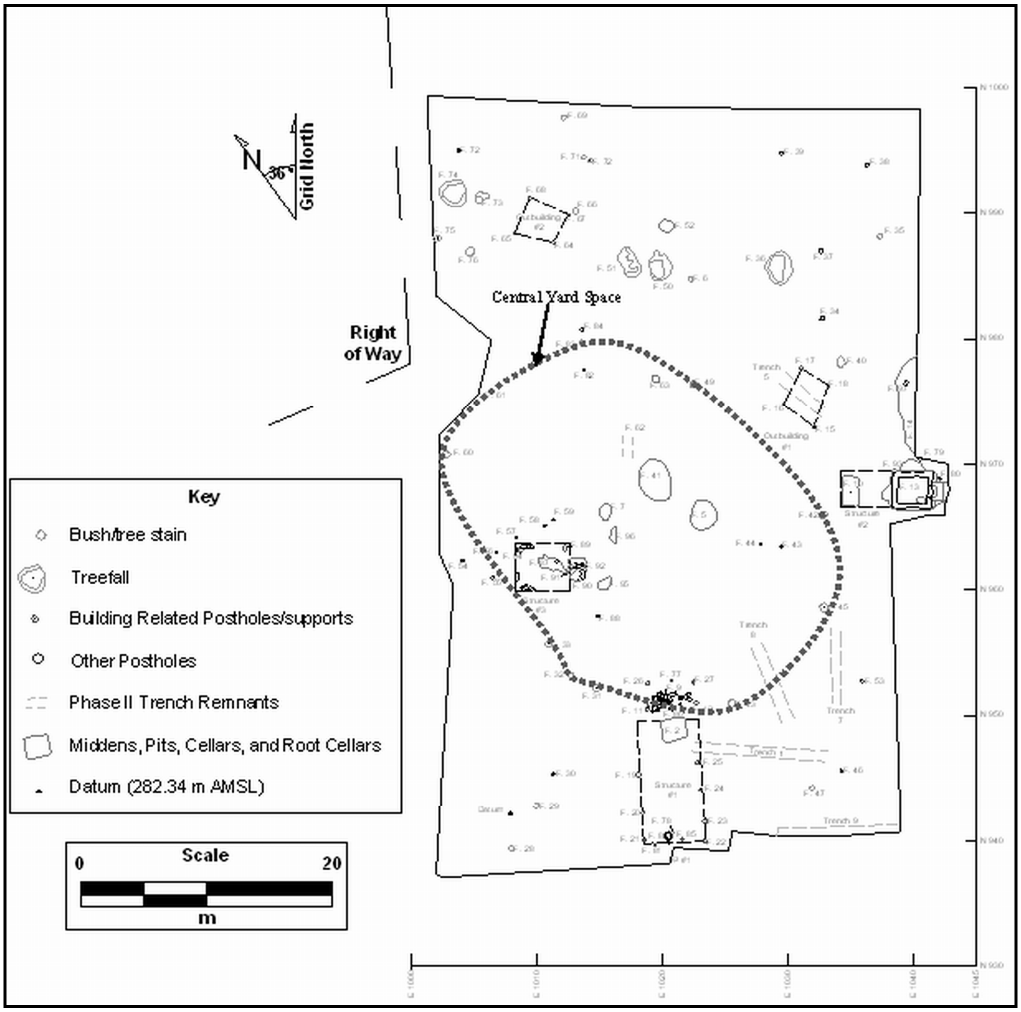

Figure 13. Duckworth Farm Site, Plan Map Showing Open Central Yard Space.

No tree features were identified within the central yard space, but several pit features were found, including three medium to large pit features. One of these pit features (Feature 41) is a large, nearly empty pit (Figure 14). Small limestone fragments and a prehistoric hafted biface were found on top of an ashy layer and beneath the initial fill layer; unburned faunal materials were recovered from within the ashy layer. Overall, this oval pit measured roughly 2.7 x 3.0 m in plan, and over 0.6 m deep. Other than the faunal materials (n=173) and a small collection of limestone fragments, artifacts include five small fragments of light green, blown-in-mold glass, two pieces of plain creamware, a piece of local redware with a black interior glaze, two cut nail fragments, and a piece of a colorless glass container. Despite the ashy nature of the lower layer of fill, only one of the 173 pieces of faunal material exhibited evidence of burning. The low density and diversity of artifacts in the feature contrasts with most other disposal contexts on the site, and the pit was probably used for some kind of specialized disposal related to activities in the central yard space.

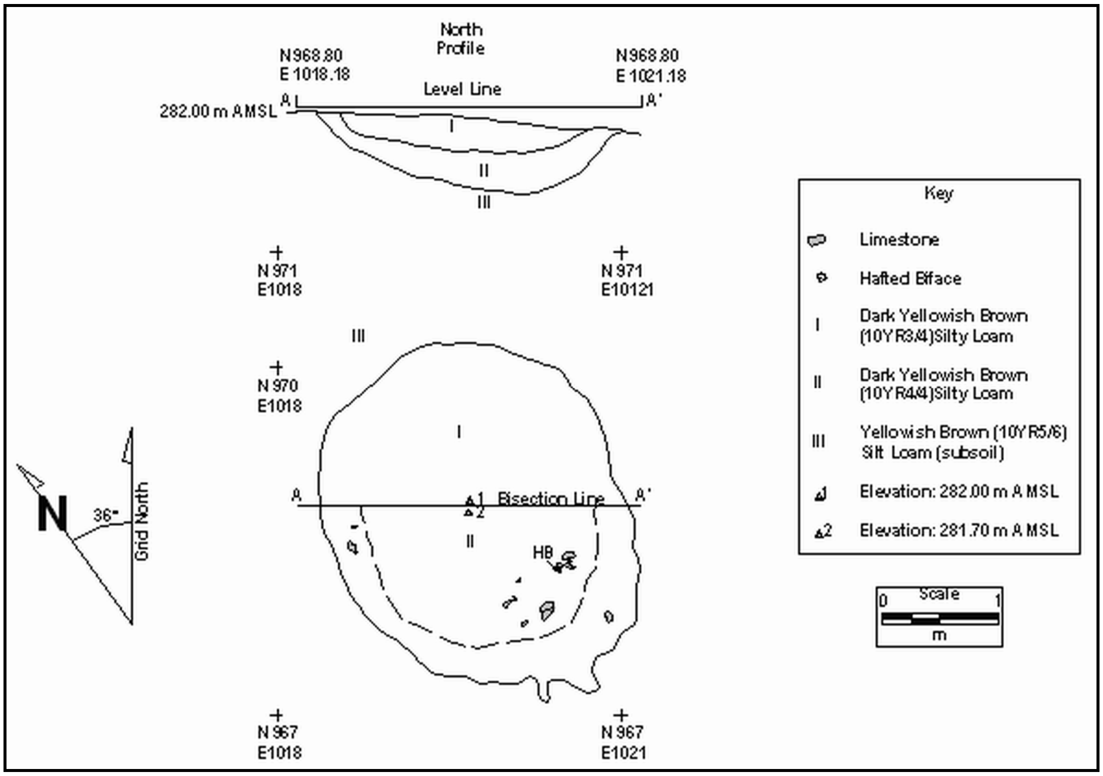

Figure 14. Duckworht Farm Site, Feature 41, Plan and Profile.

OUTBUILDINGS

Two sets of four postholes have been tentatively identified as informal outbuildings or shelter-like structures (Figure 3). Outbuilding 1 is located about 4.3 m north of Structure 2, and Outbuilding 2 is located about 24 m northeast of Structure 3, in the line of trees (represented archaeologically by large treefalls) on the north edge of the site. The two sets of four posts do not form a square or rectangular structure in either case, which casts some doubt on their function as utility sheds. If these eight postholes do define a pair of utility sheds, then they were expediently built and informal.

Outbuilding 1 is formed by Features 15-18. No post molds were identified in any of the postholes, which range from 23 to 25 cm in diameter and 10 to 32 cm deep. No artifacts were recovered from any of the postholes. The posts potentially define four walls; three of the walls range from about 3.10 to 3.55 m in length; the northeast wall would have been shorter at 2.55 m. No artifacts were recovered from any of the postholes.

Outbuilding 2 is formed by Features 64, 65, 67, and 68. As with Outbuilding 1, no post molds were identified in any of the postholes. The posthole diameters are more variable than in Outbuilding 1, ranging from 14 to 31 cm in diameter and 17 to 28 cm deep. No artifacts were recovered from any of the postholes.

Lacking any artifacts or additional associated features, it is difficult to speculate on the function of these two structures. Both appear to have been built with one short side, and both encompass about 11 m^2. They could represent anything from storage or utility sheds to corn cribs or chicken coops.

CHRONOLOGY

Chronological indicators at the Duckworth Farm include ceramic vessels, nails, and window glass.

In an effort to examine the chronology of each of the three major buildings, the date range of selected vessels from the ceramic vesselization was plotted for each structure. This approach does not refer to the date of the construction of any given building, but attempts to define the general period of manufacture for goods disposed in features related to the building. Feature 2 was used for the house (Structure 1), Features 10 and 13 were used for the barn (Structure 2), and Feature 87 was used for the cabin (Structure 3). The results are illustrated in Figures 15, 16, 17, and 18. The X-axis represents all decorative types of ceramics that date within the illustrated range and parenthetically presents frequency of vessels manufactured during that time period within the context. The range of the date of manufacture for identifiable unique vessels in contexts associated with Structures 1, 2, and 3 generally lie between 1790 and 1860.

Window glass can also be used to estimate building use dates. A regression formula for estimating the construction date of a building based on the date of manufacture for window glass was developed by Moir (1987). Since the sample size of the window glass at the Duckworth farm is so small (n=59), Moir's formula (Glass Manufacture Date = 84.22 x [Glass Thickness] + 1712.7) was used to create a histogram of individual window glass fragments for Structures 1 and 2 (no window glass was recovered from any feature associated with Structure 3) to examine the date ranges based on fragment thickness (Figures 21 and 22). McKelway (1994) has suggested that the earliest significant increase or rise in such a histogram should be most closely associated with the initial construction date of the structure being analyzed. However, by graphing each fragment individually instead of by groups or classes it is possible to obtain a much finer degree of resolution with regard to estimated dates. Instead of observing a peak that represents a ten or twenty-year span, a peak that represents a single year is observed. Furthermore, later peaks or rises in the histogram may indicate an episode of remodeling or the building of an addition. Since the number of window pane fragments is so small at the Duckworth Farm site, the concern is not so much with peaks and valleys, but with the overall temporal distribution of the artifacts.

Figures 19 and 20 suggest that Structure 2 may have been built in the late eighteenth-century. Structure 1 appears to have been built later, in the early nineteenth-century, with both structures in use until around 1853. The replacement of window glass appears to have stopped around 1853, near the time of Catharine Duckworth's death, and suggests that the buildings were no longer in use. Note that the early twentieth-century outliers are either from surface collections or near-surface contexts (associated topsoil) in Structure 2. Window glass thickness suggests that the span of occupation for Structures 1 and 2 fall predominantly between 1788 and 1853, consistent with dates of manufacture for the ceramic vessel assemblage.

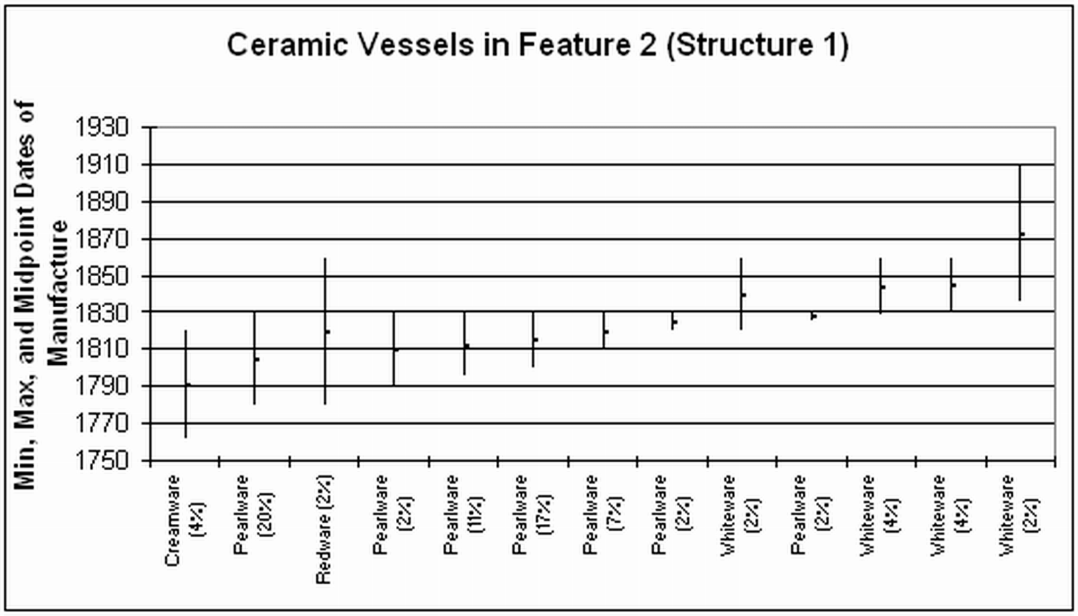

Figure 15. Duckworth Farm Site, Date Ranges for Ceramic Vessels Recovered from Structure 1, Feature 2 (subfloor pit).

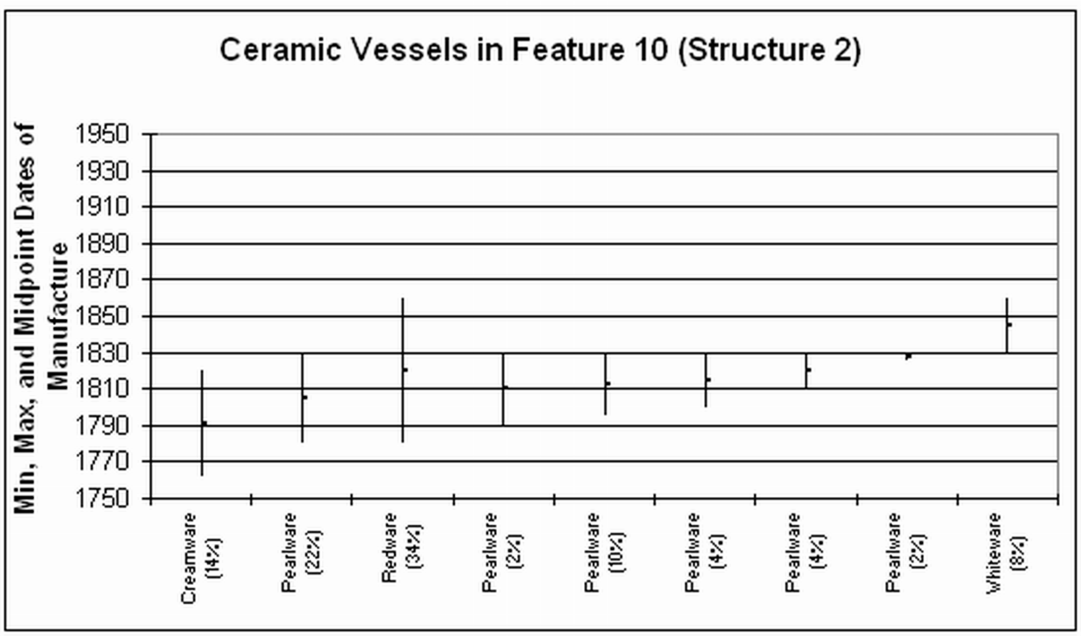

Figure 16. Duckworth Farm Site, Date Ranges for Ceramic Vessels Recovered from Structure 2, Feature 10 (subfloor pit).

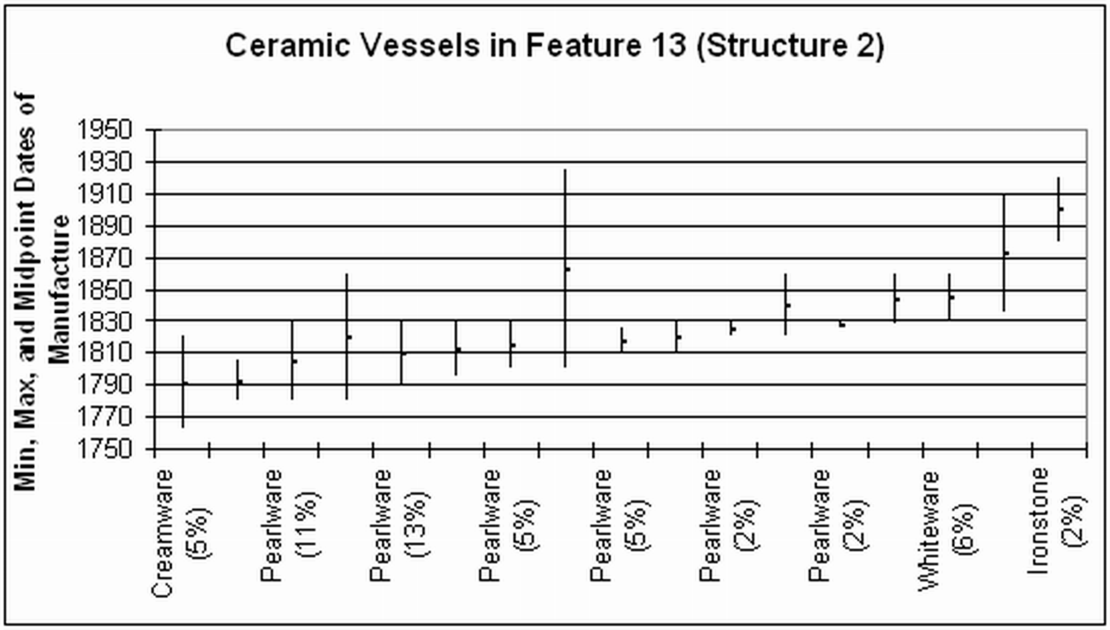

Figure 17. Duckworth Farm Site, Date Ranges for Ceramic Vessels Recovered from Structure 2, Feature 13 (stone-lined cellar).

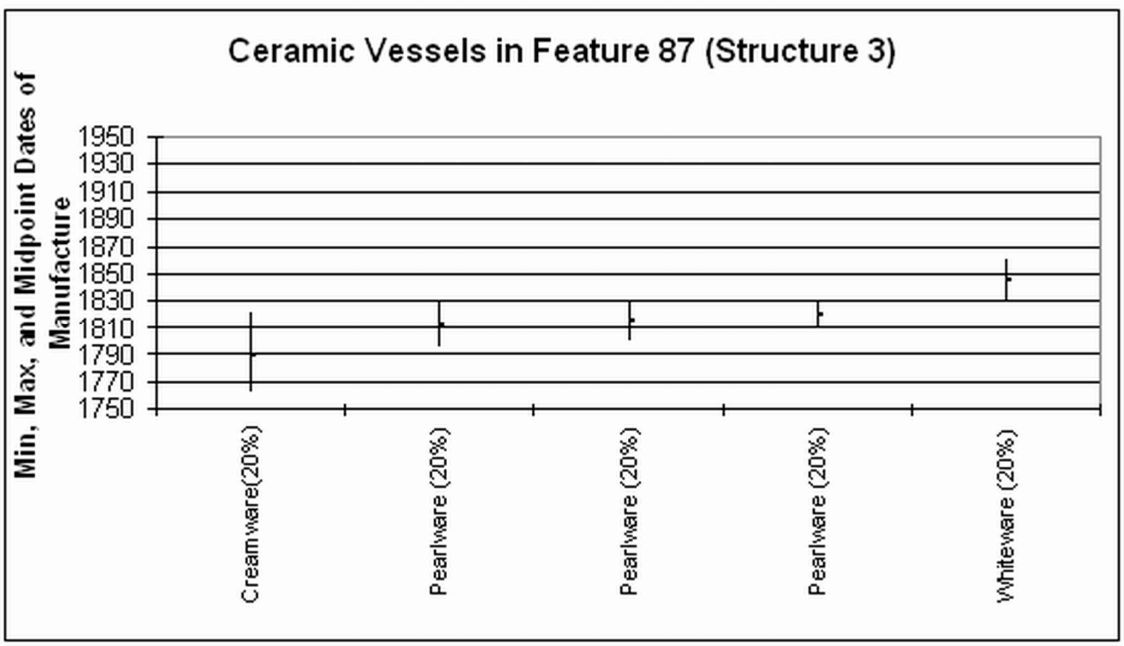

Figure 18. Duckworth Farm Site, Date Ranges for Ceramic Vessels Recovered from Structure 3, Feature 87 (subfloor pit).

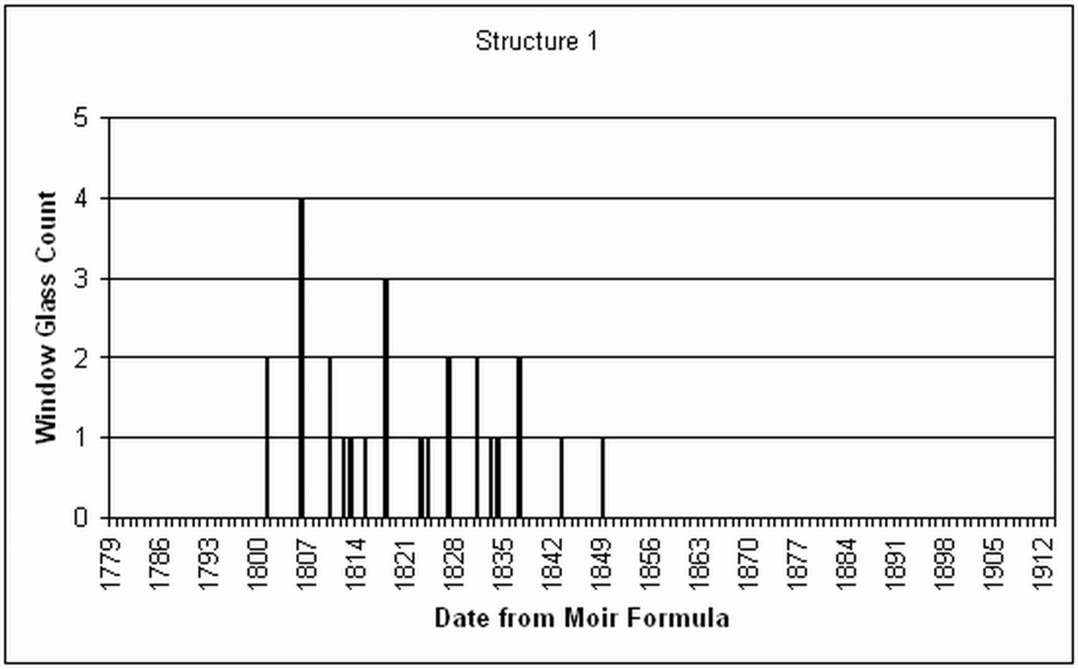

Figure 19. Duckworth Farm Site, Structure 1, Moir Dates for Window Pane Glass Fragments.

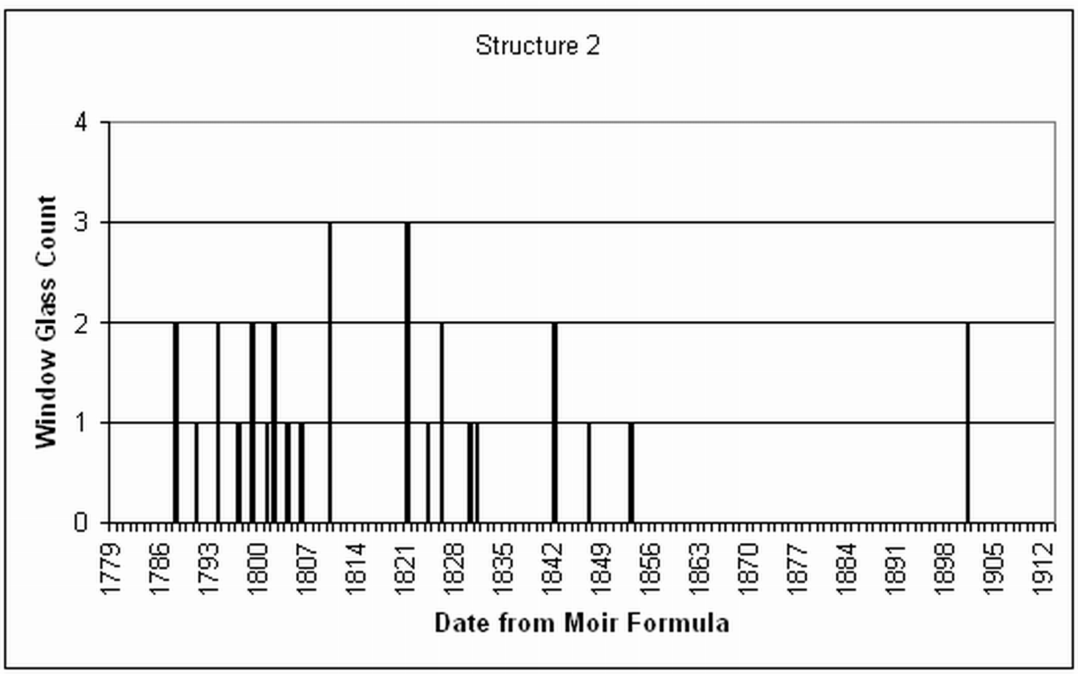

Figure 20. Site 15Bh212, Structure 2, Moir Dates for Window Pane Glass Fragments.

As noted earlier, nearly all of the nails recovered from contexts associated with Structures 1, 2, and 3, are cut nails. Cut nails were introduced as early as 1790, and although wire nails were produced as early as the 1860s and 1870s, they were not commonly used until the 1880s (Wells 1998). These results are again consistent with the occupational span suggested by the ceramic and window glass assemblage, and do not conflict with historical documentation of the Duckworth Farm.

DISCUSSION

The remains of three buildings and numerous landscape features were identified within the project area, including a residential structure with a sub-floor pit and a large hearth (Structure 1), a smaller cabin-like structure and hearth (Structure 3), and a small barn with a sub-floor pit and a stone-lined cellar (Structure 2). Although the sparse architectural remains generally preclude a definitive functional determination of these buildings, the following discussion will refer to each building by it's most likely function.

STRUCTURE 1

Structure 1 is the largest building identified on the site and probably represents a residential building. The house had a large, limestone-based chimney at the north gable end with a subfloor pit in front of the fireplace. The house is oriented perpendicular to the barn (Structure 2) and the cabin (Structure 3).

At least a partial earthfast construction is evidenced by the remainders of postholes out-lining the footprint of the house; occasionally, shallow depressions were identified in line with the postholes, and may represent evidence of repair or supplementary support using piers made from limestone or other material. No evidence of any supporting material remained in any of these depressions, however.

The chimney had a limestone base, but only part of the bottom layer remained beneath the plowzone. Postholes for posts that supported scaffolding needed to build the chimney were identified around the chimney base; these postholes contained brick fragments and, occasionally, small pieces of limestone probably used as wedges to enhance post stability. At least part of the chimney was probably made from brick, but no hearth (charred material, burned earth) was reported in association with the chimney, unlike at the cabin (Structure 2).

A single large subfloor pit (Feature 2) was identified in front of the hearth and excavated by UKPAR (Peres 2003). When comparing the subfloor pits (Features 2 and 10) beneath Structures 1 and 2 to other contexts, including the stone-lined cellar (Feature 13) beneath Structure 2 and the Phase II test units, the artifact assemblage in Features 2 and 10 are quite different (Figure 21). The frequency of ceramic fragments is much lower in Feature 2, and the frequency of such items as faunal materials and other artifacts (such as window glass, clothing fasteners, housekeeping items, and personal items) are much higher than in the stone-lined cellar (Feature 13) or the typical plowzone context sampled by the test units. The strong contrast with the test unit results suggests that the fill in Feature 2 was not primarily derived from generalized site contexts, but from activities and contexts more directly related to the building itself. Although the relative artifact frequencies in Feature 2 are somewhat atypical when compared to other site contexts, it is difficult to attribute such differences to any specific cause. There is a lower proportion of ceramic ware fragments relative to personal artifacts (jewelry, pipes, marbles, jew's harp, graphite pencil), housekeeping items (pins, thimble, and iron), and clothing-related items (buttons, buckles, and cufflinks) than is found elsewhere on the site. It may be that the activities carried out in the vicinity of the house were slightly different, or that the assemblage was at least partially generated by a different group of people, or that there was a greater intensity of occupation that resulted in a higher frequency of loss.

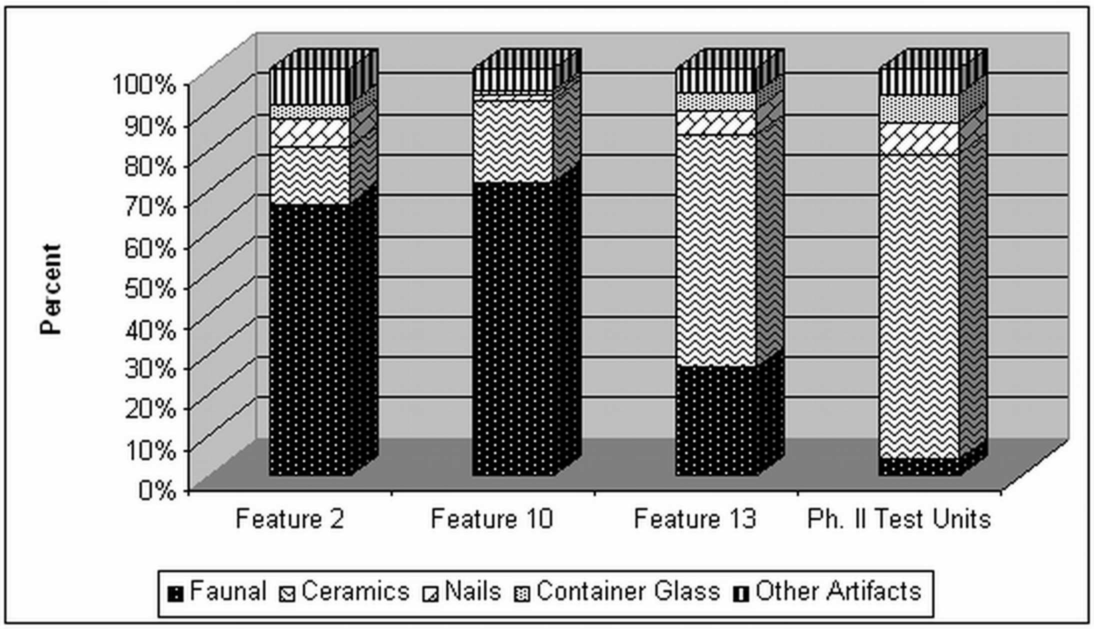

Figure 21. Duckworth Farm Site, Frequency of Artifacts Recovered from Selected Features and Test Units.

There is no clear indication that the John S. Duckworth's slaves lived in this house. John S. Duckworth was the only owner of this property who owned slaves, and he never owned more than four slaves at a time (Table 2). A ceramic assemblage of more than 200 individual vessels from feature contexts across the site appears to represent far more vessels than would be used by slaves over a period of only about 11 years (Table 2). So who was residing in the earthfast house? We would first suspect the Duckworths themselves (first the elder George, the sons George W. and John S.). But we know that the elder George Duckworth lived in a brick house, and Structure 1 clearly was not a brick house. Residents could have included old Mr. Duckworth's son George W., as well as the possibility that the land was leased during the latter years of Catherine Duckworth's ownership. There is some archival evidence that the elder George Duckworth's son George W. resided on his parents property prior to buying 45 acres of the property, and that one of the boundary lines for the 45 acres ran opposite the brick house on the hill above the project area. If this scenario is true, then Structure 1 may have been originally inhabited by George W. Duckworth. Figure 21 provides only a gross summary of artifacts, but the chart does illustrate overall results demonstrating that the types of artifacts contained within the subfloor pits and other features are virtually identical. We cannot say definitively who occupied the house, especially without any comparative information from what is probably the main brick house on the hill above the project area. The most obvious differences between the subfloor pits in Structure 1 and Structure 2 lie in the inventory of personal artifacts and ceramic vessel types and function. The subfloor pit in Structure 1 (Feature 2) contained more personal items and several examples of porcelain teaware, but coarse earthenwares were very rare (Tables 4, 7, and 8). The subfloor pit in Structure 2 (Feature 10) contained fewer personal items and many examples of coarse earthenware bowls and utilitarian vessels, but little porcelain. Such differences may be attributable to slave versus non-slave occupation, differences in the function of the structures, or both.

STRUCTURE 2

Structure 2 may represent a small barn. A stone-lined cellar (Feature 13) was constructed below ground on the east end, with a door opening onto a stair leading up to a slope-side exit above the creek. There was also a subfloor pit accessed below the floor at the west end of the barn (Feature 10), but it appeared to have been partially filled with refuse, then topped with general site destruction debris similar to the root cellar beneath the house (Structure 1). Examination of the size, form, and alteration of the nails suggests that the barn was likely a timber frame construction and the building probably rested on sills or limestone supports since there was no evidence of post construction (Pullins, et al. 2005).

The barn cellar may have been used for the storage of potatoes and other garden produce. Fruits such as apples may have been stored here, since there is reference to an orchard in an 1826 deed description (Bath County Deed Book E:418-419). Historically, root cellars were used to keep such things as apples, carrots, turnips, potatoes and squash through the winter. Salt pork and smoked meats, milk, cream, butter, and cheese could also be kept in the root cellar to stay cool and fresh, ready for use. However, no evidence of fruit or vegetable storage was recovered in flotation samples from the cellar floor (Pullins, et al. 2005).

STRUCUTRE 3

Structure 3 may represent a small cabin. It is the smallest building identified, measuring about 4.0 x 4.9 m. A small chimney and hearth are centered on the southeastern gable end. A partial limestone foundation was identified at the northwest end, but it is not clear whether there was a foundation around the entire structure. There is a shallow, very irregularly-shaped pit extending from the hearth towards the northwest (Feature 87), but it contained numerous smaller fragments of limestone and appeared to have been filled with destruction debris. The hearth deposits were more intact, exhibiting charred materials and burned earth. There were few artifacts recovered in direct association with the structure, which made it difficult to make statistically valid comparisons with other buildings on the site or to determine whether the cabin was used to house slaves.

CONCLUSIONS

The house was constructed on what was clearly the working portion of the farm, with easy access to the root barn storage and a small cabin to the side and further back from the house, and a large out-door working space (Figure 22). If the cabin housed slaves, the proximity of the cabin to the house represents an efficient spatial organization, and suggests that such considerations may be of greater importance on a self-sufficient farm than on a larger plantation, where slave quarters are more notably separated.

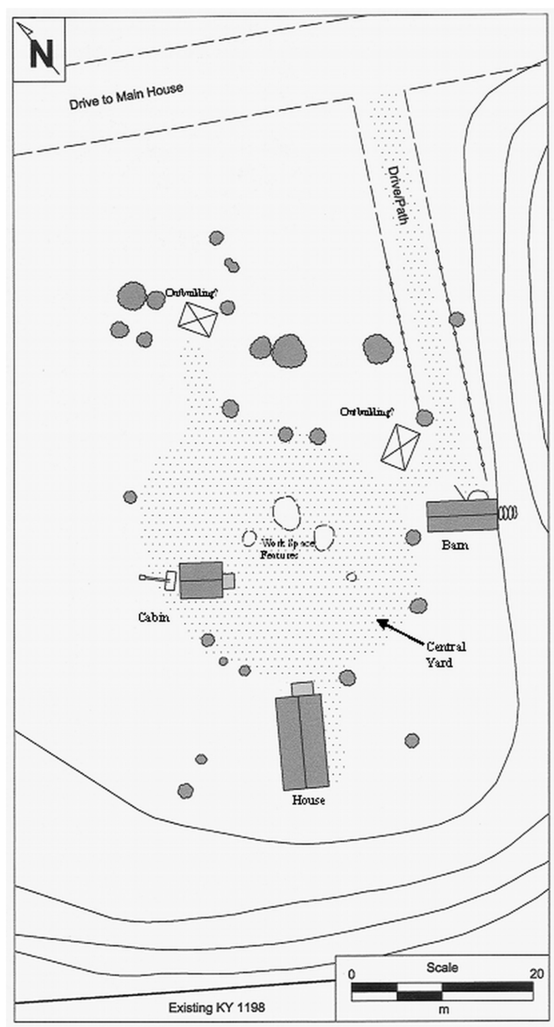

Figure 24. Reconstruction of the Excavated Portion of the Duckworth Farm Site.

Examined within the larger spatial context, however, the cabin, house, and barn are certainly separated from the main brick house on the hill above, screened from the approach to the main house by a line of trees, and situated on a more marginal portion of the property in a manner similar to some plantation layouts. During the short time that a few slaves were used on the 100-acre Duckworth farm, the cabin was probably closely and formally integrated with a well-organized portion of the farm that served as both a working and residential space. The landscape of this portion of the farm remained archaeologically visible, and was evident not only in the remains of the buildings, but in the posts, pits, and even the trees and bushes that could still be documented.

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PRELIMINARY ANALYSIS OF ARTIFACTS FROM THE OLD FRANKFORT CEMETERY (15FR154)

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ABSTRACT

In the absence of written materials, artifacts from the Old Frankfort Cemetery can help answer how old the graveyard is and who was buried in it. Overall, the artifacts from the cemetery date from 1830 to 1850 with a mean date of 1840. This date is supported by the presence of "mourner's" beads (popular from 1840-1920), cut nails (1830-1890), liberty dimes dated 1838 and 1840, and early swirl headed straight pins (pre 1824). Preliminary findings suggest the cemetery was used for an institutional population, working class families, and possibly a few middle class individuals. The majority of burials did not contain luxury items and contained buttons you would expect to find among a working class or institutional population. The two gold rings and silver shirt stud indicate some middle class burials may be contained within the cemetery.

INTRODUCTION

In the spring of 2002, the Old Frankfort Cemetery was rediscovered during construction of the new Kentucky Transportation Cabinet building. This project was a success in many ways, not the least of which was the removal of 272 identifiable individuals in advance of construction. Historic materials recovered can provide information as to when the cemetery was used, who was buried in the cemetery, and contribute to the growing scientific knowledge of early to mid nineteenth-century cemeteries.

Archival research into the Old Frankfort Cemetery indicates it was effectively removed from public memory and the landscape by the late nineteenth-century (Stahlgren and Stottman 2006). Only four direct references to the cemetery have been found. Samuel Haycraft (1860) wrote an article for the *Tri-Weekly Kentucky Yeoman* where he says 43 years earlier he had "walked through the graveyard and climbed the hill". Another writer, Bayless Hardin (n.d.), wrote in the twentieth-century that there was a prison cemetery during the nineteenth-century on the site of a workhouse on Ann Street in Frankfort. A third reference for the cemetery is printed in the form of Willard R. Jillson's (n.d.) map of family burial plots around Frankfort. The final archival source for the cemetery is a painting by a British prisoner during the War of 1812 that figures what could be interpreted as a cemetery in the background (n.d.). Despite the contradictory interpretations and lack of primary sources, it is speculated that the cemetery is one of the earliest burial grounds in Frankfort and that it was used to bury Frankfort's poorest people and families.

Preliminary results from the biological analysis of the remains also suggest the Old Frankfort Cemetery was used for low-income families. The combination of men, women, and children support the assertion that this was a family cemetery. Pathologies show the population was hard working and that they took care of each other with many surviving injury or sickness.

The analysis of the historic materials can provide, along with archival and biological data, a fuller view of who was buried at the cemetery, what choices were available for mid nineteenth-century burials in Frankfort, how do the cemetery inhabitants compare to each other and other known cemeteries, and what rituals were associated with internment. Preliminary findings from the artifacts are in accordance with the biological findings. In general, the individuals at the Old Frankfort Cemetery are modestly buried. Personal items are found equally between age, gender, and ethnicity, suggesting equal status among most of the individuals interred.

ARTIFACTS RECOVERED

The artifacts were divided into categories to facilitate inter and intra-site comparisons: personal artifacts associated with the person buried within the coffin, hardware artifacts associated with the coffin, and miscellaneous artifacts. Cultural materials associated with the person buried in the casket were further sorted into beads, buckles, buttons, a cartridge, ceramics, clothing samples, coins, a collar stud, eyeglasses, finger rings, glass, and straight pins. Artifacts associated with the coffin were further divided into classes including coffin plates, coffin handles, nails, screws, and tacks. Miscellaneous artifacts are mostly comprised of bricks and limestone slabs used for lining, and wire. After assignment into a function category, all artifacts were then counted, weighed, and in some cases measured and drawn.

For a more accurate representation of the materials recovered from the cemetery, the concept of minimum number of vessels or objects (MNV) was calculated by grouping together: ceramic sherds with similar paste, decoration, and shape; glass fragments with similar color, shape, and surface treatment; and clothing artifacts, such as pins or beads. For example, one broken bottle has a value of one rather than 20. Similarly, a pinhead fragment, a pin shaft fragment, and a pin point have a value of one rather than three.

A total of 8,332 historic artifacts, including hardware, personal, and miscellaneous artifacts, was recovered from 241 of the 272 burials (89 percent). Burials without hardware were either commingled individuals or those most heavily impacted by construction. It is more likely that all individuals were interred in coffins and that the few without hardware have been disturbed. Data from the historic materials recovered was used to address when the Old Frankfort Cemetery was used, who is buried in the cemetery based on the hardware and personal artifacts, and how can the investigation at Old Frankfort Cemetery contribute to what is known about early to mid nineteenth-century urban cemeteries.

PERSONAL ARTIFACTS

Perhaps the most intrinsically interesting artifacts recovered were the personal items: beads, buttons, coins, eyeglasses, rings, a shirt stud, and straight pins (Table 1). Personal artifacts make up only 14 percent of the assemblage but were found in 68 percent of all burials. In other words, personal artifacts were common but not found in large quantity.

Table 1. Inventory of Personal Artifacts.

Personal	N=
Beads	78
Buckles	2
Buttons	473
Cartridge	1
Ceramics	5
Coins	10
Collar Stud	1
Eyeglasses	1
Finger Rings	15
Glass	
Pins	577
Total	**1166**

Beads

Five types of beads were recovered: a black seed bead, a white glass bead, black mourner's beads, and red and blue glass beads that formed a necklace. Dating of the beads has proven difficult due to the variety of handmade beads and length of use, however, all beads were found associated with cut nails suggesting a broad date range of 1830-1890 (Nelson 1968). The black seed bead and white ceramic bead were recovered from infant burials of undetermined gender and ethnicity (Figures 1a and 1b). The black bead was found in the chest area of an infant aged 3-6 months (Burial 207) and the white bead in an unspecified location on an 18-20 month old infant (Burial 20). The three other bead types belong to two necklaces that were found with two separate individuals.

The first necklace is made from 13 black lozenge faceted beads measuring 21.8 x 8.2 mm, found in Burial 206 next to the skull of an approximately 60 year old female of mixed ethnicity (Figure 1c) (Table 1). These were identified as faux jet "mourner's" beads. Jet, a mineral mined in England, was the height of fashion from 1840 to 1920. The increase in jet bead shops in Whitby (a town in North Yorkshire, England) demonstrates the rise in popularity of these types of beads in the mid nineteenth-century.

In 1832, only two shops that traded in jet operated in Whitby. By 1872, the number rose to over 200 shops, in Whitby alone, dedicated to the sale of jet. The French copied many of the Whitby designs and made faux jet, also known as French jet or French glass (Coles and Budwig 1997:26-27). Jet jewelry became known as mourner's beads after Queen Victoria's husband Prince Albert's death in 1861. A year of mourning to be demonstrated by the wearing of black, among other customs, was instituted for all royal subjects. While the queen wore black the rest of her life, others continued to honor the prince by wearing jet jewelry.

The second necklace, made of alternating blue and red beads, was found in Burial 232 around the neck of a 9-12 year old; gender and ethnicity of the child were undetermined (Figures 1d and 1e). Sixty-three beads combined to make the necklace, 29 rounded red glass beads and an estimated 34 fluted or gadrooned blue glass beads. No diagnostic information was available for these types of beads. Other diagnostic artifacts associated with this necklace include nineteenth-century cut nails manufactured from 1830-1890 (Nelson 1968).

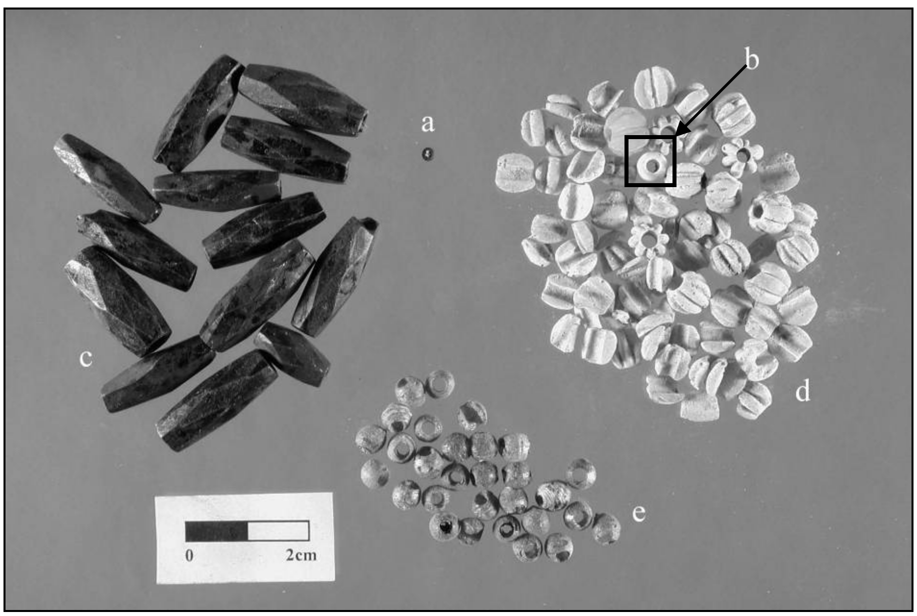

Figure 1. Beads Recovered from the Old Frankfort Cemetery (a. black seed bead; b. white ceramic bead; c. black "mourners" lozenge beads, d. blue gadrooned beads; e. red rounded beads).

Buckles

Two cinch buckles were recovered just above the pelvis from Burials 22 and 114. Placement of these buckles suggests they were used for vests or pants. Both buckle types were patented by Sheldon Hartshorn in 1854 and 1855, though the basic form of these buckles predates the patent (Patent as cited in Mainfort and Davidson 2006:158-160). Both individuals were young adult males, one was African-American and the other

European. Burial 22 contained several buttons, including a diagnostic calico Prosser button that indicates a post 1850 internment date.

Buttons

A total of 474 buttons made of bone, copper alloy, iron, porcelain, and shell were recovered from 75 burials (31 percent of burials with associated artifacts) (Figure 2). Using South's (1964:122) button typology from Brunswick Town, all buttons from the Old Frankfort Cemetery were commonly used from 1800 to 1865.

Bone

Over half (55.2 percent) of the buttons recovered from the Old Frankfort Cemetery are made from bone. In an attempt to imitate eighteenth-century ivory buttons, less expensive buttons were made from animal bones (Fink and Ditzler 1993:52). Bone buttons became the most common utilitarian button during the nineteenth-century (Hughes and Lester 1981:8). They were often hand-lathed and were made in one-holed (n=86) (Figure 2a), four-holed (n=27) (Figure 2b), and five-holed forms (n=99) (Figure 2c). The majority of bone buttons recovered from the cemetery were five-holed buttons, generally regarded as the oldest among the bone button types.

Shell

Shell buttons replaced bone buttons by the mid nineteenth-century as the primary utilitarian button for shirts and underwear (Epstein 1990:60). All 38 shell buttons from the Old Frankfort Cemetery feature four holes. Two buttons displayed etching on the surface. One features an etched oval (Figure 2d) and the other radiating incised lines (Figure 2e).

Porcelain

Porcelain buttons have been used since the eighteenth-century, but not until Richard Prosser patented machinery in 1840 were they machine made. Most Prosser buttons were white and 4-holed (Figure 2f), except a few transfer printed buttons also called calico buttons (Figure 2g). Jean Felix Bapterosse, who dominated the button market from the 1850s to the early twentieth-century, developed calico buttons in the 1850s. His company produced over 300 varieties of calico buttons (Epstein and Safro 2001:74). A total of 21 ceramic buttons, all identified as Prosser buttons, were recovered from seven different burials. Five of the Prosser buttons are calico buttons that feature a black transfer printed pattern.

Metal

A variety of metal buttons were recovered (n=151). Most were flat cast brass disks with an eye on the back. These buttons, known as utility or coin buttons, featured no designs on the face and were commonly used as trouser or vest buttons (Figure 2h)

(Adams-Graf 2000:196). Some fabric was detected on the surface of the buttons and will be further analyzed. Only one button featured markings on the back (Figure 3). While individual letters are decipherable, the words could not be determined, thus no other information about the button can be derived.

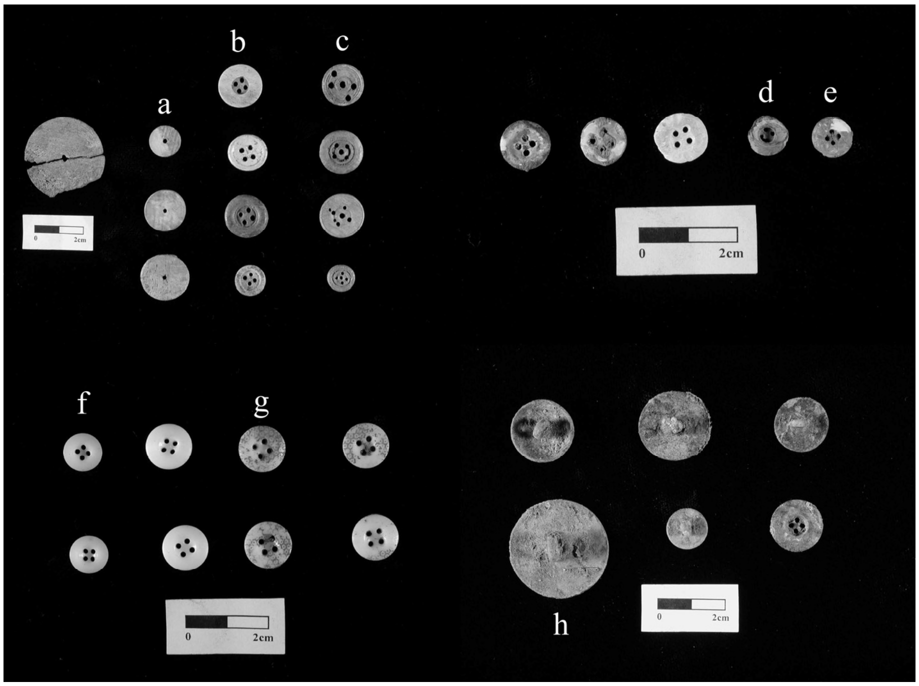

Figure 2. Sampling of Buttons (a. 1-holed bone; b. 4-holed bone; c. 5-holed bone; d. shell with oval pattern; e. shell with incised lines; f. small Prosser; g. transfer printed prosser; h. metal disk).

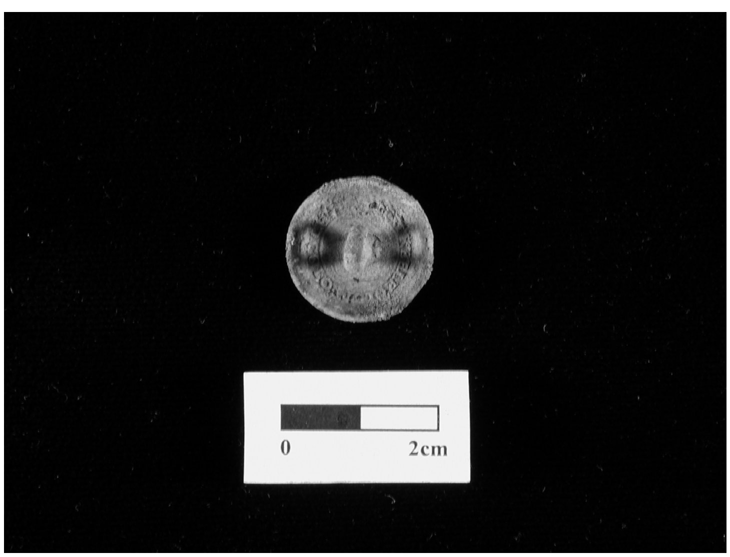

Figure 3. Button Featuring Writing on the Back.

The placement of some buttons was specified in the field notes allowing for a spatial analysis of buttons within the burials (Table 2). Buttons were generally found in the pelvis region, possibly used for men's pants and women's skirt fasteners (females=6, males =29, unspecified=7). Of the seven buttons found near the legs, all but one belongs to a male burial suggesting use in pants. Four of the seven buttons were found at the knee, suggesting knickers or short pants. All but one of the males buried wearing pants, suggested by leg region buttons, were 50+ years old.

Table 2. Buttons Recovered from the Old Frankfort Cemetery.

	N=	Legs*	Pelvis*	Torso*	Skull*
Ceramic					
Prosser, Calico	5			1	
Prosser, White	16				1
Metal					
Copper Alloy, Coin	131	3	11	4	
Copper Alloy, 4-holed	10				
Copper Alloy, 5-holed	1				
Iron, Coin	7				
Iron, 4-holed	2				
Organic					
Bone, 1-holed	117	2	11	11	2
Bone, 4-holed	27		6	2	1
Bone, 5-holed	115	2	10	5	1
Bone, Unspecified	5		2	1	1
Shell, 4-holed	37		2	1	
Total	**473**	**7**	**42**	**24**	**5**

*Denotes number of burials with button placement specified in excavation notes. Does not represent total number of buttons by region nor total burials with buttons.

Cartridge

A single 0.48-caliber rimfire cartridge was recovered in two segments alongside a 50-59 year old African-American female (Burial 37). The tip was intact, indicating the bullet was never fired. While the burial had been impacted by historic and modern construction, the bullet appears to be within the burial container and laid next to the articulated right humorous. The placement implies that the bullet was placed by another person, perhaps a mourner, before burial. No headstamp was featured on the cartridge. Rimfire cartridges began mass production between 1856 and 1858 (Barnes 1972:69 and 217).

Coins/Metal Disks

During the nineteenth-century, coins were often placed over decedents eyes at the time of death. According to Puckett (1926), this was done to keep the eyes of the deceased closed in preparation for burial. Coins were occasionally placed in the ears as well to keep the haunts and ghosts out (Parler 1962). A total of nine coins or metal disks were recovered from five burials at the Old Frankfort Cemetery. With one exception (Burial 41), the coins were found in pairs in or near the skull. Two sets of coins were found inside the ocular cavities of two separate individuals (Burials 39 and 199). Other coins were found associated with crushed skulls, therefore may have been placed over the eyes (Burials 67 and 77). A fraction of a coin was found in Burial 41; due to disturbance to the burial the precise provenience is not known.

Coins from the Old Frankfort Cemetery included two silver Liberty dimes, two brass coins, two lead disks, and three unidentified metal disks (Figures 4 and 5). The two Liberty dimes date to 1838 and 1840 (Burial 77). Liberty dimes have been documented at other cemeteries as charms that were worn during life. No perforation holes or marks were found on the Frankfort dimes, but they are an important marker for dating the cemetery (Figure 5). Coins were found in both male and female burials ranging from 25 to over 60 years of age. The two brass coins were unidentified for monetary amount. The remaining five specimens may be more accurately labeled disks as absence of embossing or shape did not resemble that of known coins, such as the two octagonal lead disks recovered near the skull of Burial 67.

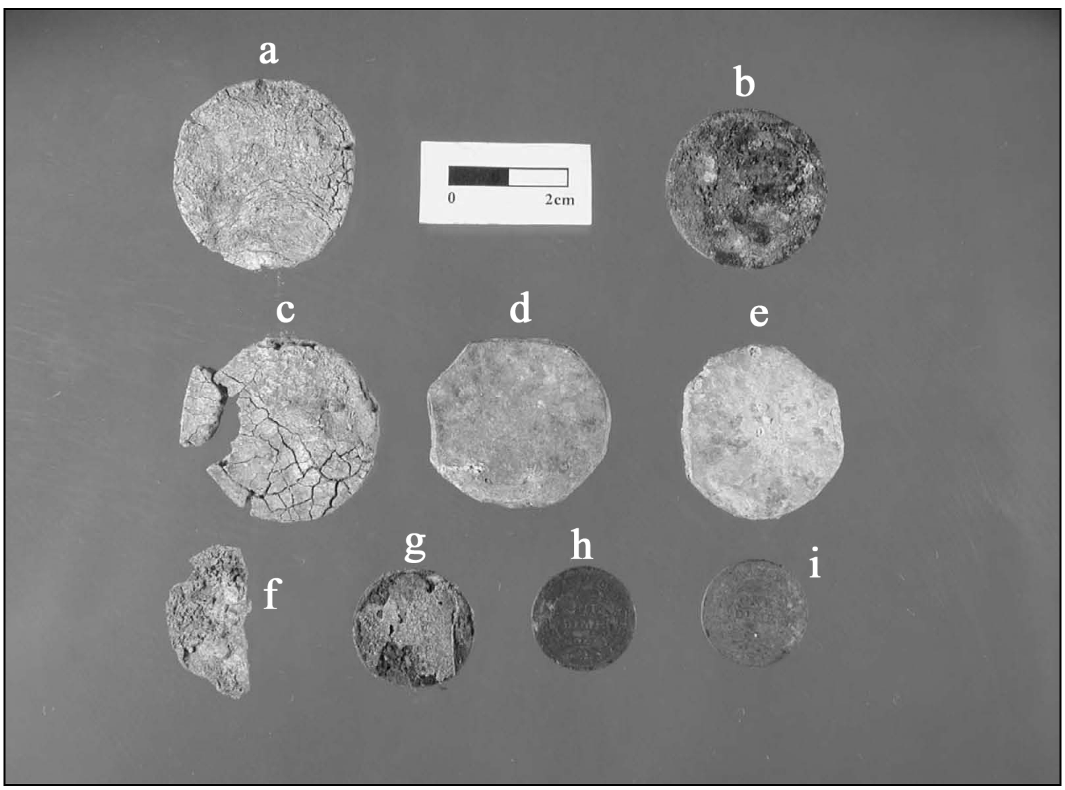

Figure 4. Coins/Disks recovered from the Old Frankfort Cemetery (a. unidentified metal disk; b. brass coin; c. unidentified metal disk; d. octagonal lead disk; e. octagonal lead disk; f. unidentified metal disk fragment; g. brass coin; h. silver Liberty dime; i. silver Liberty dime).

Figure 5. Liberty Dimes Recovered from the Old Frankfort Cemetery.

<u>Collar Stud</u>

A unique silver shirt stud was found in Burial 175 (Figure 6). The burial belonged to a 35-45 year old female of mixed ethnicity where the stud was found below the jaw. This placement suggests its use as a top button shirt stud. Associated artifacts include nineteenth-century cut nails and brass tacks that were used before the 1860s (Little, et al. 1992).

Figure 6. Collar Stud Recovered from the Old Frankfort Cemetery (Burial 175).

Eyeglasses

A pair of eyeglasses was recovered from Burial 194 (Figure 7). This individual was identified from the skeletal remains to be a European male 60+ years of age. The glasses were located next to the ribs suggesting they were placed along side the body, possibly in a jacket pocket.

The eyeglasses were analyzed for manufacture, date, and socioeconomic considerations. Wallace Williams, a local optician, identified the lens and temple types. The lenses are handmade flat flint glass. He believes these lenses predate the grind and polish methods used today in manufacturing lenses. Using calipers, the lenses measured 1.7 mm thick in the center and 1.2 mm thick along the edges, indicative of magnification for reading glasses. He estimated the lenses contained 0.75 percent dioptic power, a very low powered correction.

Figure 7. Eyeglasses Recovered from the Old Frankfort Cemetery.

The edges of the lenses were not polished as they are today, but appeared to be chipped to make the oval shape that fit into the frames. The temples of the glasses (the part worn over the ears) were extendible and designed to hinge. More common extendable glasses have temples that will slip to extend. The glasses recovered from the Old Frankfort Cemetery feature hinged extendable legs that would fold out the temple extensions. String was often threaded through holes, such as those found at the end of the temples, to keep the glasses around the neck when not in use. The heavy brass used for the frames is uncharacteristic; lighter frames of the period were often made with silver, gold, or tortoise shell frames. According to Williams, the glasses were most likely not manufactured in the United States and were brought over from Europe, either England or Germany.

The glasses are similar to styles with extendable legs made in Germany and England ca. 1800 (Del Vecchio n.d.). The bridge style, heavier metal framing, flat flint glass, and hinged temple extensions are constant with a late eighteenth- to early nineteenth-century manufacture date. Artifacts of later manufacture, such as cut nails, bone and copper buttons, were also found with this individual and suggest the burial post dates the glasses by 30-60 years.

The eyeglasses may have served as a more powerful status symbol than as a reading aid. Williams noted that the correction is very slight. During the nineteenth-century, eyeglasses served as a status symbol (Del Vecchio n.d). Aristocrats would even wear clear glass in the frames for the sake of just wearing them. Williams remarked that the power of the lenses is so small that they would not have benefited an older person, but a younger one. He also confirmed that not many individuals would have had glasses in the nineteenth-century and that once issued a pair, the wearer may keep one set for their entire life. In fact, due to the expense of eyeglasses the working class could often only afford one set of spectacles, and they would be handed down from father to son (Del Vecchio n.d.). This may explain why the glasses appear to have been made much earlier than the body was interred.

Together with the biological data a fuller picture of the eyeglasses' owner emerges. Based on the human remains, a 60+ year old male of European descent owned the glasses. He may have purchased the glasses in England or Germany and immigrated to America, or purchased them in the United States after they had been shipped from abroad. He was likely fitted for the reading glasses as a younger man and kept the pair into his old age. The glasses were buried with him when he died, in the breast pocket of his coat.

Finger Rings

A variety of rings were collected from 14 different burials, most of which have been identified as finger rings (Figure 8). Two of the fourteen rings were made from gold, the rest made of a copper alloy, most likely brass. The two gold rings featured intricate floral incising on the outside of the band (Figure 9c). They were associated with two separate adult African-American female burials (Burials 49 and 175). Another ring featured gold plating and was found in the burial of a juvenile of undetermined gender and ethnicity (Figure 9b) (Burial 59). This ring had incised lines decorating the band of the ring with a flattened face. Two other bands featured diamond shaped cut outs on the front of the band (Figure 9a) (Burials 11 and 232). One small ringlet from Burial 108 may be associated with clothing. This ring may have been used as an infant's ring, however analysis of the human remains from Burial 108 indicates an individual 60+ years in age was buried at this location. The rest were plain brass bands. Rings were found on both the right and left "ring" finger of both men and women (Table 3). Generally, men wear sizes 9-12, women's range from 5-9, and children ring sizes start at 4.

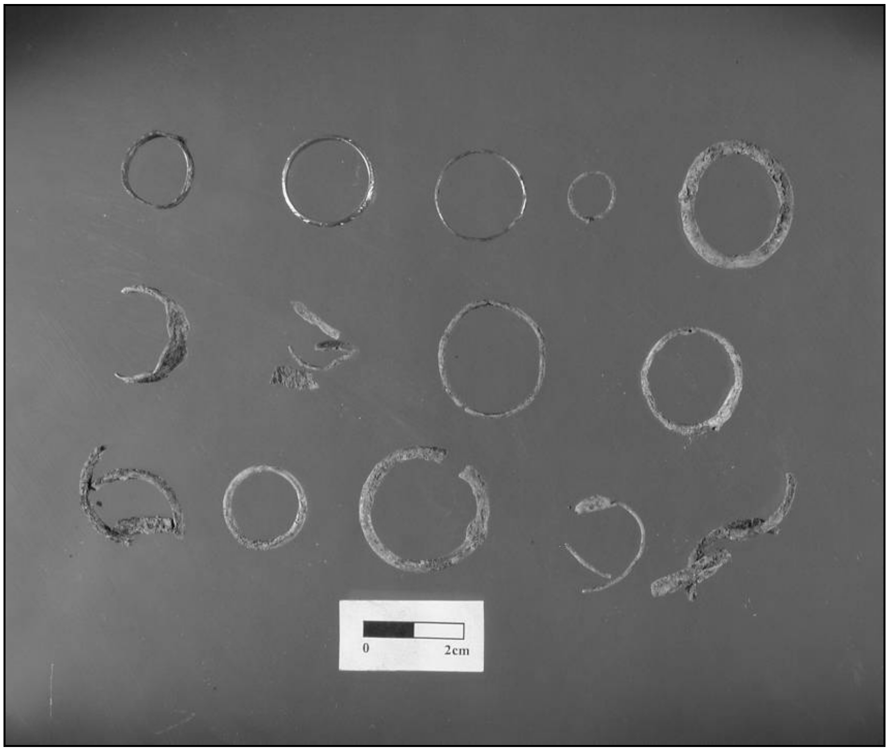

Figure 8. Rings Recovered from the Old Frankfort Cemetery.

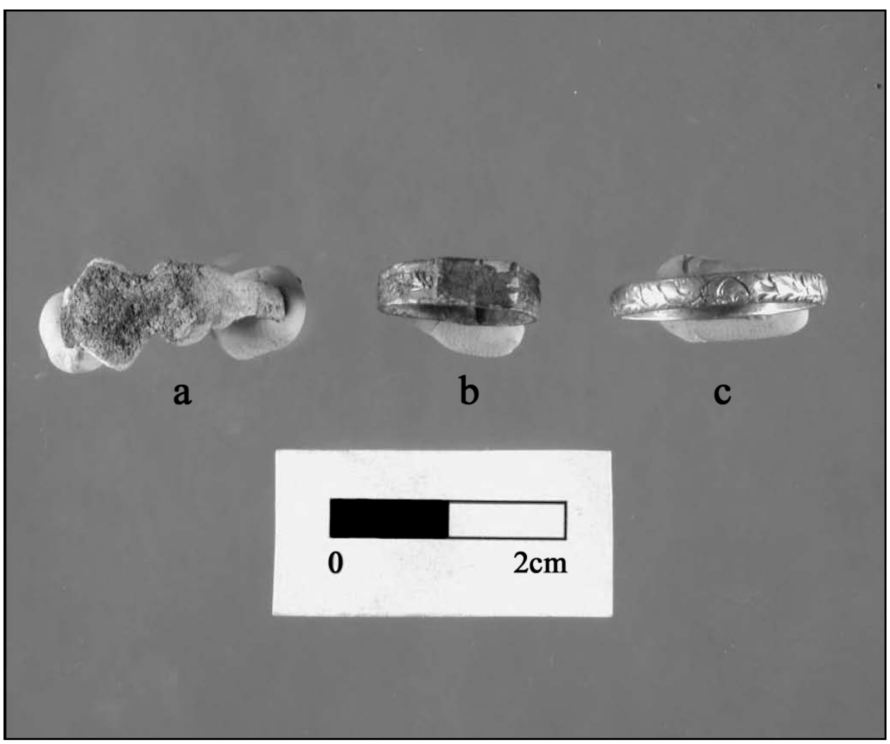

Figure 9. Close-up View of Select Finger Rings (a. diamond shape façade, b. gold-plated ring with flat façade, c. gold rings featuring floral incising.)

Table 3. Rings Recovered from the Old Frankfort Cemetery.

Burial	Description	Diameter (mm)	Size	Ethnicity/Gender/Age	Placement (R/L)
11	Brass Diamond Shape	17.7	7½	African-American /Male /30-34	L
21	Brass Oval	22.5	13	European /* /40-45	*
35A	Brass	19.1	9 1/8	African-American/ Female/ 50-59	R
38	Brass Ringlet	8.2	>0	African-American /Male /35-39	*
49	Gold	17.5	7 ¼	African-American /Female /30-40	L
59	Gold Plated	16.7	6 ¼	* /*/ Juvenile	L
91	Brass	13.3	2 ¼	* /* /7-11	R
94	Brass	20.7	11	*/ */ *	*
108	UID White Metal	13.3	2 ¼	African-American/Male/60+	L
120	Brass	*	*	African-American /Male/ 60+	*
175	Gold Incised	17.1	6 ¾	Mixed/Female /35-45	*
193	Brass	19.8	10	African-American/Male/35-39	L
200	Brass	17.5	7 ¼	African-American /Female /60+	R
232	Brass Diamond Shape	14.7	4	*/Female/9-15	R

*Undetermined

Pins

Most of the pins were classified as brass straight pins (n=534) though some iron pins also were found (n=43). A total of 534 straight pin fragments estimated to represent a minimum of 373 individual pins were recovered from 112 burials. Pins were found among a range of ages, appear nearly equal among males and females, and occur among all ethnic groups. Pins were predominantly found at the head and feet of the different individuals, suggesting they were pinned to a burial shroud (Table 4).

The pins exhibit a great deal of variety in length, shaft width, and head type. Most of these dimensions are not diagnostic, except for swirl headed pins. This type has been found on colonial sites and was used until 1832 and the advent of a one-piece pin producing machine (Lubar 1987). Twenty-two individuals were buried the swirl headed pins (Figure 10).

Table 4. Burials with Straight Pins by Location*.

	Feet	Legs	Pelvis	Torso	Skull
Straight Pin	11	5	6	20	40

*Denotes number of burials with button placement specified in excavation notes. Does not represent total number of buttons by region nor total burials with buttons.

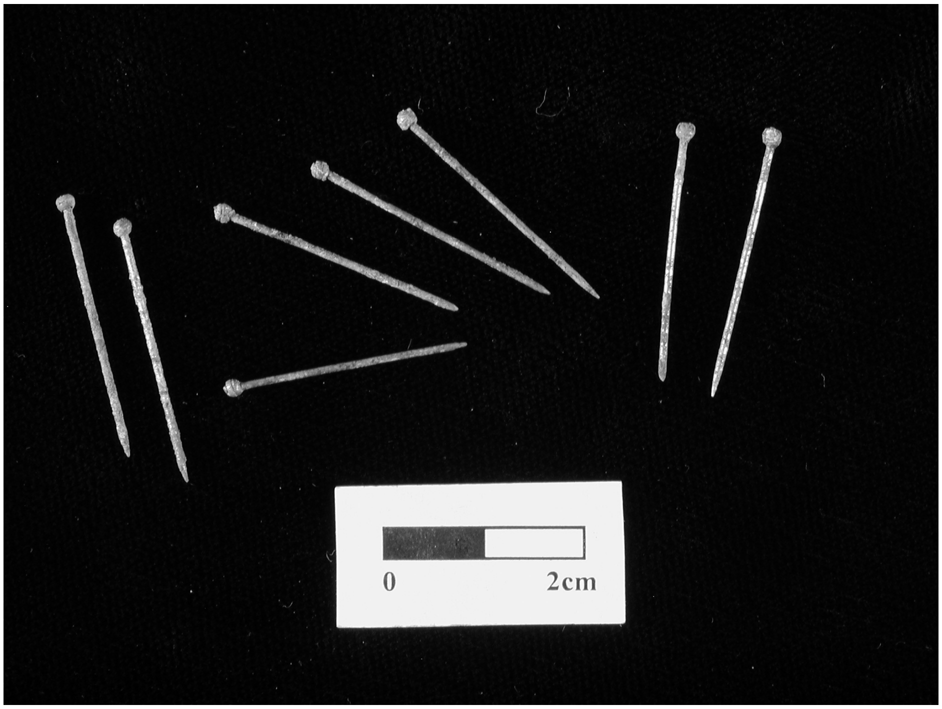

Figure 10. Straight Pins with Swirl Heads.

<u>Other</u>

Ceramics (a whiteware rim, a white stoneware bottle sherd, and a mulberry transfer printed whiteware body sherd) and container glass (aqua, blue tinted, and clear fragments) were found at the Old Frankfort Cemetery in a total of six burials. There is evidence at other cemeteries for nineteenth-century burials with glass and ceramics placed as surface decoration (Davidson 1999; Jamieson 1995:50-51). Of the three burials with associated ceramics at the Old Frankfort Cemetery, one was identified as an older African-American of undetermined gender, while the ethnicity and gender could not be determined for the others. Similarly, container glass fragments were recovered from one burial of a 50+ year old African-American male, but the ethnicity and gender of the other two burials could not be determined. However, this area has been greatly disturbed by the construction of the Luscher Brewery in 1860 and subsequent building episodes up to the twenty-first-century. While there is some evidence that these materials were found within the burial matrix, interpretations are limited due to the disturbed nature of the site.

COFFIN HARDWARE

All of the burials with associated artifacts contained coffin hardware. Of all the artifacts recovered, most (86 percent) were assigned to the coffin hardware group. These included a decorative coffin plate (n=1), handles (n=14), nails (n=5,868), screws (n=191), a spike, straps (n=3), tacks (lining) (n=566), tacks (unspecified) (n=57), and wire (n=2) (Table 5).

Table 5. Inventory of Hardware from the Old Frankfort Cemetery.

Hardware	N=	Weight (g)
Coffin Plate	77*	96.1
Handles	14	567.2
Misc. Hardware	390	1476.3
Nails	5868	20,420.0
Screws	191	1409.9
Spike	2	28.5
Strap	3	22.2
Tack, Lining	566	473.6
Tack, Unspecified	57	17.6
Wire	2	2.0
Total	**7,170**	**24,045.4**

*MNV= 1

Decorative Plate

One decorative cast iron plate was recovered with wood still affixed to the back. The plate, broken into fragments (n=77/ 96.1 g), was found with the burial of a 25-30 year old mixed ethnicity female (Burial 39).

Handles

A total of 14 handles representing three different styles (Figures 11a, 11b, 12, and Table 6) were found associated with four different burials. Two types feature swing bail handles and are made of brass (Figure 11a). Type A featured a molded "HJ" at the apex of the handle and featured a molded grape pattern on the face of the handle. Burials 35, 35A, 35B, and 35C were found in a cluster together in the field. The burials were mapped and photographed separately in the field. Burials 35 and 35B probably represent secondary burials, whereas Burials 35A and 35C represent later intrusive burials that were buried side by side. The handles are likely associated with the two later interred burials. Burial 180 also contained swing bail handles that had elongated faces (Figure 11b). Type C is a heavy handle attachment and was found with Burial 46 (Figure 12).

Swing bail handles similar to these are documented in national catalogs beginning in 1860 (Trinkley and Hacker-Norton 1984:7, 11-12). The simple style handles recovered from the cemetery may have been made earlier by local furniture makers. Handles were placed along the side of the coffin for carrying. Adult caskets typically have three handles on each side and infant caskets have two on each side (McKillop 1995). Except for these handles, the cemetery lacked mass-produced funerary hardware. This absence is expected at cemeteries that predate 1960 and the advent of inexpensive, mass-produced coffin hardware.

The amount of handles can help distinguish between adult and child graves (McKillop 1995:84). At the St. Thomas Anglican Churchyard children's graves had four handles and adults had five or six present. At the Old Frankfort Cemetery, all handles were associated with adult graves. Five handles were present in two of the burials, and three at another. In the case of the three, the other handles for the adult casket were most likely disturbed by construction activities after internment.

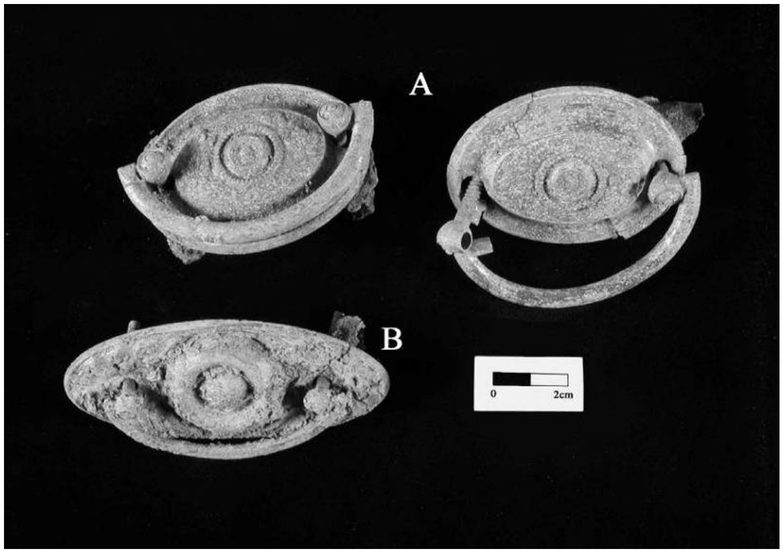

Figure 11. Type A and Type B Swing Bail Handles.

Figure 12. Handle Attachment from Burial 46.

Table 6. Handle Dimensions from the Old Frankfort Cemetery.

Style	Burial	Age/Gender/Ethnicity	N=	Length (mm)	Width (mm)	Weight (g)
A	35B	Adult/Male/*	5	65.5	50.5	41.0
A	35C	Adult/*/*	3	65.2	47.3	46.5
B	180	Adult/Male/European	5	90.7	40.8	105.8
C	46	Child/*/*	1	91.1	62.5	300+

* Undetermined

Nails

Most of the hardware used to make the coffins consisted of late cut nails, manufactured and widely used from 1830 and 1890 (Table 7 and Figure 13a) (Nelson 1968). Wrought nails (n=65) and early cut nails (n=24) also were recovered (Figure 13b).

Some crossed cut nails were identified. These nails were likely used on corners of wood coffins where the edges meet (Figure 13c). The wood has rotted away and the nails have concreted together. The angle of some crossed nails measured 90-degrees, which suggests a four-sided casket construction with perpendicular angles. Other crossed nails displayed a wider, approximately 110-degree angle, which suggests hexagonal casket construction and obtuse angles. Hexagonal coffins were the norm in the United States from 1700 to the mid nineteenth-century when the four-sided form was introduced (Habenstein and Lamers 1955:270-271).

Table 7. Nails Recovered from the Old Frankfort Cemetery.

Hardware	Whole		Fragments	
	N=	Weight (g)	N=	Weight (g)
Cut Nails, Early	0	0.0	24	70.2
Cut Nails, Late	1539	7861.4	3875	10901.4
Square Nails	50	236.9	237	746.8
Wrought Nails	32	232.8	33	157.4
UID Nails	6	40.4	64	172.7
Total	**1627**	**8371.5**	**4233**	**12048.5**

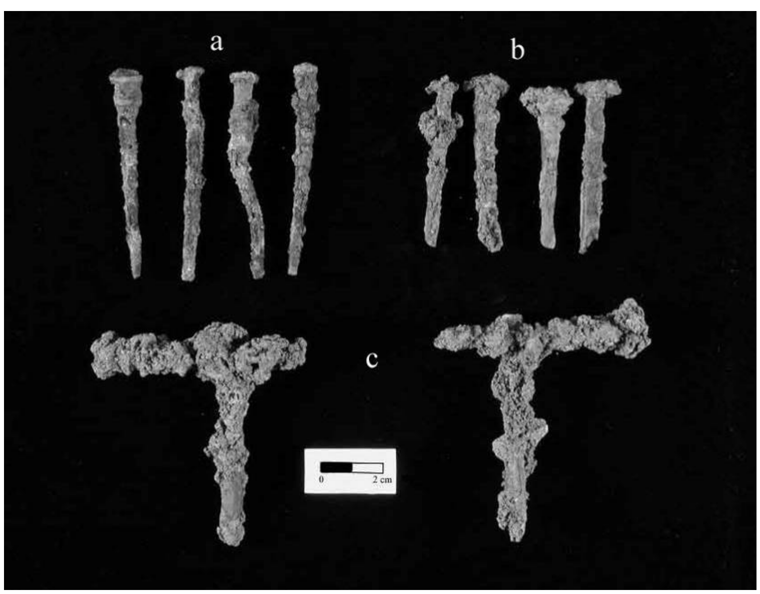

Figure 13. Cut, Wrought, and Crossed Nails from the Old Frankfort Cemetery (a. Machine-Cut Late Nails, b. Wrought Iron Nails, c. Machine-Cut Late Nails Crossed at 90 Degrees).

Preservation of the hardware was not ideal. Much of the hardware was unidentifiable due to degree of corrosion and degradation. These materials were assigned as miscellaneous hardware with a comment as to the metal's condition. The identification of nails also was hindered by the corrosion. No wire nails were observed at the cemetery except for two round spikes. Nails that were square in shaft but lacked head or point traits necessary for identification were assigned as square nails, which includes wrought, early cut, and late cut categories.

Screws

Utilitarian screws were recovered (n=191). Most of the screws were identified by the head or threaded fragments. Few screws with intact points were recovered, and those that were identified exhibited blunt ends. The screws are most likely wood screws with flat (n=68), rounded (n=12), or unidentified (n=111) head types. No decorative screws with special caps were recovered. This absence suggests these burial were interred before the increase in manufacture and distribution of white metal alloy decorative screws.

Tacks

Some of the tacks featured fabric under the heads, suggesting they were used as lining tacks (Figure 14). This use of tacks has been documented in Virginia as occurring between the 1830s and 1840s (Little, et al. 1992). In other instances, tacks have been used on the exterior of the coffin for decoration before the advent of mass-produced decorative hardware in the 1860s. At St. Thomas Anglican Churchyard, another nineteenth-century cemetery, tacks were used on the coffin lid to spell out a person's initials and age at death (McKillop 1995:79, 83). At St. Thomas where headstones and church records provided burial dates, the coffins with the brass tacks all predated 1860. Such may be the case in some of the Old Frankfort Cemetery burials where a large amount of tacks were recovered. Tacks were found associated with late cut nails, suggesting an 1830-1890 date range for the tacks by association (Nelson 1968).

Figure 14. Copper Lining Tacks with Wood Attached.

Wire

A few wire fragments were found mixed in with some burials. The wire could be related to construction after the lot was used as a cemetery. If the wire is contemporaneous with the burials, then the wire could indicate a cemetery boundary.

DISCUSSION

In the absence of written materials, artifacts from the Old Frankfort Cemetery can help answer how old the graveyard is and who was buried in it. The final analysis aims to address: internment dates for the individuals based on diagnostic artifact data; consumerism; socioeconomic variation; and burial rituals practiced in the early to mid nineteenth-century. Interpretations offered in this section and will be more fully addressed in the final report.

CHRONOLOGY

Individuals from the Old Frankfort Cemetery were generally interred from 1815 to 1860 based on the artifact analysis. The earliest artifacts are the potentially late eighteenth-century eyeglasses, swirl headed straight pins, and wrought nails. Most of the artifacts were commonly used from the early to mid nineteenth-century, including the "mourner's" beads, cut nails, 5-hole bone buttons, and the Liberty dimes (Table 8). Both pre-1850 hexagonal and post-1850 four-sided coffin shapes are present. No evidence of the beautification of death was recovered, usually suggested by the presence of mass-produced hardware. The end of the cemetery use, based on the artifacts, corresponds well with the construction of the Luscher brewery in 1860.

Table 8. Diagnostic Artifacts Recovered from the Old Frankfort Cemetery.

Object	Date Range	Reference
Wrought Nails	Pre 1830	Nelson 1968
Eyeglasses	Ca. 1800	Del Vecchio n.d.
Swirl Headed Pins	Pre 1830	Lubar 1987
5-holed bone button	1800-1850	South 1964:122
Early Cut Nails	1815-1830	Nelson 1968
Late Cut Nails	1830-1890	Nelson 1968
Liberty Dimes	1838, 1840	Printed on Coins
Mourner's Beads	1840-1920	Coles and Budwig 1997:26-27
Lining Tacks	Pre 1860	Little, et al. 1992
Hexagonal Coffin Shape	1700-ca. 1850	Habenstein and Lamers 1955:270-271
Four-sided Coffin Shape	1850-Present	Habenstein and Lamers 1955:270-271

CONSUMERISM

Cost indexing of coffins is a new avenue of inquiry in Kentucky. The Old Frankfort Cemetery artifact analysis provides an opportunity to examine the availability of coffin materials in Frankfort during the early to mid-nineteenth centuries. Variation in coffin construction can suggest different coffin makers working in the Frankfort area during the nineteenth-century and may shed light on the range in quality of construction.

Archival research has begun with checking old city directories, histories of other Frankfort cemeteries, newspapers, cemetery files, and county files for information on local blacksmiths and related businesses. The best resource thus far has been local historian Nettie Henry Glenn's *Early Frankfort, Kentucky 1786-1861* (1986:25-26, 170, 205-207). She references allowances paid by the Frankfort city government to undertakers for burial of the poor in the mid nineteenth-century (1986:207):

> In addition to supplying the bare necessities of life to the living, the town was responsible for burying its pauper dead:
>
> 1853- An allowance to James W. Haley of $6.00 for making coffin and hiring hearse for Mrs. Reed.
>
> Dec 1853- allowances made:
> To Carmichael for digging grave for pauper in South Frankfort $2.00.
> Mrs. Curdy received a load of wood by order of (__) [sic].
> Hord making a coffin for pauper in South Frankfort $5.00.
>
> April 1, 1854- Mrs. Hale, for taking care of Read's child and one other $10.00.
> Carmichael for digging a grave for a black, Ateck??? [sic] $2.00.
> Cost of buying same $0.30.
> John D. Rake, for coffin $5.00.
> John Rake was also paid for building a coffin for Mrs. Bowen $5.00.
> Hearse and stage hire to Steele $4.00.
> Herndon's bill for a shroud $3.10.
> (Mrs. Bowen's burial expenses to be charged to 8th ward.)

This excerpt demonstrates the process and cost of burial in Frankfort during the mid nineteenth-century. It lists the cost of making a coffin ($5), digging a burial shaft ($2-5), burial shroud ($3.10), and hearse and stage hire ($4). Glenn further states that 1850 is a decade of unprecedented pauperism in Frankfort due to initial settlers getting older, cholera epidemics, and widows without means. Responsibility for the dead may have often fallen on the city's shoulders.

Newspaper advertisements from Frankfort during the 1840s revealed at least three different hardware businesses and two cabinet/hearse makers. *The Frankfort Commonwealth* (1843:4) listed Edward S. Handy & Co., Lockwood & Lindsey, and the George Q. Gwin & Co. as providers of nails and other assorted iron hardware. The same page lists John P. Cammack as a cabinetmaker located on Main Street in Frankfort. In his advertisement it states "he gives notice, also, that he has lately procured a NEW

HEARSE, and will attend strictly to all Funeral calls, night or day, either in town or in the country." Another newspaper, *The Yeoman* (1848), featured an advertisement for "Hearse/John D. Rake." The advertisement goes on to state that Mr. Rake will be "ready at all times to attend funerals – he will also make coffins and furnish all articles necessary at internments – he will be thankful for any call in this line of his business." Mr. Rake is mentioned above in Glenn's excerpt, as is Carmichael. Carmichael is a Scotsman and was the master gardener who designed and laid out the grounds of the later Frankfort Cemetery that was incorporated in 1844 (Glenn 1986:170).

From the archaeological record, variation of coffin construction is recognized in the range of pennyweights of nails. A wide range of weights suggests that not all coffins were constructed the same (Table 9). It may be possible to further associate those with a higher socioeconomic status with a certain kind of construction by examining what hardware was associated with higher status individuals. This pennyweight data would be interesting to compare with rural vs. urban burials and intra-site comparison between interred individuals. Continued archival research may assist in characterizing readership of different newspapers to see what services were advertised to different sects of the public. Other sources on available businesses and cost will continue to examine consumer choice in burial practices in Frankfort in the mid nineteenth-century.

Table 9. Pennyweights of Whole Nails Recovered from the Old Frankfort Cemetery.

Size	N=
2d	87
3d	212
4d	181
5d	123
6d	95
7d	350
8d	245
9d	134
10d	55
12d	30
16d	3

SOCIOECONOMIC STATUS

Socioeconomic status may be best understood by an intra-site comparison of the materials recovered by age, gender, and ethnic assignments of the individuals. So far, few patterns have emerged, suggesting that for the most part people were of similar socio-economic backgrounds, with a few individuals of higher status. All types of artifacts have been examined by age, gender, and ethnicity. The only discernable pattern to emerge is that the majority of bone buttons came from male burials, particularly in the case of 1-holed buttons where 14 were assigned to male burials and only one button identified among the female burials. Since there is no record of the individuals buried in the cemetery, it remains unknown what this population had in common. The more variation in clothing, personal items, and coffin construction, the more variation the population may have had in terms of socioeconomic status, age, gender, or ethnicity. In general, however, the majority of the people are buried in a similar manner, suggesting that the population shared many similar traits.

CROSS COMPARISON

Part of the justification for studying the Old Frankfort Cemetery so closely was to use it as a model for understanding other early to mid nineteenth-century cemeteries. Reporting of cemetery excavation is important for adding to the archaeological record and has anthropologic value (Little, et al. 1992:415). It has been difficult thus far to cross compare cemeteries because they are often treated methodically different based on type of project, temporal assignment, and condition of remains. The more uniform the presentation of findings, the more comparable cemeteries will become and the more patterns that will be discernable. Future studies of historical-period practices allow archaeologists to test assumptions (Little, et al. 1992:398).

Comparisons with other cemetery assemblages have helped determine that this is one of the earliest excavated cemeteries in the state, if not the greater region. Few historic cemeteries have been excavated in Kentucky to date and no results have yet been published.

BURIAL RITUAL

Understanding the actual burial ritual of the early to mid nineteenth-century is as important as studying the artifacts themselves. In all cases at the Frankfort Cemetery, individuals were buried in wooden coffins. Based on the straight pin and button data, most people were buried in shrouds. Some were buried in clothes, and a smaller few buried wearing clothes in a shroud. The absence of hinges and viewing glass indicates no open caskets and may indicate decreased ritual activity surrounding these burials. One of the best indicators of ritual at the cemetery is the use of coins found in a few individuals' eyes. Since the individuals did not die with these coins in their sockets, this suggests the ritual has meaning to others present at the burial who placed the coins purposefully. Continued research into nineteenth-century burial practices may provide more artifactual markers for ritualized behavior in the treatment of the dead.

CONCLUSION

The Old Frankfort Cemetery was associated with early to mid nineteenth-century poor or working class families in Frankfort, Kentucky (King-Wetzel 2007). There are no artifacts to indicate great wealth. Personal items were common but not found in abundance. The majority of burials did not contain luxury items and contained buttons one would expect to find among a working class population. The two gold rings, eyeglasses, and silver shirt stud indicate a very small number of middle class individuals may have been interred within the cemetery. The people were buried in shrouds or in their clothes, and in a few instances people wore both. Everyone was buried in wood coffins using simple utilitarian hardware, except for the four individuals where handles were found. In some cases coins were placed over the eyes indicating a burial ritual took place for the sake of those still living. Differences in nails and historical advertisements may demonstrate a choice in coffin manufacture during the mid nineteenth-century in Frankfort. The examination of the historic materials from the Old Frankfort Cemetery provided insights into when the individuals were buried, what the inhabitants had in common, and the treatment of the dead during the mid nineteenth-century. Future cemetery studies should continue inter- and intra-site comparisons to further understand past people's life, death, and role in society.

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ANALYSIS OF ENAMEL HYPOPLASIAS IN THE OLD FRANKFORT CEMETERY: COMPARISONS BETWEEN ADULT MALE AND FEMALE AND JUVENILE PREVALENCE AND AGE AT ONSET OF DEFECTS

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ABSTRACT

Enamel hypoplasias are presented for 61 adult male, 47 adult female, and 39 individuals represented by deciduous dentition from the Old Frankfort Cemetery. The age at onset of enamel hypoplasias was calculated for all individuals by measuring the location of the defects on maxillary and mandibular incisors and canines. These measurements were then placed in regression equations formulated to calculate the age of onset of the defect for each particular group. The regression equations were developed based on the chronology of Massler, et al. (1941) and Goodman and Rose (1990, 1991).

The chronological distribution of enamel hypoplasias represented by individuals in the Old Frankfort Cemetery is similar to that found in previous studies, with hypoplasias most frequently occurring between the ages of 2.0 and 4.0 years of age. The frequency of individuals affected is high with 97.5 percent of the adult individuals and 67 percent of the juveniles showing one or more defect.

INTRODUCTION

The Old Frankfort Cemetery was rediscovered during construction of the new KYTC Office building in downtown Frankfort, Kentucky. In the Spring of 2002 archaeologists from the Kentucky Archaeological Survey recovered 272 individuals from the site. Based on archival research and the age of the buildings that were constructed on top of the Old Frankfort Cemetery after it fell into disuse, the Old Frankfort Cemetery dates to between 1800 and 1860 (Stahlgren and Stottman 2006). Coffin hardware and artifacts recovered during the excavation of the burials support this date range (Miller 2007).

The types of grave goods recovered, the style of coffins, and the supporting skeletal and dental evidence indicate that the Old Frankfort Cemetery served the lower class residents of the city of Frankfort. The demographic profile obtained from the skeletal and dental analysis indicates the people interred at the Old Frankfort Cemetery were a mixed group of African Americans, Native Americans, and Europeans. A total of 272 graves were discovered in the cemetery. About 34 percent of these burials were juvenile skeletons. The adult population was pretty evenly spread between males and females. The skeletal and dental analysis indicates these people were in very poor health with many showing signs of chronic diseases, tuberculosis, Vitamin D deficiencies, and arthritis (Peter Killoran, personal communication 2003).

Although a detailed dental inventory was created and numerous dental attributes (including morphologic traits) were recorded, this paper will focus on the interpretation of the enamel hypoplasias (EH) observed within this population. The intent of this paper is to present the EH data and make preliminary observations of the ramifications of the results. In-depth analyses of these results is out of the scope of this paper.

ENAMEL HYPOPLASIAS

Human dentition can reflect the nutritional status of an individual during the years of tooth development. Markers in dentition such as enamel hypoplasias have consistently been associated with malnutrition and disease (Goodman and Rose 1990, 1991; Goodman, et al. 1989; Solomons and Keusch 1981; Chavez and Martinez 1982). By examining enamel hypoplasias (EH), an overall nutritional state of an individual can be inferred. Enamel hypoplasias are the result of a temporary disturbance in amelogenesis, or enamel development. This disturbance leaves visible markers in the relatively permanent enamel that is deposited during the time of stress. They are defects in the thickness of the enamel and can be manifest as single or multiple pits, narrow or wide troughs, or areas of entirely missing enamel (Figure 1). Enamel hypoplasias are deficiencies in the amount or thickness of enamel (Suckling 1989; after Weinmann, et al. 1945). These are quantitative defects as opposed to enamel opacities, which are qualitative defects. Opacities involve change in color and opacity of enamel, indicating differences in hardness or quality of enamel (Federation Dentaire International 1982). Because enamel does not remodel once it is formed, enamel hypoplasias are permanent markers left on the tooth crown that are not lost except from heavy wear or pathological conditions such as caries.

Examination of enamel hypoplasias in a population can give a glimpse as to the general health status of that population. They cannot be attributed to a specific pathological condition or nutritional deficiency. They can, however, be used as an indicator of developmental disturbances caused by some sort of metabolic stress. The locations of these defects can then be measured to obtain a relatively accurate estimate of the age of the individual during the time of stress. Due to the regular and ring-like deposition of human enamel, and the permanent, non-regenerative nature of enamel, measurements of enamel hypoplasias can be placed in regression equations to calculate the age of the individual at the time of the disturbance.

Figure 1 shows linear enamel hypoplasias on the mandibular dentition (permanent incisors and first molars) of Burial 91 from the Old Frankfort Cemetery. The first and second deciduous molars still in occlusion do not exhibit hypoplasias as enamel had already been formed on these teeth prior to the physiological stress causing the EH on the permanent dentition. The age at death of this individual was determined to be around 9 years old +/- 24 months based on tooth eruption and development. The age at occurrence of the physiological stress causing the EH was calculated to be between 2 and 4 years of age.

Figure 1. Enamel Hypoplasias on an Individual from the Old Frankfort Cemetery.

MATERIALS AND METHODS

All individuals represented in the Old Frankfort Cemetery collection with dentition were observed for the presence of enamel hypoplasias. Enamel Hypoplasias were scored on all teeth recovered in the sample with a total of 199 individuals being represented in the dental sample. However, only 170 individuals had teeth present to record hypoplasias. The 29 individuals without dentition had either lost teeth pre-mortem, had not fully developed dentition, or the teeth were not recovered during excavation of the burials. Of the 170 individuals with teeth available for hypoplasia analysis, 67 (39.4 percent) adults were retained for the enamel hypoplasia statistical analysis. That is, they had maxillary and mandibular incisors and canines with wear scores of “2” or lower according to wear scoring techniques presented in Standards for Data Collection from Human Skeletal Remains (Buikstra and Ubelaker 1994). Teeth that were assigned a wear score of "3" or higher were omitted from the sample due to the possibility that enamel defects had been worn away. All individuals with deciduous maxillary and mandibular incisors and canines (39) were included in the statistical analyses of the sample due to very low patterns of wear on these teeth. These numbers for adult and subadults in the Old Frankfort Cemetery dental collection includes six individuals who had both permanent and deciduous dentition (such as the individual represented in Figure 1). The permanent dentition from these six individuals was included with the indeterminate adult group for statistical analyses while the deciduous dentition was included with the subadults.

ANALYSES

Through a series of studies, Goodman, et al. (1980, 1984) suggest that enamel hypoplasia analysis focus on incisors and canines. In the 1980 study on a prehistoric population from Illinois, Goodman, et al. (1980:526) report that the maxillary central incisors combined with the mandibular canines were the most hypoplastic, with over 95 percent of the total growth disruptions observed in their study being observed on at least one of these teeth. They determined that in general, stress episodes that produced defects on the anterior teeth were concurrently manifest on the anterior teeth forming at the same time. Subsequent studies have focused on maxillary and mandibular incisors and canines (Goodman, et al. 1987; Goodman and Rose 1991; Hodges 1987; Hutchinson and Larsen 1988; Lanphear 1990; Van Gerven, et al. 1990). The study of the Old Frankfort Cemetery population follows this example and examines the enamel defects represented on the maxillary and mandibular incisors and canines. For each tooth type, only the left side of the arcade is reported. When the left tooth was not observable, the right antimere was substituted. This eliminates duplicitous reporting of single stress episodes.

Hypoplasias were scored on the labial surface of each tooth with the aid of a magnification light. Measurements were taken from the mid-point of the defect to the cemento-enamel-junction (CEJ) by use of sliding calipers to the nearest 0.02 mm. Defects were scored as linear horizontal grooves, linear vertical grooves, linear horizontal pits, non-linear arrays of pits, and single pits. These are all treated as a single class of defect in the statistical analyses.

The labial crown height was recorded for each tooth from the left side of the arcade. When the left tooth was not observable, the right antimere was substituted. Rather than using Goodman (1988) standards of crown heights, which was derived from a Swedish population, a population specific series of regression equations was developed to calculate age of onset of hypoplasias for the Old Frankfort Cemetery collection. The mean maximum crown height was calculated for males, females, adult indeterminate, and subadults for each tooth type to use in the linear regression equations used to calculate the age of onset of hypoplasias for each individual (Tables 1, 2, and 3). Based on the assumption that the Old Frankfort Cemetery population is relatively homogenous and tooth size variation within each group is small, the error involved in using this method should be minimal (Hodges and Wilkinson 1988; Blakely and Armelagos 1985). Adult teeth with wear scores of 3 or greater (according to the Scott 1979 scoring system) were omitted from this calculation. Due to preservation, a mean crown height for each deciduous tooth type was obtained from measuring crown heights of a sample from the Old Frankfort Cemetery collection (N=12) and taking the average for each tooth type.

Table 1. Mean Crown Heights for Deciduous Dentition from the Old Frankfort Cemetery Collection.

Tooth	Mean Crown Height
Maxillary and Mandibular	
C	7.25
I2	5.98
I1	5.86

Table 2. Mean Crown Heights for Male Permanent Dentition from the Old Frankfort Cemetery Collection.

Tooth	Mean Crown Height
Maxillary	
C	8.875
I2	8.555
I1	8.60
Mandibular	
C	9.64
I2	8.52
I1	8.005

Table 3. Mean Crown Heights for Female Permanent Dentition from the Old Frankfort Cemetery Collection.

Tooth	Mean Crown Height
Maxillary	
C	8.625
I2	8.95
I1	9.86
Mandibular	
C	9.01
I2	7.264
I1	6.23

The age of enamel formation was taken from the developmental sequences of Massler, et al. (1941) and Shaw and Sweeney (1973). Table 4 lists permanent tooth crown formation times according to Massler et al. (1941) while Table 5 lists deciduous tooth crown formation times according to Shaw and Sweeney (1973).

Table 4. Permanent Tooth Crown Formation Times According to Massler, et al. (1941).

Tooth	Year Crown Formation Begins	Year Crown Formation Ends	Years of Formation
Maxillary			
C	0.0	6.0	6.0
I2	1.0	4.5	3.5
I1	0.0	4.5	4.5
Mandibular			
C	0.5	6.5	6.0
I2	0.0	4.0	4.0
I1	0.0	4.0	4.0

Table 5. Deciduous Tooth Crown Formation Times According to Shaw and Sweeney (1973).

Tooth	Crown Formation Begins (Prenatal Month)	Crown Formation Ends (Postnatal Month)	Duration of Formation
Maxillary and Mandibular			
M2	6th	11th	15 months
M1	5th	6th	11 months
C	6th	9th	13 months
I2	5th	5th	10 months
I1	5th	4th	9 months

The calculation for the age of onset of enamel defects was based on the method presented by Goodman and Rose (1990), which was modified from Swardstedt (1966), using the developmental sequence of Massler et al. (1941). Age of onset of hypoplasias was calculated using regression equations that incorporate the average maximum crown height for the Old Frankfort Cemetery collection and the ages of enamel formation. These equations assume a constant velocity of enamel formation as recommended by Goodman and Rose (1990, 1991). The regression equation is as follows:

$$\text{Age at formation of defect} = \text{Age at crown completion} - \frac{\text{years of formation}}{\text{crown height}} \times \text{defect height from CEJ}$$

The equations developed for each of the groups in the Old Frankfort Cemetery collection (males, females, adult indeterminate, and subadults) are listed in Tables 6, 7, 8, and 9. The following analysis of enamel hypoplasia presence in the Old Frankfort Cemetery reports both the occurrences of hypoplasias per individual from the Old Frankfort Cemetery and prevalence of hypoplasias per specific tooth type.

Table 6. Regression Equations for Estimations of Age at Formation of Linear Enamel Hypoplasias (in years) for Adult Males at the Old Frankfort Cemetery.

Tooth	Regression Formula
Maxillary	
C	Age = -(.676 x Ht) + 6.0
I2	Age = -(.409 x Ht) + 4.5
I1	Age = -(.523 x Ht) + 4.5
Mandibular	
C	Age = -(.622 x Ht) + 6.5
I2	Age = -(.470 x Ht) + 4.0
I1	Age = -(.500 x Ht) + 4.0

Table 7. Regression Equations for Estimations of Age at Formation of Linear Enamel Hypoplasias (in years) for Adult Females at the Old Frankfort Cemetery.

Tooth	Regression Formula
Maxillary	
C	Age = -(.696 x Ht) + 6.0
I2	Age = -(.391 x Ht) + 4.5
I1	Age = -(.456 x Ht) + 4.5
Mandibular	
C	Age = -(.666 x Ht) + 6.5
I2	Age = -(.551 x Ht) + 4.0
I1	Age = -(.642 x Ht) + 4.0

Table 8. Regression Equations for Estimations of Age at Formation of Linear Enamel Hypoplasias (in years) for Adults of Indeterminate Sex at the Old Frankfort Cemetery.

Tooth	Regression Formula
Maxillary	
C	Age = -(.545 x Ht) + 6.0
I2	Age = -(.357 x Ht) + 4.5
I1	Age = -(.421 x Ht) + 4.5
Mandibular	
C	Age = -(.550 x Ht) + 6.5
I2	Age = -(.433 x Ht) + 4.0
I1	Age = -(.462 x Ht) + 4.0

Table 9. Regression Equations for Estimations of Age at Formation of Linear Enamel Hypoplasias (in years and months) for Subadults at the Old Frankfort Cemetery.

Tooth	Regression Formula (Years)	Regression Formula (Months)
Maxillary and Mandibular		
Canine	Age = -(.149 x Ht) + .750	Age = -(1.79 x Ht) + 9
Second Incisor	Age = -(.139 x Ht) + .417	Age = -(1.67 x Ht) + 5
First Incisor	Age = -(.128 x Ht) + .333	Age = -(1.54 x Ht) + 4

RESULTS

ADULT DATA

Table 10 summarizes the adult hypoplasia data. Of the 67 adults in the sample, 98.5 percent had one or more hypoplasia. One hundred percent of the females, 95 percent of the males, and 100 percent of the indeterminate individuals had one or more hypoplasias. A total of 263 permanent maxillary and mandibular incisors and canines representing a total of 67 individuals were retained for statistical analysis. Figure 2 shows the number of defects recorded per permanent tooth type for each of the adult sub-groups in the Old Frankfort Cemetery population. This shows that the mandibular canine averaged the most number of defects for the females (3.00 per tooth) while the mandibular incisor averaged the most number of defects for the males (3.28). The maxillary canine averages the lowest number of defects for both the males and females (2.5 and 2.47, respectively).

Table 10. Defects Per Permanent Tooth Type

	Central Incisor (I1)		Lateral Incisor (I2)		Canine	
	# Defects Recorded (# of teeth observed)	Average # of Defects per Tooth	# Defects Recorded (# of teeth observed)	Average # of Defects per Tooth	# Defects Recorded (# of teeth observed)	Average # of Defects per Tooth
Maxilla						
Males	29 (12)	2.41	45 (16)	2.81	30 (12)	2.5
Females	33 (12)	2.75	37 (15)	2.47	47 (19)	2.47
Indeterminate	44 (15)	2.93	32 (14)	2.29	33 (14)	2.36
Mandible						
Males	23 (7)	3.28	43 (14)	3.07	48 (15)	3.2
Females	31 (12)	2.58	48 (18)	2.67	69 (23)	3.00
Indeterminate	34 (13)	2.62	43 (16)	2.69	54 (16)	3.38

SUBADULT DATA

Table 11 summarizes the subadult hypoplasia data. Of the 39 subadults in the Old Frankfort Cemetery dental collection with maxillary and mandibular incisors and canines, 67 percent of the population had one or more hypoplasias. A total of 171 deciduous maxillary and mandibular incisors and canines representing a total of 39 individuals were retained for statistical analysis. Figure 3 shows the number of defects recorded per deciduous tooth type. The deciduous mandibular canine averaged the most number of defects while the mandibular first incisor averages the lowest.

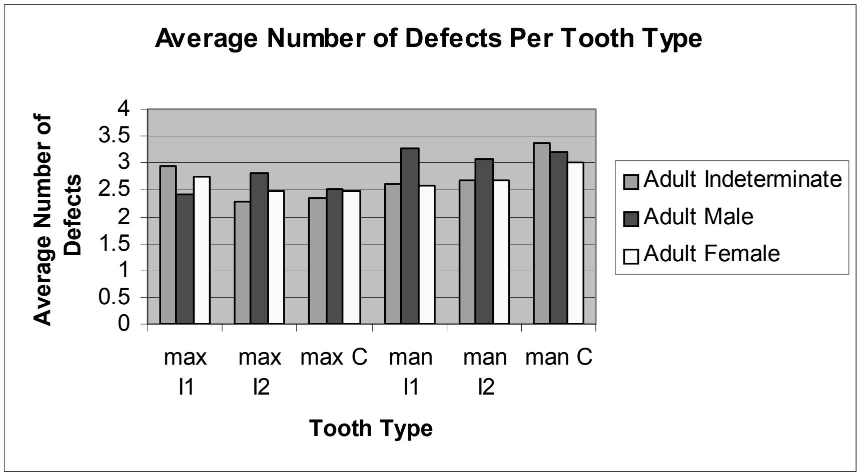

Figure 2. Average Number of Defects Per Permanent Tooth Type for Each of the Adult Subgroups in the Old Frankfort Cemetery.

Table 11. Defects Per Deciduous Tooth Type

	Central Incisor (I1)		**Lateral Incisor (I2)**		**Canine**	
Maxilla						
	# defects Recorded (# of teeth observed)	Average # defects per tooth	# defects recorded (# of teeth observed)	Average # defects per tooth	# defects Recorded (# of teeth observed)	Average # defects pertooth
Deciduous	8 (32)	0.25	7 (30)	0.23	22 (27)	0.81
Mandible						
Deciduous	4 (26)	0.15	6 (28)	0.21	25 (28)	0.89

POPULATION SUMMARY

It appears that the mandibular canine was the most affected tooth in the Old Frankfort Cemetery collection. For the adults, the maxillary canine showed the lowest number of defects while the mandibular first incisor showed the lowest for the juveniles. Notably, the permanent dentition averaged, overall, more defects per tooth, regardless of tooth type, than the deciduous dentition.

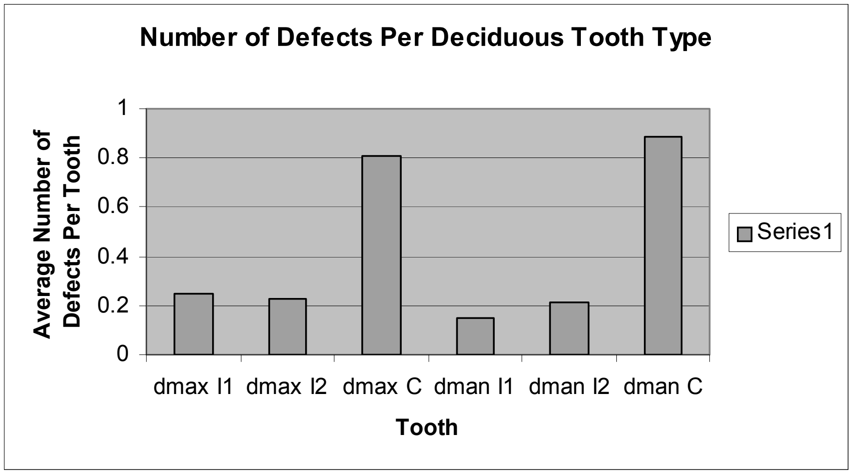

Figure 3. Average Number of Defects Recorded Per Deciduous Tooth Type.

Figure 4 displays the percent of permanent teeth affected by hypoplasias in the Old Frankfort Cemetery. The mandibular first incisor is the most frequently affected tooth, with 100 percent of these teeth for both the males and females in this sample having one or more hypoplasias. The maxillary first incisor is the least frequently affected tooth for the males (83.33 percent), while the mandibular second incisor shows the lowest frequency for the females (88.89 percent).

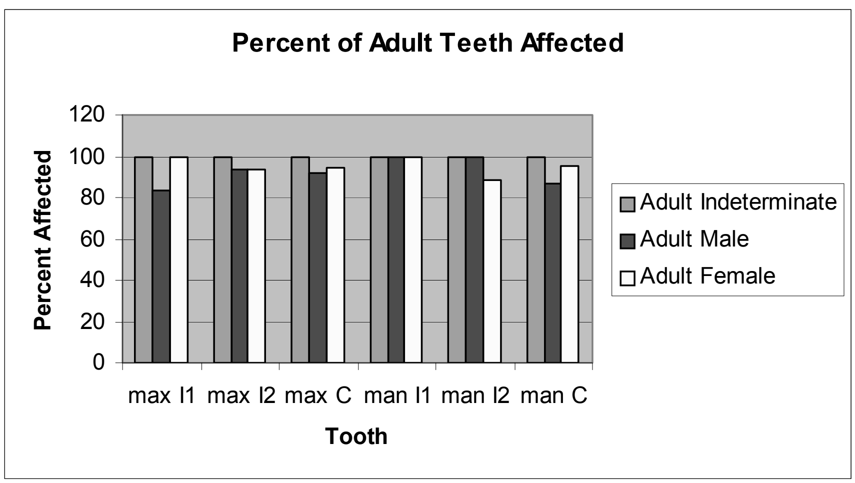

Figure 4. Percent of Permanent Teeth Affected by Hypoplasias in the Old Frankfort Cemetery.

Figure 5 shows the percent of deciduous teeth affected by hypoplasias in the Old Frankfort Cemetery. The deciduous mandibular canine is the most frequently affected tooth, with 100 percent of these teeth being affected. The deciduous mandibular first incisor is the least frequently affected tooth with only 11.11 percent of these teeth having one or more hypoplasias.

The measurement of each hypoplasia was inserted into a regression equation in order to estimate the age at onset of the defect. The resulting data is presented in half-year growth interval for the adult population from birth to 7.0 years of age. The data was then plotted as total number of hypoplasias per age interval. Figure 6 shows that there is a peak of hypoplasia occurrence at 3.0-3.5 years of age for the adults, with most hypoplasias occurring between the ages of 2.0 and 4.5 years of age. This data is consistent with that reported by numerous other researches on both historic and prehistoric populations (Allen, et al. 1987; Corruccini, et al. 1985; Goodman 1988; Goodman, et al. 1984; Goodman, et. al. 1987; Powell 1988). Many of these researchers have concluded that the peak in hypoplasia occurrence at this age is associated with the stresses of weaning. Although weaning is a gradual shift from breast feeding to solid foods, it is considered to be the most dramatic transition of childhood and likely has strong influence on the presence and occurrence of hypoplastic defects.

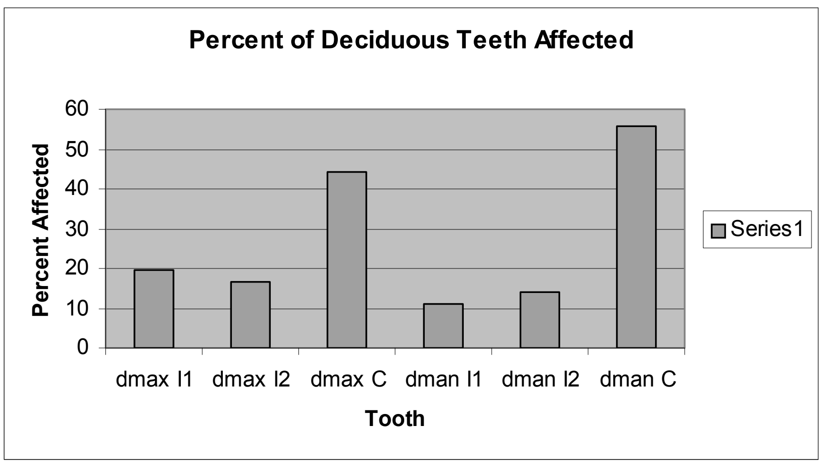

Figure 5. Percent of Deciduous Teeth Affected by Hypoplasias in the Old Frankfort Cemetery.

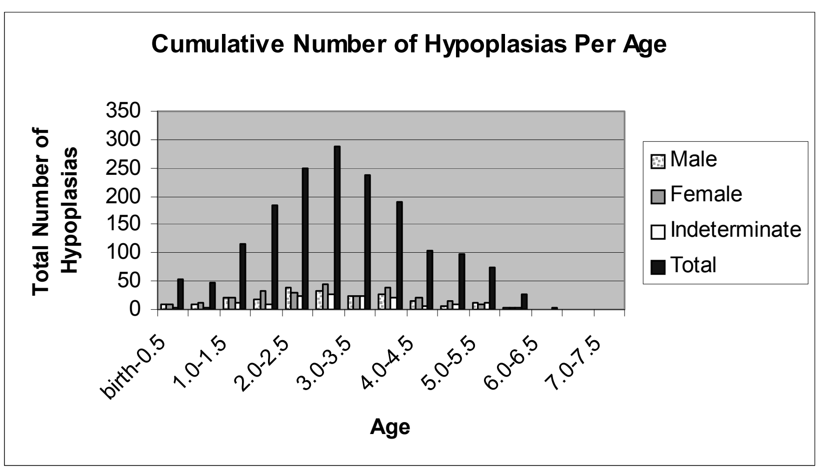

Figure 6. Cumulative Number of Hypoplasias Per Age Group of Adults from the Old Frankfort Cemetery.

The percent of hypoplasias observed in the adults from the Old Frankfort Cemetery per half year age interval (Figure 7) shows similar results with around 17% of all hypoplasias occurring around 2.5-3.0 years of age. Again, the most hypoplasias occur between about 1.0/1.5 and 4.5 years of age.

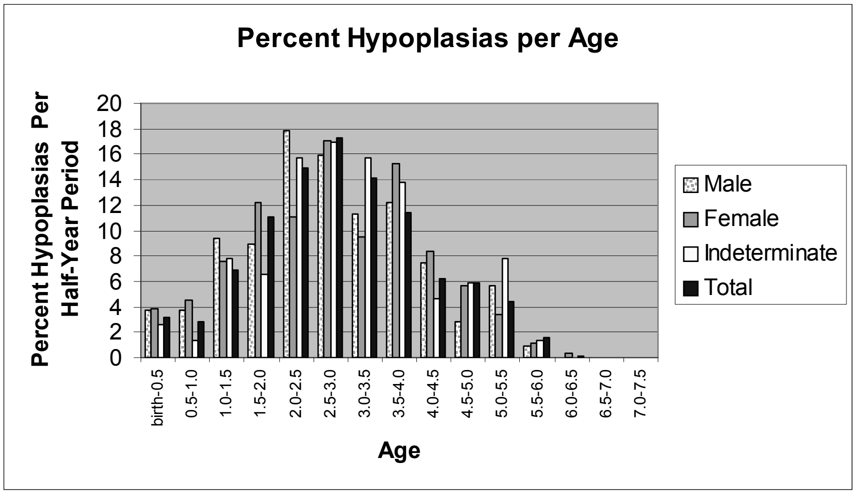

Figure 7. Percent of Hypoplasias Per Age Interval of Adults from the Old Frankfort Cemetery.

The measurements of each hypoplasia were again inserted into regression equations in order to estimate the age at onset of defects in the deciduous dentition from the Old Frankfort Cemetery. The resulting data is presented by month, rather than years, from the fifth prenatal to the ninth postnatal growth interval (Figure 8).

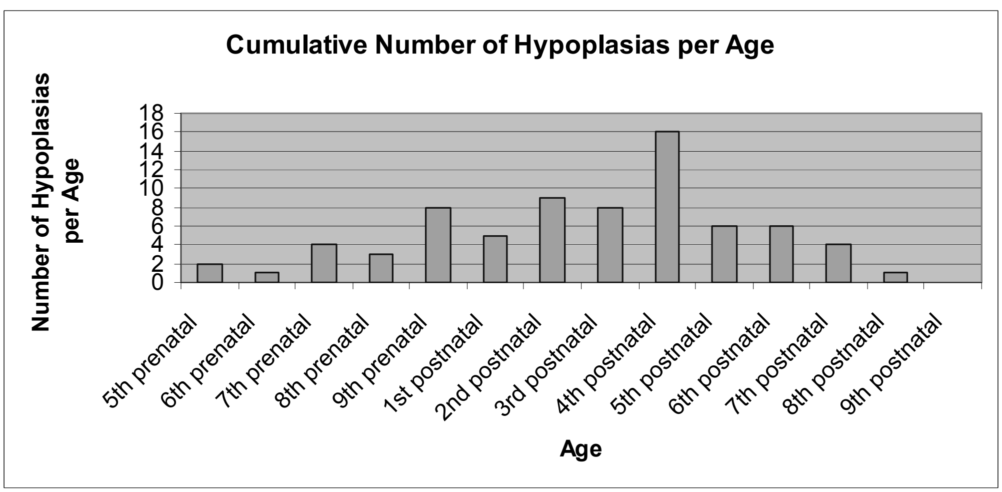

Figure 8. Cumulative Number of Hypoplasias of Deciduous Teeth Per Age Interval from the Old Frankfort Cemetery.

The deciduous tooth data shows that there is a peak of hypoplasia occurrence during the 4th postnatal month. This data is not consistent with other studies. Most researchers have reported a gradual increase in hypoplasia occurrence over the course of the prenatal development period, which accompanies fetal nutritional demands. There is typically a peak around birth, followed by a rapid decline in the postnatal period (Goodman, et al. 1987; Blakely and Armelagos 1985). The typical ages at which there is a more frequent occurrence is between the 8th prenatal and the 2nd postnatal month. This has been attributed to increased stress associated with birth (Kronfield and Schour 1939; Via and Churchill 1959). The subadults from the Old Frankfort Cemetery do not follow this trend, rather, there is a peak of hypoplasia occurrence during the 4th postnatal month. The subadult data indicates there is the possibility that the children were not receiving the proper nutrition from their mothers and were therefore more susceptible to malnutrition and disease.

There is general acceptance that the frequency of hypoplasias may provide an indication of general health status of a population. The high prevalence of enamel defects in the Old Frankfort Cemetery, with over 90 percent of the adult individuals and 37 percent of the subadults showing one or more hypoplasias, indicates the individuals interred in this cemetery lived under less than desirable conditions and were exposed to chronic malnutrition and/or disease.

Further, the late peak at the 4th postnatal month in the juveniles from the Old Frankfort cemetery suggests the possibility that the children were not receiving the proper nutrition from breastfeeding and were therefore more susceptible to malnutrition and disease. Infants are weaker and more susceptible to disease and malnutrition than are adults, especially when they are not receiving proper nourishment from breast milk. A peak in enamel defects at this late stage is another indication of the dire conditions in which the individuals interred at the Old Frankfort Cemetery resided.

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MISSISSIPPIAN COMMUNITY AND CONSTRUCTION AT ANNIS VILLAGE

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ABSTRACT

Community layout and mound construction are commonly used to make inferences about the nature of Mississippian social organization. In this paper, I examine the construction of the Annis Village (15Bt2, 15Bt20, 15Bt21), a Mississippian mound center in western Kentucky, as understood through new fieldwork (2002-03) and WPA collections (1939-1940). The site underwent at least three expansions, as indicated by the construction of sequential palisades and enlargement of the earth mound. It is hypothesized that these construction episodes and variation in architecture reflect local changes in social organization.

INTRODUCTION

The study of the layout of past communities gives archaeologists important information that allows them to reconstruct the organization of the societies that constructed them. However, research on this topic is often limited by the lack of large-scale exposure of community plans because mound and village centers are rarely completely exposed. In this paper, I describe the sequential stages of construction and expansion of the Annis Village (15Bt2, 15Bt20), a single-mound site located along the Big Bend of the Green River in Butler County, Kentucky. This is possible because of a combination of large-scale Works Progress Administration (WPA) excavations and recent, more focused, Penn State work. I examine the overall layout of the site, how the use of space changed over time, and what can be said about social structure from the sites' features, their configuration, and their contents. Significant labor investment in the form of palisades, mounds, and structures is viewed as a marker for the presence of one or more individuals who wielded considerable influence.

MISSISSIPPIAN COMMUNITIES

Archaeologists have long recognized that Mississippian mound centers were built according to a plan (e.g., Sherrod and Rolingson 1987). Early European explorers noted the existence of plazas, mounds, palisades, and residential structures (both summit and non-summit) (e.g., Elvas 1993) and nineteenth-century investigators described and mapped the layouts of mound sites (e.g., Squier and Davis 1998; Stout and Lewis 1995).

At the largest Mississippian sites, such as Cahokia, Moundville, Etowah, and Kincaid, (among others), there is clear evidence for a planned community (e.g., Cole, et al. 1951; Fowler 1997; King 2003; Knight 1998; Knight and Steponaitis 1998; Lewis, et al. 1998; Milner 1990, 1998; Pauketat 1994). This evidence consists of an orderly arrangement of mounds, clear demarcation of plazas, and construction of palisades around part or all of the site.

At smaller but more numerous sites possessing few or no mounds, evidence for community planning is less obvious but still present. Stout and Lewis (1998; see also Lewis 1990, 1996) provide a detailed summary of site plans in Kentucky's Mississippi Valley region, focusing on the importance of mounds, plazas, and palisades. Sites such as Larson in Illinois (Harn 1994), Snodgrass in Missouri (O'Brien 2000; Price and Griffin 1979), Hiwassee Island in Tennessee (Lewis and Kneberg 1946), and Andalex, Jonathan Creek, and Morris in Kentucky (Niquette 1991; Rolingson and Schwartz 1966; Webb 1951) possess mounds, plazas, palisades, and structures, often laid out in an orderly fashion and showing growth over time. Likewise, some Mississippian sites, like King and Ledford Island, show clearly organized arrangements of houses and other features, although mounds are absent (Hally 1988; Sullivan 1987).

ELITIES AND LABOR

Central to any discussion of Mississippian community patterns is the role and status of the local elite and their interaction with the non-elite inhabitants. These elite individuals were likely those who directed the construction of the site in some form or another. Therefore, the elite (presumably a chief and close kin) enjoyed greater prestige and wielded some level of control over the labor of others. The degree to which this control conferred an economic (subsistence) advantage is not clear (e.g., Cobb 2003; Milner 1998; Muller 1997; Pauketat 1994) and is beyond the scope of this paper, although it is unlikely that the needs of the chief greatly interfered with the day-to-day life of the villagers.

While there are no ethnohistoric descriptions available that specifically deal with Kentucky, written accounts from elsewhere in the Southeast indicate that chiefs lived in large structures atop mounds and that temples or "council houses" were also often located on summits (e.g., Bartram 1996:165; Biedma 1993:239; du Pratz 1972:333; Elvas 1993:75, 95). Payne (1994, 2002), in a cross-cultural study of chiefdoms and Mississippian architecture, shows that the houses of chiefs are substantially larger than those of the commoners and that these houses are usually in a prominent location, although this is not always the case (Hammerstedt 2005a). Regardless of whether or not summit structures were residences or ceremonial buildings, it is clear that summit architecture was emblematic of enhanced status and access was likely restricted to a small subset of the community (Lindauer and Blitz 1997).

Archaeologists working in the Southeast have used these accounts to inform their interpretations. Knight (1981, 1986; Schnell, et al. 1981:133, 137-145; see also Krause 1988), drawing on ethnohistoric documents and archaeological evidence from Cemochechobee, argues that mounds and the rituals performed upon them were central to Mississippian life. Black (1967) interprets the large structure on the primary mound summit at Angel Mound F as a temple and believes that the chief's dwelling was atop the largest mound, Mound A. Polhemus (1987) notes domestic refuse within summit buildings at Toqua and Hally (1996) uses summit architecture and mounds as evidence for chiefly succession and legitimacy in northern Georgia. Many more examples of summit architecture exist but merely confirm the pattern above.

The cost of labor required to build mounds and palisades was relatively high and was presumably directed by the chief or other individuals of high rank (see Milner 1998:150). Lafferty (1977:215) estimates that over 1.5 million person-hours were required to construct the mounds. Muller (1997:274) provides lower estimates of 15,000 person-hours (1 person-day per 1.25 m^3 of mound fill) and points out that the requirements would not have overly taxed the local residents (e.g., important subsistence tasks need not have been interrupted for construction). He argues that 1,250 people could have built the mounds at Kincaid in 100 years if each household of 5 people contributed only 4 days of labor per year. Further, Milner (1998; see also Hammerstedt 2005b) states that at Cahokia demands on households were not that great even during the peak of mound building.

The vast majority of Mississippian palisades were constructed using posts between 15 and 25 cm in diameter and were often accompanied by ditches or embankments for additional security (Milner 1999). Few estimates of palisade heights are in the literature, however Vogel and Allan (1985) estimate a height of 4 m for the Moundville palisade and Ritchie (1980) argues that the palisade at the Iroquoian Kelso site reached to a similar height of 4.5 m. Obviously, a considerable amount of labor would have been required to cut suitable posts with stone tools, to dig or twist the posts into the ground, and to maintain the walls as rot set in. Lafferty (1977:215) provides a figure of 7,000 person-hours for the construction of the palisade at Kincaid. Iseminger et al. (1990), estimate 130,000 to 190,000 person-hours for each Cahokia palisade while Milner (1998) argues that 500 people working for 10 days per year for 100 years would have been enough to construct each palisade.

Although the mound and palisade construction estimates listed above differ, the point as far as this paper is concerned remains the same. Building mounds and palisades was a time-consuming and expensive process but one which would have been easily accomplished with the population available (Hammerstedt 2005b). The individuals who were able to motivate and direct this construction likely wielded considerable influence and enjoyed some degree of prestige. Keeping this discussion in mind, let us move on to a description of the growth and expansion of Annis Village and its local socio-political implications.

ANNIS VILLAGE

The most prominent features at Annis are a 3.7 m tall earthen platform mound measuring approximately 33.5 m on a side (Figure 1) and a surrounding fortified village that encompassed approximately 1.3 ha (Figure 2). An estimated additional 0.5 ha was eroded away by the river thus making the original area of the village about 1.8 ha, assuming the village extended to the river's edge.

Figure 1. The Annis Mound as it Appeared Before Excavation in 1939 (Courtesy William S. Webb Museum of Anthropology, University of Kentucky. UKMA 3250.)

PREVIOUS WORK

C. B. Moore made the first professional visit to Annis in 1915, and described it as the "largest mound seen or heard of by us on Green River." (Moore 1916:480) His observation about the size of the mound has been borne out by subsequent research—no other such mound has been found for over 50 km. Moore excavated a 3 m deep and 17.5 m^2 "trial hole" in the mound and a second in the nearby Annis Sand Mound (15Bt21) but did not find anything of interest to him (e.g., no fancy burial goods) and moved elsewhere.

Annis was revisited in 1939-1940 by a Works Progress Administration (WPA) crew under the supervision of Ralph D. Brown. Brown's crew excavated the entire platform mound and much of the surrounding village, over 7,000 m^2. These excavations revealed three separate mound construction stages, termed the Sub-Primary, Primary, and Secondary mound (Figure 3); sixteen structures and numerous pits in the village area; two palisades; and over 30,000 artifacts (Figure 2)[1].

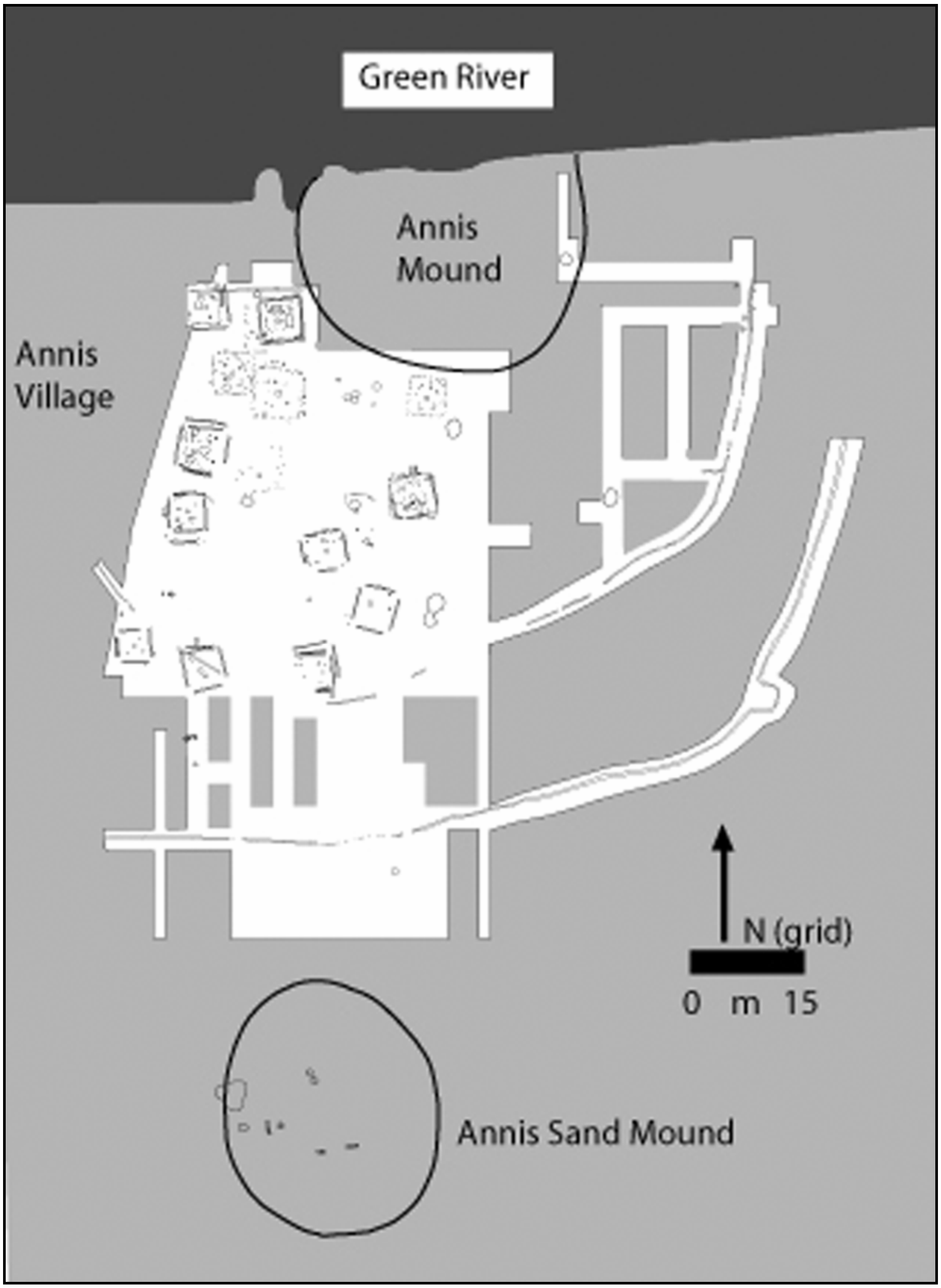

Figure 2. Annis Village Overall Site Plan.

Penn State began an active research program at Annis in 2001. Excavation of 144 m^2 in 2002 and 2003 revealed a previously unrecognized palisade, a structure and extended one of the WPA-excavated palisades to the river bank. The excellent documentation left behind by Brown permits us to take advantage of the strengths of old excavations that provide large-scale exposures with selective sampling of artifacts versus focused excavations with the collection of diverse cultural and biological materials (Milner, et al. 2003). This combination of excavations and strategies cover enough of the site area to document change over time at Annis.

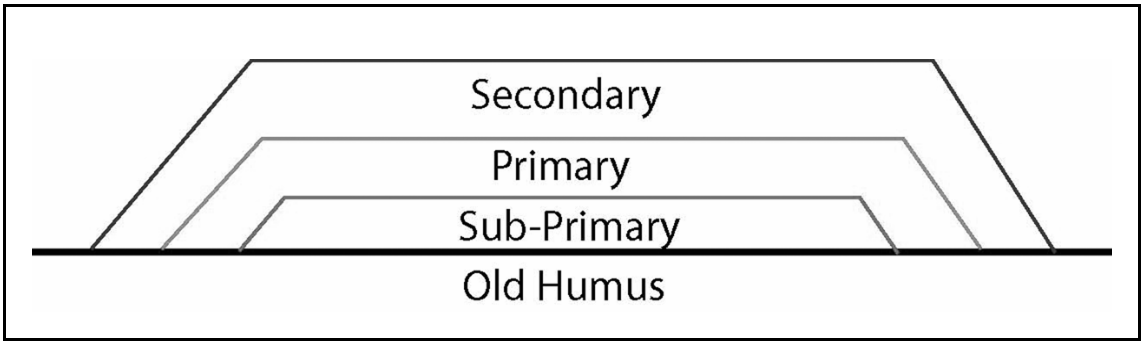

Figure 3. Schematic Diagram of Mound Construction Stages (not to scale).

CONSTURCTION AND EXPANSION OF ANNIS

The earliest recognizable Mississippian occupation at Annis is represented by the Old Humus (pre-mound) layer (Figure 4)[2]. This level consists of a number of postmolds that do not form any recognizable pattern. The exact date of occupation remains unclear, however the presence of a lone Ramey Incised sherd hints at a twelfth- to thirteenth-century occupation (Fowler and Hall 1972; Milner, et al. 1984).

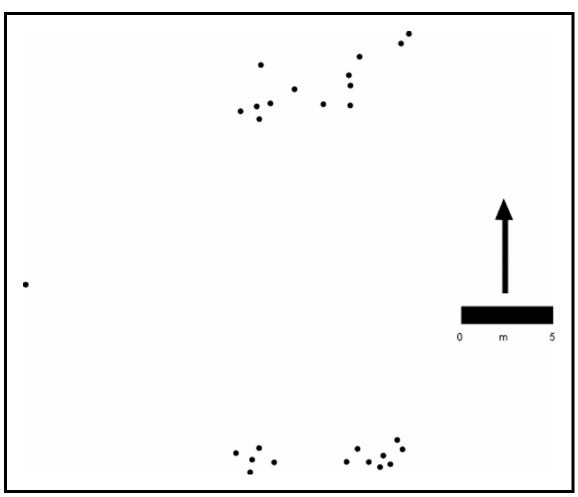

Figure 4. Old Humus Layer, Pre-Mound.

Phase 1

The first clear evidence for the Mississippian occupation of the site is referred to here as Phase 1. The initial construction of the mound occurred, referred to by the WPA excavators as the Sub-Primary mound. This mound stage reached a maximum height of 70 cm above the Old Humus level, and it was topped by a summit structure (Figure 5). This structure was constructed using single-set posts and was rebuilt at least once. The floor area encompassed by this structure is unclear due to erosion prior to excavation but it exceeded 89 m^2. Numerous hearths and trash-filled pits were excavated within this structure and two large flank middens were recorded on the east slope of the mound (Figure 6). These middens contained primarily animal bone (primarily white-tailed deer), but also some shell and pottery. A wide variety of skeletal elements are represented and many of the long bones seem to have been purposefully smashed. A few show evidence of pot polish (White 1992:120-128). Jars, bowls, and pans --both shell- and grog-tempered-- were the most common vessel forms in the Sub-Primary mound.

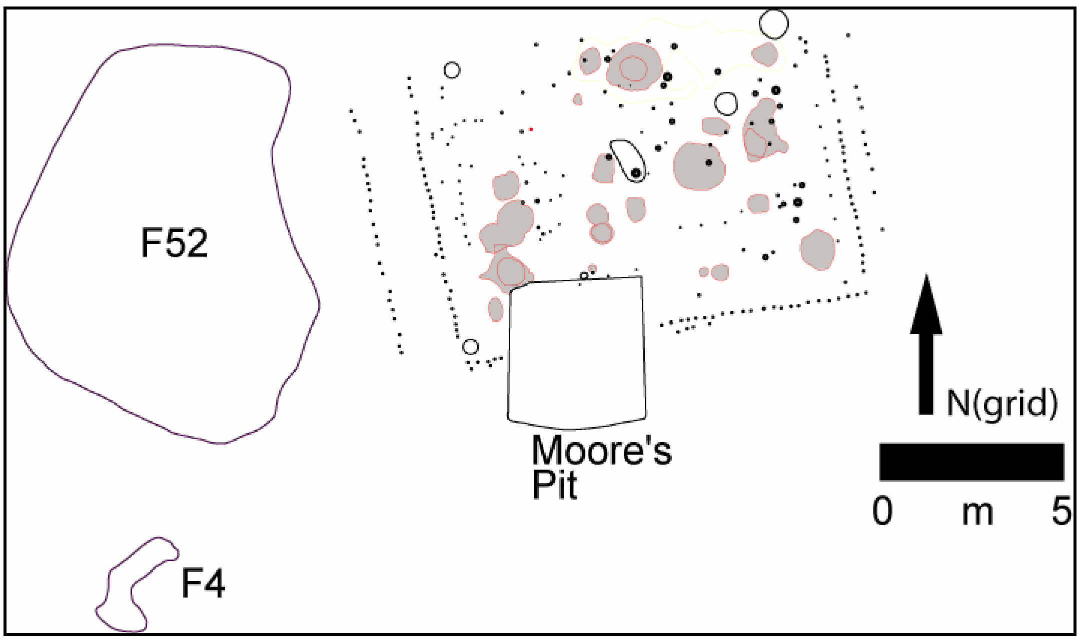

Figure 5. Sub-Primary Mound Structure, Part of Phase 1 Construction. Fire-Related Features are Gray; Pits are Open Circles.

About this time the first palisade was constructed (Figure 6). This was a deep trench with individual posts, some made of ash (*Fraxinus* sp.; Lee Newsom, personal communication 2003) set at approximately 20 cm intervals (Figure 7). This palisade was approximately 114 m long. Extrapolation based on this length and assuming 20 cm spacing between posts results in an estimate of 570 posts for the entire enclosure. It encloses an approximately 0.25 ha D-shaped area with the river forming one side. A 2-sigma calibrated radiocarbon range of AD 1285-1405 with multiple intercepts (Beta 181396, 181398, wood charcoal) was obtained from two samples from a charred post in this palisade. The palisade wall superimposed an earlier wall-trench structure found during Penn State's 2003 excavation (Figure 5)[3]. The structure, located east[4] of the mound, would have been contemporaneous with, or slightly predated, the initial mound construction.

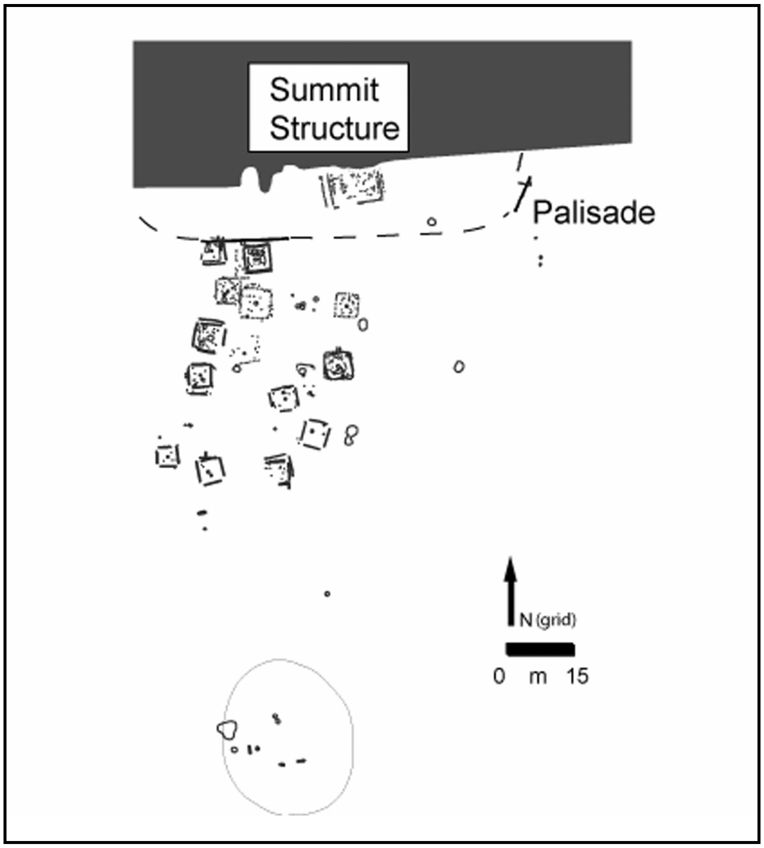

Figure 6. Phase 1 Palisade and Sub-Primary Mound Summit Structure. The Dashed Line Indicates the Presumed Path of the Palisade. A Pre-Phase 1 Structure is Superimposed by the Palisade to the Upper Right.

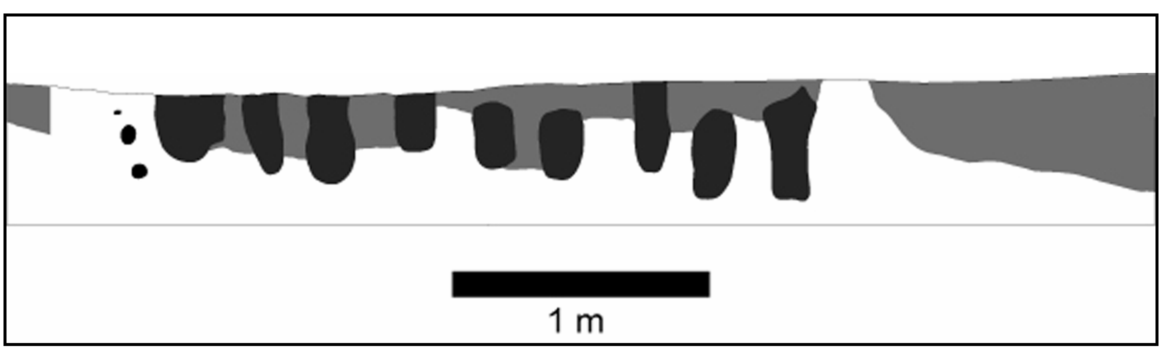

Figure 7. Profile of Phase 1 Palisade Showing Posts (black) and the Trench (gray). Facing Southeast.

The presence of a handful of Ramey Incised, Powell Plain, and Matthews Incised, *var. Manly* sherds[5] (Figure 8) in both mound fill and summit feature fill lend support to this radiocarbon assay. It is likely the mound and palisade wall were used at the same time.

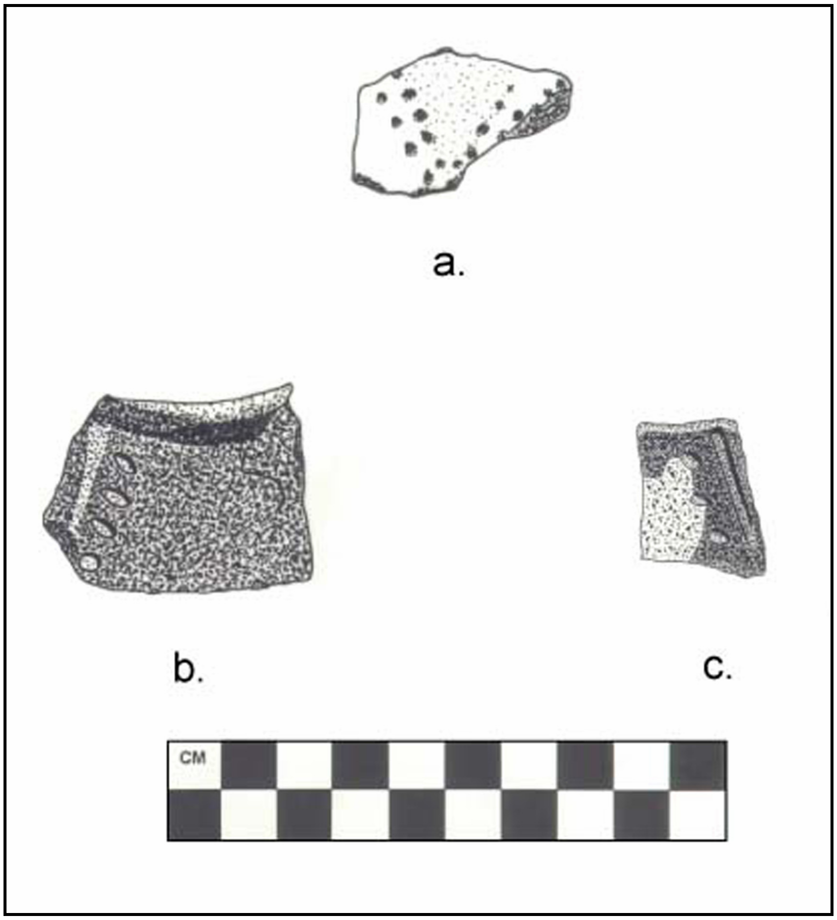

Figure 8. Decorated Sherds from Old Humus and Sub-Primary Feature and Mound Fill. a). Matthews Incised, *var. Manly* (Bt2-C381-5); b). Ramey Incised (Bt2-C169-1); c). Ramey Incised (Bt2-C96-112). Drawing Used Courtesy of Rich Burnette.

Phase 2

During the second phase of construction, referred to here as Phase 2, an additional 90 cm of soil was added to the mound. This level, termed the Primary mound, reached a maximum height of 1.6 m above the Old Humus. It expanded south far enough to cover part of the Phase 1 palisade, which by this time was abandoned. Again, the mound was topped by a structure (Figure 9); this one exhibited a combination of single-set post and wall trench construction techniques. The entire area delineated by the post molds encompassed at least 250 m^2, although it is unlikely that this entire area was roofed since no interior support posts exist. The post molds seen on the south and east sides likely formed an fence that blocked public view of an interior wall-trench structure of uncertain dimensions.

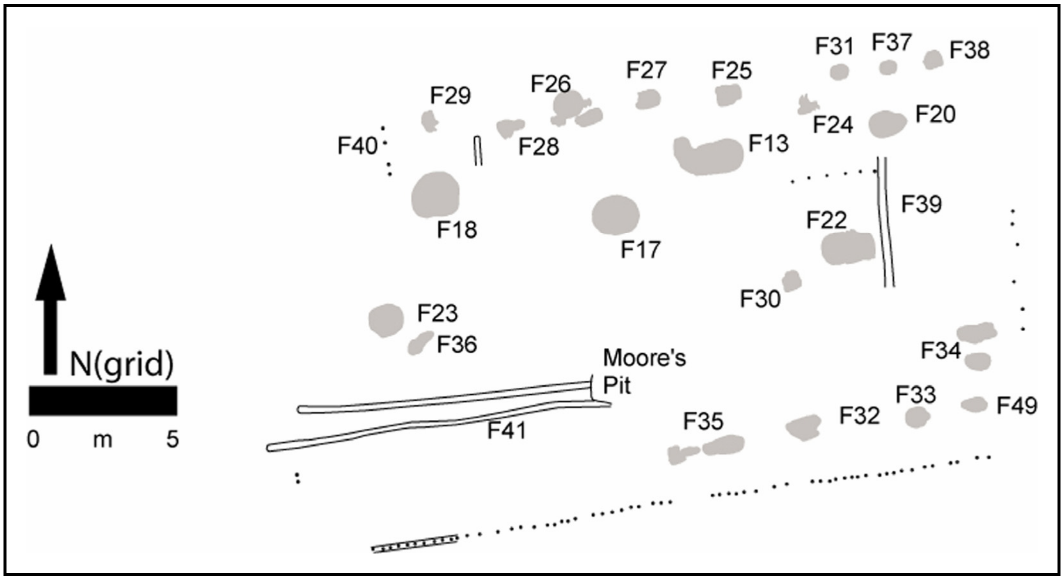

Figure 9. Primary Mound Structure, Part of Phase 2 Construction. Fire-Related Features are Gray.

It is unlikely that anyone resided on the mound during Phase 2. All of the non-architectural features atop this mound stage were fire-related--either hearths or surface fires--although no charcoal or burned daub was recorded. No clay platforms or seats such as those reported for parts of eastern and central Tennessee (e.g., Lewis and Kneberg 1946; Myer 1928; Webb 1938) were present. No trash-filled or storage pits were identified on this level and there was a near-absence of domestic debris --only two jar rims and one unknown vessel form, along with a handful of body sherds and stone, were recovered.

At or near the same time as the enlargement of the mound, a low embankment with a second palisade, also constructed by placing posts within a deep trench, was built to surround the now-larger village (Figure 10). Approximately 1025 posts were used in the construction of this 205 m long palisade. At this point, the settlement encompassed approximately 0.75 ha. A 2-sigma calibrated radiocarbon range of AD 1265-1300 with an intercept of AD 1285 (Beta 181397, wood charcoal) was obtained for the Phase 2 palisade.

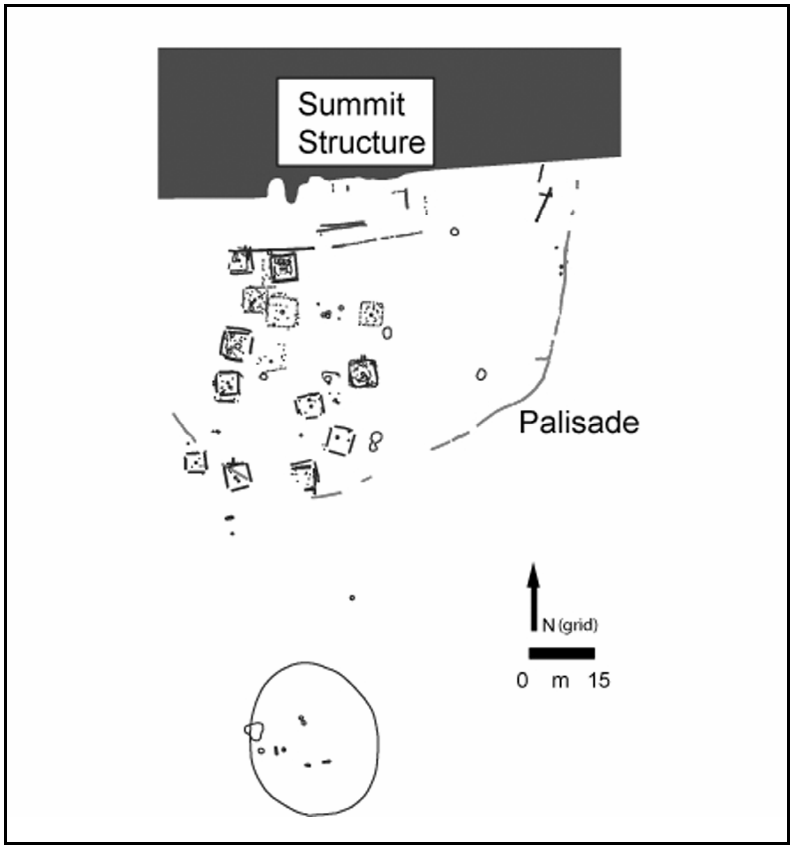

Figure 10. Phase 2 Palisade and Primary Mound Summit Structure.

Phase 3

The third and final stage of village construction saw the most significant labor investment. Over 2 meters of soil was added to the mound, termed the Secondary mound, bringing it to its final dimensions of 3.7 m high and 33.5 m on a side. A wall-trench structure with an estimated floor area of 105 m^2 was located on the Secondary mound summit (Figure 11). This building was the first with an identifiable entrance--two short wall trenches set at a right angle to the eastern wall. An internal partition may have also been present.

Refuse-filled and storage pits reappeared in this level; some were filled with charcoal. No prepared hearths are evident but other fire-related features, possibly surface fires, exist, particularly just outside the eastern wall. Jars, pans, and bowls are the most common vessel forms. Two plate rims were also recovered

A third, and final, palisade was also constructed at this time, presumably to encompass the village (Figure 12). This palisade, 277 meters in length, defined the final limits of the village at approximately 1.3-1.8 ha and is the only one of the three palisades with a bastion (Figure 13). No profiles exist for this palisade, although the plan maps are quite similar to the Phase 1 and 2 palisades. It is probable that it was constructed in the same manner and an estimated 1385 posts were used.

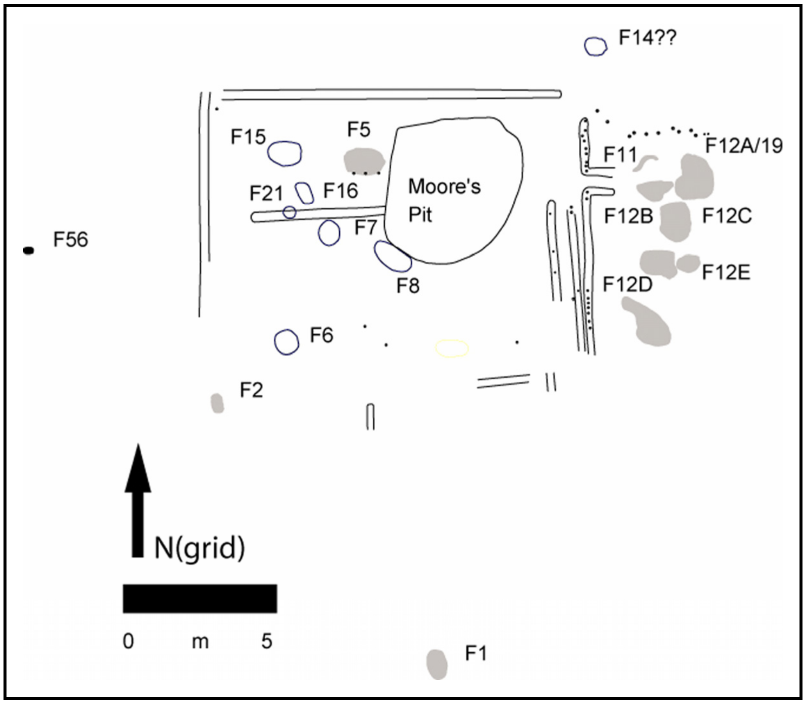

Figure 11. Secondary Mound Structure, Part of Phase 3 Construction. Fire-Related Features are Gray; Pits are Open Circles.

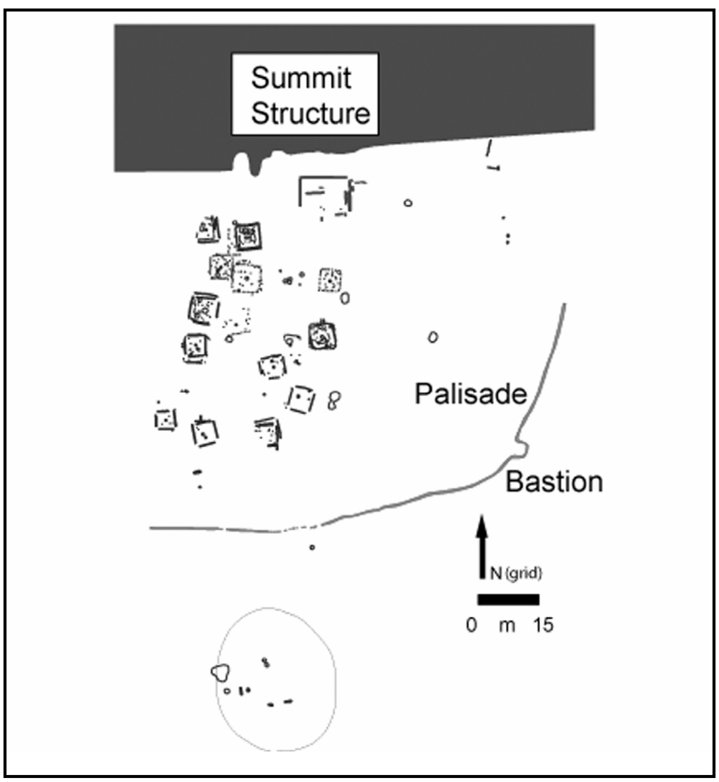

Figure 12. Phase 3 Palisade and Secondary Mound Summit Structure (Note Bastion on Eastern Section of Palisade).

Figure 13. Bastion After Excavation (Courtesy William S. Webb Museum of Anthropology, University of Kentucky. UKMA 4111).

Further evidence for village expansion can be seen in the village plan. Several wall-trench houses were built over the remains of the Phase 1 and 2 palisades. No radiocarbon dates are available for either the Secondary mound or the outer palisade, however the presence of strap handles in the Secondary mound fill points to a fourteenth- or fifteenth-century construction (Hilgeman 2000), a date that fits comfortably with the radiocarbon dates presented above.

Summary

To summarize, each phase of Annis' expansion saw an increase in the overall volume of the platform mound and the area circumscribed by the palisade. Interestingly, there is no evidence for a plaza—rather there appears to be a ring of houses around the mound (although it is possible that a plaza may have existed at one point only to have houses constructed within it during a later construction episode). The available data puts most construction between the 12th and 15th centuries.

SOCIAL ORGANIZATION AND COMMUNITY PATTERNS

The growth of the platform mound and the surrounding village provides important insights into the social situation at Annis and how it changed over time. No burials were present in the platform mound or within any of the village structures; therefore, this discussion focuses on structures, mound construction, and palisades. Detailed discussion of each construction phase can be found elsewhere (Hammerstedt 2005b)

Phase 1

During Phase 1, mound construction began and the first palisade was constructed. The Sub-Primary summit structure was clearly domestic based on the presence of refuse-filled pits, hearths, and several large flank middens (Figure 5). These middens, which contained primarily animal bone, do not appear to be related to feasting since all parts of deer are heavily represented and many of the long bones were purposefully smashed to extract marrow. The construction of the initial palisade indicates a need for a social or defensive boundary surrounding the mound and at least some of the village (Figure 6).

It is likely that a particular individual or local kin group had risen to local prominence and took up residence on top of the mound. The construction of the Sub-Primary mound both literally and figuratively elevated these people above their neighbors.

The presence of Ramey Incised pottery, sometimes argued to have ideological value in the American Bottom (e.g., Pauketat and Emerson 1991), is unsurprising in these contexts. However, its importance was likely linked simply to the fact that it was a tradeware from a distant region and did not have the same ideological meaning to the residents of Annis as it did to people near Cahokia. Further, while plates are not well represented in the sample, a number of pans are present. Pans were not always used for the evaporation of brine in salt-making; the smaller examples could have been used for serving or food preparation. Usewear on one vessel from the Julien site in Illinois indicates that it was used for parching (Milner 1984); this is backed up by other archaeological and historic references (Adair 2005:399; Brown 1980:28-30; Lewis and Kneberg 1946:90; Lewis, et al. 1995:104; Milner 1984:153; Thruston 1890:159).

The construction of the initial palisade represented a need for local defense and perhaps a local social boundary. There is no evidence for bastions or ditches associated with this palisade, however, a significant amount of labor would have been required to cut the trees, transport them, and lift them into place. Perhaps more importantly, construction of the palisade would have pulled people away from important subsistence tasks.

Phase 2

The village and mound were enlarged during Phase 2. A second palisade was built, enlarging the enclosure to around 0.75 ha (Figure 10). The mound nearly doubled in size, covering the old Phase 1 palisade, and a substantial summit structure was constructed and surrounded by a fence (Figure 9). All available evidence points to a non-residential function for this structure: few artifacts, no pits, fire-related features only, and substantial architecture. It is unclear where the local elite, presumably a chief and his or her relatives, lived at this time. There are a number of structures located near the mound that are possibilities. One of these, Structure 10, was adjacent to the mound and contained a cache of marine shell beads and blanks covered by potsherds (Figure 14).

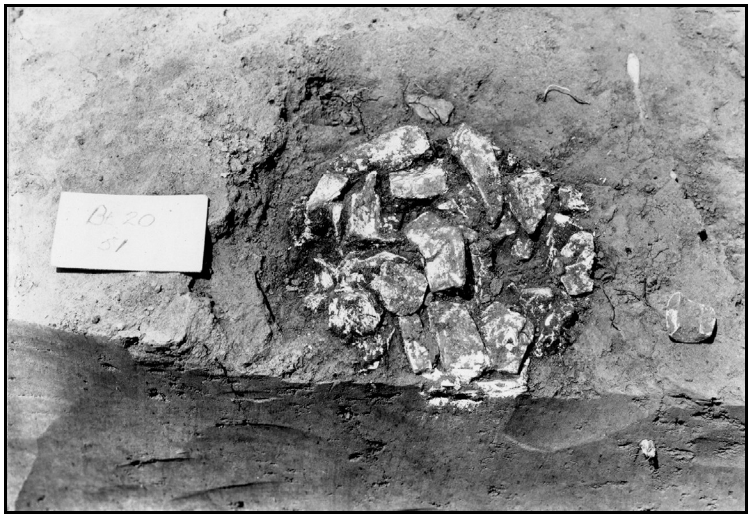

Figure 14a. Marine Shell Bead Cache in Situ (Courtesy William S. Webb Museum of Anthropology, University of Kentucky. UKMA 4064).

Figure 14b. A Sample of the Beads (top row) and Blanks (bottom row). (Bt20-FS152).

The summit structure at this stage was likely a building used for ritual activities, presumably by a limited number of the local population. The fence would have screened the activity taking place atop the mound from view. Similar fences on mound summits or slopes have been described by European explorers and found at several sites, including Angel, Bessemer, Cahokia, Etowah, Lake George, Towosaghy, and several in the Savannah River valley (Anderson 1994; Black 1967; DeJarnette and Wimberly 1941; Larson 1971; Price and Fox 1990; Smith 1969; Swanton 1911; Williams and Brain 1983).

These have generally been referred to as “temples” or “council houses” in the literature. However, as mentioned above, no burials or obvious internal features, such as prepared clay platforms or seats, were recorded. Nevertheless, this building likely served some unknown, but important, public or community function.

It is possible that at this time the people living at Annis chose a more group-oriented council form of leadership rather than relying on a single individual. Presumably local elites were still in residence, but they no longer lived on the mound summit. Their chief responsibility may have been to carry out ritual functions atop the mound.

Phase 3

The final expansion of the site is perhaps the most intriguing for several reasons. First, the mound increased in height by over 2 m above the Primary mound (Phase 2), and clear evidence for a domestic dwelling with more complex architecture (wall trenches, a doorway, and partitions) is present (Figure 11). Third, the surrounding village continued to grow and a third palisade with a single bastion was constructed (Figure 12).

It seems clear that at this time there was a return to a society in which a chief was given greater attention than the other residents. This perhaps could be a shift from the Phase 2 council-style form of leadership to one dominated by a powerful chief who took up residence atop the mound. Alternatively, another group took over possession of the site after a period of abandonment. The latter scenario has been suggested for the Mississippian occupation at Andalex in nearby Hopkins County (Clay in Niquette, et al. 1991) but is doubtful at Annis since the sequential palisades are neatly nested rather than overlapping.

Regardless, whoever was living on the mound wanted to make a clear statement of their authority. By recapping the mound, the chief established a purifying tie with the earth, an act believed to be a major symbolic aspect of Mississippian religion and ritual (Knight 1986). Further, by reestablishing a residence on the mound he/she placed themselves on a far different plane, both symbolically and literally, than the rest of the local villagers. The structure is also significantly larger than the average village structure (the Phase 3 summit structure covers 105 m^2 and the mean for village structures is 35 m^2) (Figure 15), thus indicating another attempt to distinguish the chief from the average villager.

The palisade again required a major labor investment. The village reached its largest area during Phase 3 and the presence of a bastion indicates that some degree of conflict existed in the area. However, one bastion alone would not provide sufficient protection against an attacking group; certainly not the same level of defense that would have been possible at other western Kentucky sites, such as Jonathan Creek (Webb 1951) and Morris (Rolingson and Schwartz 1966), that possessed palisades with evenly spaced bastions. The Annis Village bastion faces out into a wide, flat area and may have served as a fortified gate or as a watchtower to provide an early warning system to people working in the nearby fields as well as a line of defense.

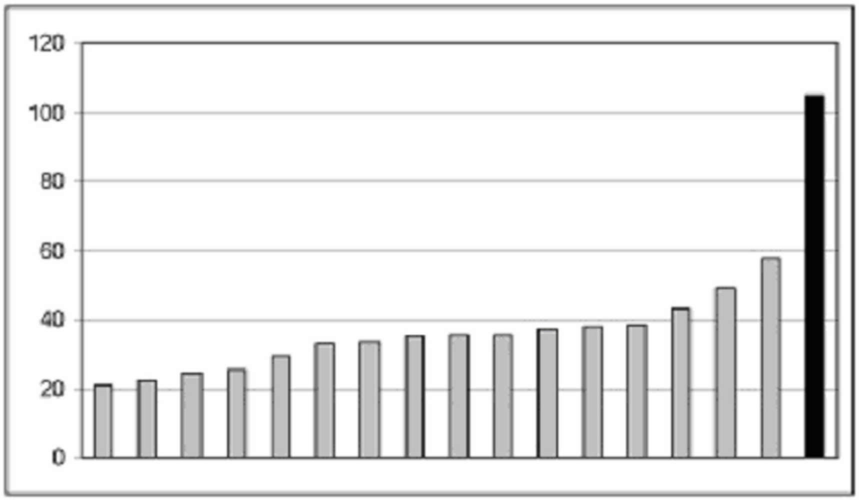

Figure 15. Structure Area Comparison. Individual Village Structures are Gray, Secondary Mound Structure is Black. Scale is in Square Meters.

Summary

To recap my interpretation of the shifting social situation at Annis, then, let me offer a few remarks. During Phase 1, we see a local leader with enough influence to have a low mound constructed and a substantial, if small, palisade built. During Phase 2, the use of the mound shifted to a non-domestic, presumably ritual, purpose. A large structure enclosed by a fence was built atop the mound and a second, larger palisade was built around the expanding village. Evidence for a local elite in residence is not clear, although they might have occupied adjoining houses, such as Structure 10 with its marine shell bead cache. Finally, during Phase 3 the mound was significantly enlarged and again served a domestic function. This may have been an attempt by a new, perhaps unrelated, leader to exert influence and legitimize their position by symbolically recapping the mound. The significantly enlarged palisade indicates some level of local stress, an additional attempt to illustrate the power of the chief, or both.

Each of these construction phases would have required the mobilization of a considerable amount of labor. The degree to which this labor would have interfered with daily subsistence tasks would have varied with the intensity of the construction. If a crisis required the palisade to be erected quickly the labor would be more focused, hurried, and disruptive. However, if circumstances permitted it to be constructed in a more leisurely fashion, the impact on the local population would have been lessened.

Mound construction would have had less of an impact than the palisade. Even if the various mound stages would have been raised fairly quickly, only a few days to a week of labor would have been required to complete the task with an similar amount of time required to construct the various forms of summit architecture.

ANNIS VILLAGE IN A REGIONAL PERSPECTIVE

A number of researchers have contributed to the understanding of the regional settlement dynamics of western Kentucky. Most of this work has taken place in the Ohio-Mississippi Confluence region (e.g., Clay 1997; Kreisa 1990, 1995; Wesler 2001 among others). Albeit with somewhat differing interpretations, these researchers have developed models for the interaction and integration of various mound sites in the region and their degree of independence from larger sites such as Kincaid and Angel.

Unfortunately, at this point it is difficult to place Annis Village into a more comprehensive regional perspective. This is partly because the Green River Mississippian is poorly known despite a significant (and growing) body of data. Sites within the Western Coalfields section of the Green River drainage include Eaton (Hanson 1959), Kirtley (Rolingson 1961), Morris (Rolingson and Schwartz 1966), and Martin Mound (Milner and Smith 1986). Kirtley and Morris are small sites that seem to date to AD 1000-1300 (Lewis 1990), somewhat earlier than the major occupation at Annis. The nearby Martin Mound (15Bt1), a stone box burial mound excavated by the WPA, promises to provide important information on burial treatment and chronology in the area and is the focus of an upcoming Penn State project.

Not including Martin, the nearest mound site is Andalex, located 56 km away (Figure 16). Closer to Annis, there are Mississippian houses scattered along the Green River, often superimposed on Archaic shell middens: areas of especially fertile soil. Until more work is done in this area, it is not possible to fully understand how Annis Village fits into a broader regional context or the processes that drove the sequence of cultural change at the site. It is perhaps part of broader patterns seen in this part of the mid-South and Midwest as suggested by the eventual abandonment of the site and the surrounding area.

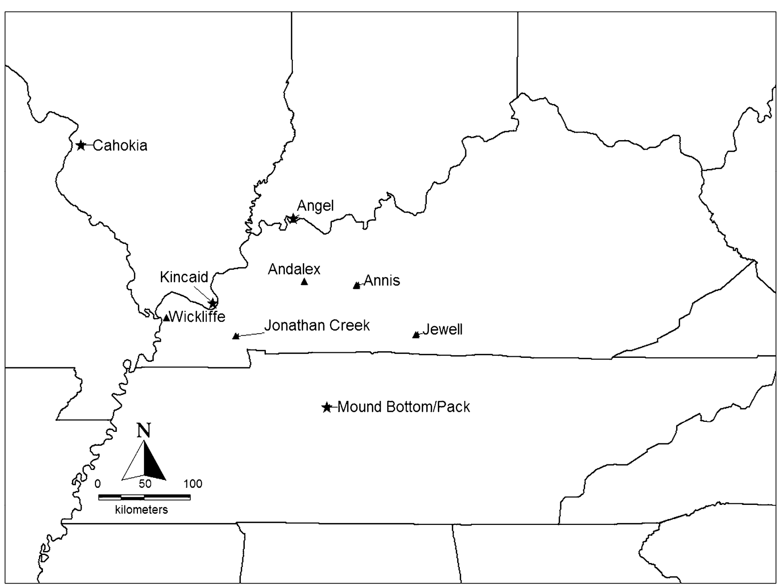

Figure 16. Location of Andalex and Selected Nearby Sites. Stars Represent Major Sites Triangles Represent Smaller Sites.

ACKNOWLEDGEMENTS

Funding for this project was provided by the Pennsylvania State University College of the Liberal Arts Research and Graduate Studies Office, the Department of Anthropology's Hill Fellowship, and the Department of Continuing Education. I would like to thank Carroll and Doris Tichenor for serving as gracious hosts, allowing several Penn State field schools to excavate at Annis (under the direction of George R. Milner and myself), and preserving the site for all these years. Finally, Rich Burnette drew the sherds in Figure 8 and George Milner made helpful comments on an earlier draft of this paper.

FOOTNOTES

[1]All of the WPA collections and documents are curated at the William S. Webb Museum of Anthropology at the University of Kentucky.

[2]I have described the mound stages and their contents in more detail elsewhere (Hammerstedt 2005a, b).

[3]It is not yet possible to sort out which village structures belong to each phase of site expansion. However, a number of them were in the same place for some time as indicated by rebuilding episodes at the exact same location.

[4]All directions used in this paper refer to grid orientation not magnetic orientation.

[5]The Ramey and Powell sherds from Annis are mentioned by Milner (1990:25) as UKMA collections from "along the lower Ohio River and its tributaries".

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ANGELLY PHASE MOUND CONSTRUCTION AT JONATHAN CREEK

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ABSTRACT

The Mississippian-era mound and village site of Jonathan Creek was partially excavated from 1940 to 1942. On-going studies of the collections, maps, photographs, and notes are providing new insights into the life history of a small mound at the site. The events that occurred on the mound are reconstructed with reference to architecture, earth moving activities, mortuary activities, associated features, and an AMS radiocarbon date, and indicate a substantial Angelly Phase presence.

INTRODUCTION

Antiquarians and archaeologists working in the Eastern Woodlands of North American during the nineteenth- and early twentieth-century concentrated their interests and efforts on documenting visually prominent ancient earthworks, many of which subsequently were destroyed as a consequence of development and reservoir projects while others were preserved as part of our national heritage. Such eminent sites have lent their names to local phases and regional archaeological cultures, and some have even reached a level of prominence that extends beyond the disciplinary confines of anthropology. Today, the names of many of these sites, like Cahokia, Angel, and Wickliffe, are sprinkled across the pages of introductory archaeology textbooks, reverberate in lecture halls at college campuses across the country, and resonate among New Age adherents.

Early efforts to classify and describe these sites and their material culture led to the establishment of inferential frameworks that persist in popular publications and even scholarly reviews. But, in a number of cases, the original archaeological interpretations were based on impressions of the evidence or on analyses of small and often biased samples of artifacts, especially pottery. Even when more comprehensive analyses were conducted, they were carried out within the explanatory standards of the times, which emphasized classification and description, functionalism, culture history, and chronology building (Trigger 1989; Willey and Sabloff 1993). In particular, the short chronology that existed prior to the first applications of the radiocarbon technique led many archaeologists to base their inferences about archaeological materials on analogies with living or ethnohistorically documented Native Americans with the result that regional similarities and differences in material culture traits often were explained by invoking relatively simplistic notions of migration and diffusion (e.g., Webb 1952; Kluckhohn 1936; Rouse 1958).

Today, we have many new methods of analysis, expanded typologies and classification systems, and fresh questions to apply to our investigations of ancient Mississippian societies. Inferential frameworks that involve a consideration of the diversity of chiefdoms, the nature of relations among potential rivals and allies, the actions of individual leaders, shifting landscapes of power, population movements, and the impact that all of these can have on the establishment of communities and their evolution over time have come to replace old normative and culture-historical models of chiefdoms, diffusion, and migration. Collections that would be impossible to duplicate today sit on the shelves of museums, universities, and research institutes. Over the past decade or more, many archaeologists have turned their attention to these old collections, often linking their efforts with new fieldwork targeted at acquiring specimens that were not routinely collected a century ago, expanding the coverage of old projects, and obtaining controlled samples of artifacts (e.g., Hammerstedt 2005; King 2003; Milner 1998; Schroeder 1997, 2005; Welch 2006). These reinvestigations are changing our perceptions of many of these prominent places, even though inferential ambiguities may still arise from the available evidence.

The Jonathan Creek site may not appear on the pages of introductory text books, but it is one of those places that has taken on iconic significance in the archaeology of the lower Tennessee, Cumberland, and Ohio valleys and the central Mississippi Valley, lending its name to an archaeological phase (Butler 1991; Clay 1979, 1997) and being referred to in most publications on the Mississippian Period in the Ohio Confluence region and western Kentucky (e.g., Butler 1991; Clay 1979, 1997; Cobb and Butler 2002; Lewis 1986, 1990, 1991, 1996; Moore 1915; Pollack 2004; Wesler 2001). My ongoing research on the collections, maps, notes, and photographs from this site is directed at refining the occupation history of the site and clarifying its role in the dynamic regional Mississippian sociopolitical landscape. In this paper, I focus on the events surrounding the construction, use, and abandonment of a small mound at Jonathan Creek. The ceramic assemblages from two major contexts -- mound fill and an associated trash pit -- and a radiocarbon date on charred wood that was part of the mound summit architecture provide some insights into the nature and timing of these activities.

HISTORY OF INVESTIGATIONS AT JONATHAN CREEK

Jonathan Creek was a prominent community along the lower Tennessee River in Mississippian times (*c.* A.D. 1000-1500). The site was first documented in the late nineteenth-century by a geologist, Robert Loughridge (1888:193), who identified six earthen mounds arranged around an open plaza, a layout similar to other town-and-mound centers in the Eastern Woodlands (Figure 1; Lewis and Stout 1998). A seventh mound was identified in the floodplain of Jonathan Creek, but its relationship to the other mounds at the site is unclear. C. B. Moore also stopped at the site in the early twentieth-century, referring to it as the Henson Place, and reported that the mounds had been severely impacted at that time by more than a century of plowing (Moore 1915). When his test excavations failed to turn up any artifacts, he moved on.

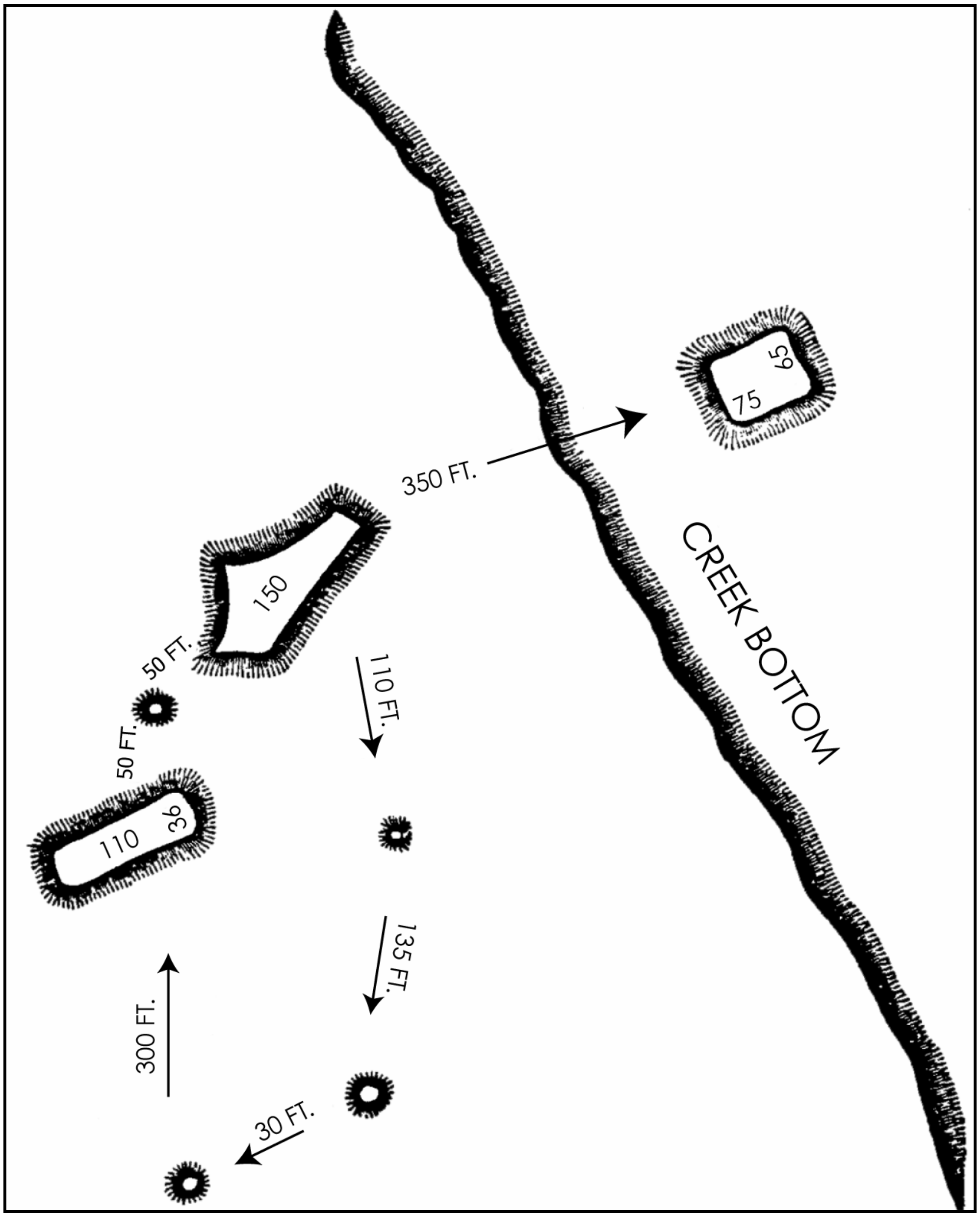

Figure 1. Loughridge's (1888) Map of the Jonathan Creek Site.

In the late 1930s, the federal government authorized the construction of a dam along the Tennessee River about 25 km north of Jonathan Creek that eventually submerged the site beneath the waters of Kentucky Lake. Mitigation excavation of the site began in the fall of 1940, but the project was prematurely terminated in the spring of 1942 when the Civilian Conservation Corps (CCC) laborers and site supervisors were mobilized for World War II. The archaeologists involved with the project were able to excavate the mound in the floodplain and the southern portions of the site, encompassing the two small mounds that appear at the bottom of Loughridge's map (Figure 1). In addition to the mounds, the CCC excavations uncovered eight separate walls constructed around the ancient community and 89 structures built in a variety of architectural styles including single-post circular structures, single-post square or rectangular structures, wall-trench structures, and pithouses – basins with interior wall trenches (Figure 2). Elsewhere, I have suggested that the community of Jonathan Creek grew over time and, as the town expanded, a dramatic reorganization of space was undertaken (Schroeder 2005, 2006). This included a transformation of secular space into a sacred ritual precinct by the construction of a small mound that was the nucleus of mortuary ritual and other activities, a process that may be linked to the ascent and expansion of chiefly leadership strategies and power at Jonathan Creek.

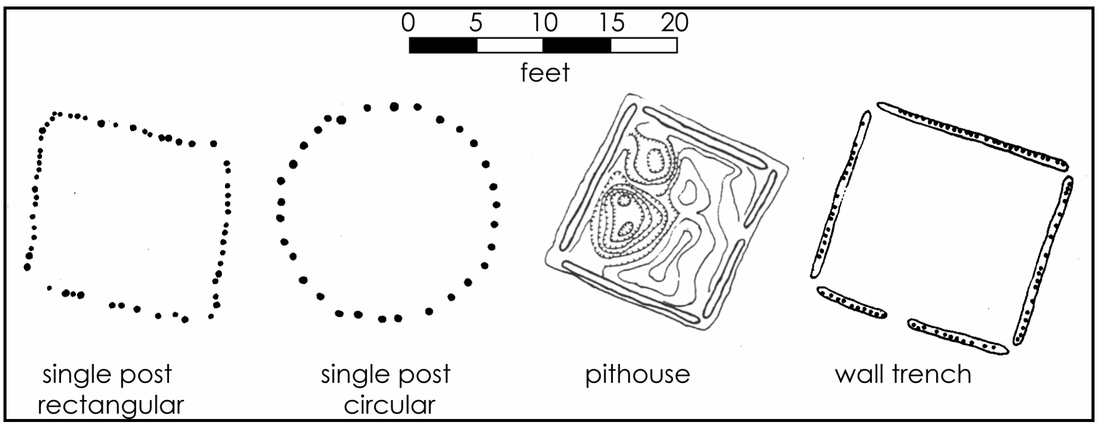

Figure 2. Structure Types at Jonathan Creek (adapted from Webb 1952:54, 57).

JONATHAN CREEK ARTIFACTS AND ARCHITECTURE

A brief report on Jonathan Creek was published in 1952 that has remained the definitive work on the site (Webb 1952). Unfortunately, the report is incomplete in its treatment of both features and artifacts. The material cultural analyses in the report are based on a very small fraction of the roughly 134 cubic feet of objects recovered during the excavation. Only 150 stone artifacts (Webb 1952:87) and 2,685 ceramic sherds and other items (Webb 1952:109) were tabulated in the report. Moreover, the contexts from which the inventoried objects came are not known, except that the ceramics did not come from the plowzone.

Attempts to determine the contexts of artifacts have been further complicated by the feature numbering system used in the field. Because of the large size of the site, it was divided into 5 separate excavation blocks, designated A-E (Figure 3). Only units A, B, and C are outlined on Figure 3. The excavations in Units D were conducted to the south and the Unit E excavations encompassed the mound in the floodplain. Within each excavation block, feature numbers were assigned beginning with the number 1. This led to considerable duplication of feature numbers that has frustrated all the researchers who have tried to work with these materials (e.g., Wolforth 1987). Furthermore, catalog numbers, which were assigned to only a small proportion of the materials retained from the excavation, also were duplicated from one excavation unit to another. Rim sherds and other diagnostics were pulled from their original bags and curated separately, often without catalog numbers and sometimes without any designation of the excavation unit from which they were recovered. Finally, most of the artifacts from the excavation were not washed until the mid- to late-1990s. These circumstances complicated previous attempts to determine the spatial distribution of trash across the site and to use temporally distinctive ceramic types to tease apart the construction sequences at the site.

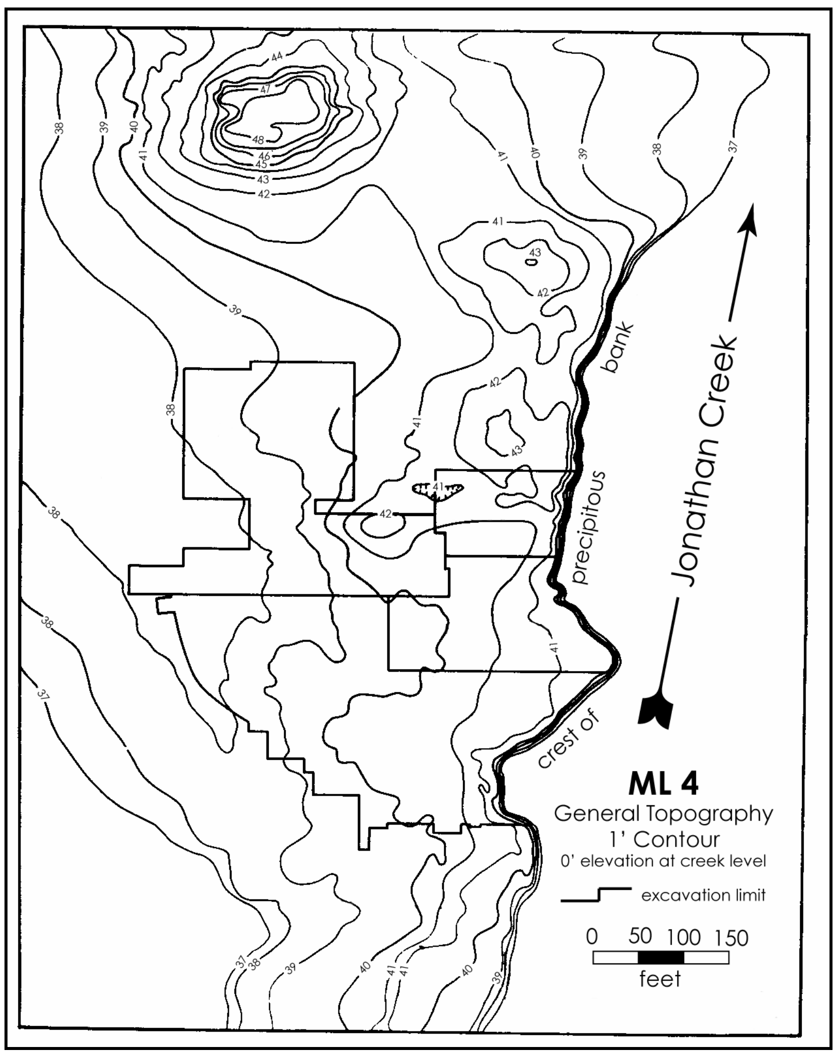

Figure 3. Topographic Map of the Jonathan Creek Site Showing Excavation Units (adapted from Webb 1952:11).

Because of the difficulties posed by the incomplete artifact inventory and the lack of stratigraphy at the site, previous researchers and I initially relied on architectural relationships to draw inferences about chronology at the site, and then supplemented this approach with analyses of samples of ceramics. According to Webb (1952:70-74), the first residents of the community lived in wall-trench structures and pit houses. Later, Webb suggested that a second occupation of the site started out small, by people who lived in the square single-post structures. However, I have found that Webb's characterization of wall trench houses as early and single post structures as late cannot be supported by the field notes and maps (Schroeder 2005), a point also made by Berle Clay more than 25 years ago (Clay 1979). Clay went on to suggest that the pithouses at the site might represent a second and much later occupation of the site. However, Lynne Wolforth (1987) was unable to confirm this proposition when she conducted a comparative study of ceramics associated with pithouses and structures made in other architectural styles. In short, the origins of structure architectural variability are ambiguous, but do not appear to be solely a consequence of time.

A CONVENTIAL VIEW OF THE CERAMIC CHRONOLOGY AT JONATHAN CREEK

Occupation histories of sites in the Eastern Woodlands have, more commonly, been accessed through reference to ceramic assemblages. For sites excavated prior to routine application of the radiocarbon dating technique in the 1950s, pottery generally is the only source of information that can be used to determine chronological placement. Building on the work of Phillips, Ford, and Griffin (1951) in the Lower Mississippi valley, R. Berle Clay developed a ceramic chronology for the Lower Tennessee and Ohio River confluence region (1963, 1979; also see Butler 1991; Muller 1986:183-185) that was based on his analysis of excavated assemblages from two distinct and stratigraphically separated deposits at the Tinsley Hill Site, which is situated along the Cumberland River at a distance of 26 km northeast from Jonathan Creek. Clay defined the Jonathan Creek Phase on the basis of the earlier assemblage and the Tinsley Hill Phase on the basis of the later assemblage. He noted a gap between the two phases, later designated as the Angelly Phase, which was characterized on the basis of excavated assemblages from three sites in the Black Bottom of the Ohio Valley (Riordan 1975). Clay and Brian Butler have since refined the associated dates (Butler 1991; Clay 1997). In the sequence presented by Butler (1991:266-267), the Late Woodland Douglas Phase spans A.D. 850-1000. Douglas Phase ceramic assemblages are dominated by plain sherds tempered with grog, with some cordmarked grog-tempered ceramics, and plain, polished, or slipped sherds tempered with grog and shell also occurring (Butler 1991: 266; Muller 1986:143-144). The Douglas Phase does not appear to be represented to any substantial degree in the assemblage from the Jonathan Creek Site. The first fully Mississippian phase defined in the sequence is the Jonathan Creek Phase, which Butler dates to *c.* A.D. 1000-1100/1150. The Angelly Phase is pretty securely dated to A.D. 1200-1300, although Clay (1979:19) has indicated that it probably starts somewhat earlier, *c.* A.D. 1150, closing the gap between it and the Jonathan Creek Phase in Butler's chronology. The Tinsley Hill Phase dates to A.D. 1300-1450. The final phase in the sequence, Caborn-Welborn, continues into the early historic era and is spatially confined to the confluence of the Ohio and Wabash rivers (Pollack 2004). No distinctive Caborn-Welborn materials are present in the Jonathan Creek collection and so this phase is not discussed further.

Ceramic assemblages associated with each of the Mississippian phases relevant to the Jonathan Creek site (Jonathan Creek, Angelly, and Tinsley Hill) are dominated by shell-tempered pottery with plain surfaces (Mississippi Plain and Bell Plain types together account for 90%+ of all assemblages; Clay 1963; Wolforth 1987). In terms of other kinds of surface treatments, all phases have modest amounts of fabric impressed sherds (Kimmswick Fabric and Tolu Fabric) and small numbers of sherds with a red film on the surface (Old Town Red or Varney Red). Jonathan Creek Phase assemblages stand out as distinctly different from both Angelly and Tinsley Hill Phase assemblages because of the absence of other kinds of decoration, such as incising and painting. However, decorated sherds constitute less than 2% of the total ceramic assemblages for both Angelly and Tinsley Hill phases (Clay 1979:116; Pollack and Railey 1987:94; Wolforth 1987:103; see also Hilgeman 2000:222 for Angel; Wesler 2001:81-82 for Wickliffe). Notably, when assemblage size is small there is a good chance that decorated sherds will not be present, a point also made by Butler (1991) and Clay (1997). Consequently, decoration may not be the most appropriate attribute to rely on when trying to determine the phase, or phases, represented at a site, unless tens of thousands of sherds from contemporaneous contexts are available.

One ceramic attribute that archaeologists working in the region have found to be more temporally useful than surface treatment is handle form (Butler 1991; Clay 1963, 1979; Hilgeman 2000:125-163, 212, 214-215, 218; Orr 1951:331; Phillips, et al. 1951:152; Pollack and Railey 1987; Riordan 1975; Smith 1969; Wesler 1991). Loop handles are found on some jars associated with Early Mississippian Jonathan Creek Phase assemblages, while loop and strap handles occur in roughly equal numbers in Angelly Phase jar assemblages, and wide strap handles dominate Tinsley Hill Phase jar assemblages (Butler 1991:266; Hilgeman 2000; Phillips, et al. 1951; note: Hilgeman 2000:129, 215 associates loop handles [thickness:width = 0.75-1.0; Hilgeman 2000:129] with A.D. 1100-1200, strap handles [handle thickness:width = 0.1-0.38; Hilgeman 2000:129] with A.D. 1300-1450, and two types that are intermediate between loop and strap [handle thickness:width = 0.39-0.74] with A.D. 1200-1325 at the Angel Site in Indiana).

Furthermore, the presence of certain vessel types may also be helpful. Jars, bowls, and pans occur in all phases, while hooded water bottles are associated with Angelly Phase and, to a lesser extent, Tinsley Hill Phase assemblages. Plates are also found in Angelly Phase and Tinsley Hill Phase assemblages. Long- and short-neck bottles are found in Tinsley Hill Phase assemblages. Finally, the metrics of certain vessel types change over time as well (e.g., the width of plate rims increases over time, etc.) and may be useful for creating chronological sorting of assemblages.

Prior to my work with the collections, the largest number of sherds to be systematically examined from the Jonathan Creek Site is 2,758, of which 44 (1.6%) were painted or incised (Wolforth 1987:103). In Clay's (1963) analysis of a smaller sample of 622 sherds from Jonathan Creek, he found no incised or painted sherds. In the assemblage analyzed by Webb (1952) only 0.2% of the sherds were incised or painted. These and other archaeologists, who have looked at the Jonathan Creek collections to draw an impressionistic assessment of the ceramic assemblage, have commented on the abundance of plain, shell-tempered sherds, which characterizes all Mississippian phases in the region, especially when small sample sizes are examined, and they have all concluded that the major occupation of the site occurred during the early Mississippian Jonathan Creek Phase (Butler 1991; Clay 1979, 1997; Wolforth 1987). The majority of the handles illustrated in Webb's report (1952:97, 101-102) are loop handles, also supporting the Early Mississippian characterization of the assemblage. However, everyone with an interest in the site also has noted that there was a later occupation (Clay 1979:117; 1997:23; Wolforth 1987:117), which is represented by small numbers of the incised sherds, slipped, painted, and negative painted sherds, hooded water bottles, bottles, and plates (see Webb 1952 for illustrations of some of these) that are considered characteristic of the Tinsley Hill Phase, although most of these attributes are also present in Angelly Phase assemblages.

In brief summary, the conventional view of the Jonathan Creek site has been that it was a substantial Early Mississippian, Jonathan Creek Phase, town, occupied sometime between A.D. 1000 and 1100/1150, deserted for a period of time, and then reoccupied after A.D. 1300, during the Tinsley Hill Phase, by a small group of people who abandoned the site by A.D. 1450 (Butler 1991; Clay 1979, 1997; Wolforth 1987).

A SHORT HISTORY OF A SMALL MOUND: AN ALTERNATIVE VIEW OF THE OCCUPATION HISTORY OF JONATHAN CREEK

THE SMALL MOUND

My recent analysis of materials from Jonathan Creek does not support the conventional view of the occupation history of the site and instead indicates a substantial presence during the Angelly Phase (Schroeder 2006, 2007). At this time, I cannot address the nature of the occupations at the site during the Jonathan Creek and Tinsley Hill phases, but as work on the collections progresses, the complex history of the site should become clearer. My inference of an Angelly Phase occupation is well demonstrated by the sequence of activities in an area of the site where a substantial amount of structure rebuilding and spatial reorganization occurred (Figure 4). In this part of the site, there was a small mound with three large, superimposed, and overlapping wall-trench structures on its summit (Features 30, 31, and 37), which archaeologists excavated in arbitrary levels. Two of these (Features 30 and 31) are the largest buildings excavated at the site. Grouped together nearby were more than a dozen burials, most with their heads oriented to the west. Based on Webb's (1952) report, it seems that he did not recognize the existence of this small mound, and may not have been familiar with the field notes, photographs, and profile maps produced during excavation of the site area that encompassed the mound.

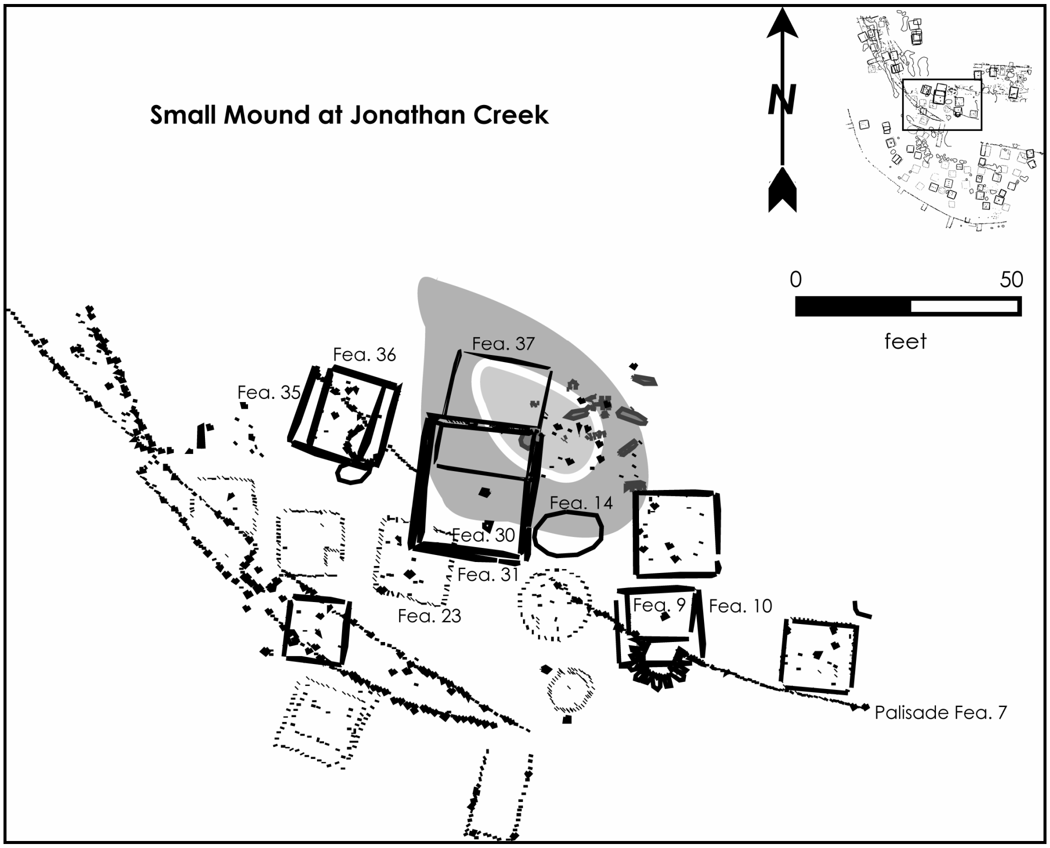

Figure 4. Map of Small Mound and Nearby Walls and Architectural Features.

Among the first structures built in this portion of the site were several wall trench houses (Features 9, 10, 35, and 36). After these houses had been dismantled, palisade Feature 7 was constructed across this area. A single post structure (Feature 23) also was built in this area, but how it relates in time to palisade Feature 7 and wall trench house Features 9, 10, 35, and 36 is unknown. It is clear, however, that sometime after Feature 23 was abandoned and after palisade Feature 7 had been dismantled, a low earthen mound was constructed in this area, covering over a burial of a single individual and a post-mold containing a fragment of a Ramey knife made of heat-treated Mill Creek chert. The burial of a single individual, deposition of the Ramey knife, and subsequent initiation of mound construction signal a dramatic change in the activities conducted in this part of the site from secular and domestic to ritual and sacred. The mound was topped by a wall-trench structure (Feature 37), which was used for a time, dismantled, and then replaced by a larger wall trench structure (Feature 30). This second wall-trench structure was destroyed by fire. It was replaced by a third wall-trench structure (Feature 31) that was constructed on the exact same spot, perhaps after adding a thin layer of earth to the mound. This third wall-trench structure also burned and was never again rebuilt. The fires that destroyed the two final structures built on top of this mound may have been accidents, or they may have been set intentionally after a decisive defeat in battle or upon the death of a particularly beloved leader as depicted in a sixteenth-century engraving of Timucua Indians mourning a dead chief (LeMoyne in Laudonniere, quoted in Fundaburk

1958:102). Or, the fires may have been set by enemies intent on destroying a symbol of leadership and desecrating the burial place of revered ancestors (see similar descriptions for Pacaha, Cofitachequi and Anilco in Varner and Varner 1951:292-293, 437-438, 493). Whatever the reasons for the destruction, and they are not entirely clear, the last conflagration signaled the end of the use-life of the mound and the possible beginnings of site abandonment.

AN ASSOCIATED MIDDEN PIT

On the south slope of the small mound, excavators encountered a large trash pit (Feature 14), described in the field notes as having layers of rubble, charcoal, ash, and red-fired streaks, but excavated as a single unit. The collections from Feature 14 are dominated by ceramics, but the field notes also describe large quantities of lithics and some animal bone, most of which were discarded in the field. At sites elsewhere in the Southeast, archaeologists have noted that large refuse pits associated with mounds may be the consequence of activities conducted on the mound and tend to have distinctive regional or site-specific patterns of location (Smith and Williams 1994). For example, at sites across the northern half of Georgia archaeologists found a consistent pattern of mound slope midden features on the northeastern side of mounds, which they have interpreted as the consequence of domestic, feasting, renewal events, other ritual activities conducted on the mound summit, or noted may relate to a desire to have fetid piles of waste downwind from mound-top residential structures or away from the plaza (Smith and Williams 1994:32-34).

CERAMICS

Six-thousand one-hundred and eighty-eight fragments of pottery, including 311 rim sherds (Table 1, Table 2), were recovered from the layers of mound fill, mound structures, and the large trash pit (Feature 14) on the south slope of the small mound. In terms of temper, coarse sized shell temper, associated with the Mississippi paste type, clearly dominates the assemblages (Figure 5). Bell paste, with fine fragments of shell, less than 1 mm in size (Phillips, et al. 1951:122), constitutes a smaller percentage of the assemblages. Other temper types, such as grit, grog, grit-grog, and temperless pastes, were recovered in small numbers from the mound fill and Feature 14. The ceramic assemblage from the mound stands out for having a higher percentage of fine shell temper and a lower percentage of coarse shell temper than the trash pit, and for having a higher diversity of temper types than the assemblage in the trash pit. Based on temper, the ceramic assemblages from the mound fill and trash pit resemble what would be expected in any Mississippian ceramic assemblage in the region, with a higher representation of fine wares in the mound fill.

When surface treatments between the two assemblages are compared, no significant differences are apparent -- the ceramics in the mound fill and trash pit Feature 14 are dominated by plain and eroded surfaces and other kinds of surface treatments, including red, brown, buff, and black slips, decorated sherds (incising with a plain, black, or eroded surface), negative painting, polished surfaces, fabric impressed, and modeled effigy

Table 1. Summary Data for Rim Sherds from the Small Mound and Associated Pit Feature 14.

FEA. 14 PIT RIMS

TEMPER	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Grog	-	-	-
Fine Shell[1]	26	233.1	12.15
Coarse Shell[1]	188	3756.1	87.85
TOTAL	214	3989.2	100.00

SURFACE	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Plain	129	1822.2	60.28
Red, Brown	3	61.5	1.40
Black	16	426.0	7.48
Eroded	20	214.8	9.34
Decorated	3	14.1	1.40
Fabric impressed	34	1332.2	15.89
Black and buff	1	13.5	0.47
Buff slip	-	-	-
Polished	4	51.7	1.87
Unknown	4	53.2	1.87
TOTAL	214	3989.2	100.00

VESSEL TYPE	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Mississippian Jar	138	2058.4	64.48
Bowl	16	283.4	7.48
Hooded Bottle	5	78.2	2.34
Pan	52	1557.9	24.30
Bottle	1	6.3	0.47
Plate	2	5.0	0.93
TOTAL	214	3989.2	100.00

MOUND RIMS

TEMPER	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Grog	1	4.2	1.03
Fine Shell[1]	28	159.7	28.87
Coarse Shell[1]	68	1388.3	70.10
TOTAL	97	1552.2	100.00

SURFACE	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Plain	66	1177.3	68.04
Red, Brown	1	53.3	1.03
Black	1	0.8	1.03
Eroded	21	146.6	21.65
Decorated	-	-	-
Fabric impressed	5	103.1	5.15
Black and buff	-	-	-
Buff slip	1	9.9	1.03
Polished	-	-	-
Unknown	2	61.2	2.06
TOTAL	97	1552.2	100.00

VESSEL TYPE	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Mississippian Jar	55	1075.6	56.70
Bowl	21	145.9	21.65
Hooded Bottle	4	151.2	4.12
Pan	9	156	9.28
Bottle	3	7.3	3.09
Plate	5	16.2	5.15
TOTAL	97	1552.2	100.00

[1] Both the Fine Shell and Coarse Shell categories include some sherds with grit or grog or grit-grog mixed in with the shell

Table 2. Summary Data for Body Sherds from Small Mound and Associated Pit Feature 14.

FEA. 14 PIT BODY SHERDS

TEMPER	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Grit	-	-	-
Grog	11	26.4	0.28
Fine Shell[2]	411	1238.2	10.58
Coarse Shell[2]	3460	18321.7	89.11
Grit-Grog	1	1.9	0.03
No Temper	-	-	-
	-	-	-
TOTAL	3883	19588.2	100.00

SURFACE	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Plain	2024	11236.5	52.12
Red, Brown	17	154.6	0.44
Black	233	2092.5	6.00
Cordmarked	-	-	0.0
Eroded	1388	3463.5	35.74
Decorated	29	212.0	0.75
Negative Painted (Red on Black)	-	-	-
Red slip over cordmarked	10	96.2	0.26
Fabric	166	2121.9	4.27
Modelled effigy	-	-	0.0
Black and buff	3	41.4	0.08
Buff slip	2	45.1	0.05
Polished	8	42.4	0.21
Black and brown	-	-	0.0
Unknown	3	82.1	0.08
	-	-	-
	3883	19588.2	100.00

MOUND BODY SHERDS

TEMPER	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Grit	2	20.3	0.10
Grog	29	112.6	1.45
Fine Shell[2]	508	1956.8	25.48
Coarse Shell[2]	1449	7650.6	72.67
Grit-Grog	4	15.1	0.20
No Temper	1	1.4	0.05
Woodland (grit)	1	5.1	0.05
	1994	9761.9	100.00

SURFACE	COUNT	WEIGHT (g)	RELATIVE ABUNDANCE (% COUNT)
Plain	917	5689	45.99
Red, Brown	23	166.3	1.15
Black	91	616.6	4.56
Cordmarked	1	9.1	0.05
Eroded	824	2279.8	41.32
Decorated	28	161.9	1.40
Negative Painted (Red on Black)	2	2.8	0.10
Red slip over cordmarked	-	-	-
Fabric	48	423.6	2.41
Modelled effigy	6	44.7	0.30
Black and buff	2	51.4	0.10
Buff slip	17	146.4	0.85
Polished	31	160.8	1.55
Black and brown	3	4.4	0.15
Unknown	-	-	-
Woodland (eroded)	1	5.1	0.05
	1994	9761.9	100.00

[2] Both the Fine Shell and Coarse Shell categories include some sherds with grit or grog or grit-grog mixed in with the shell

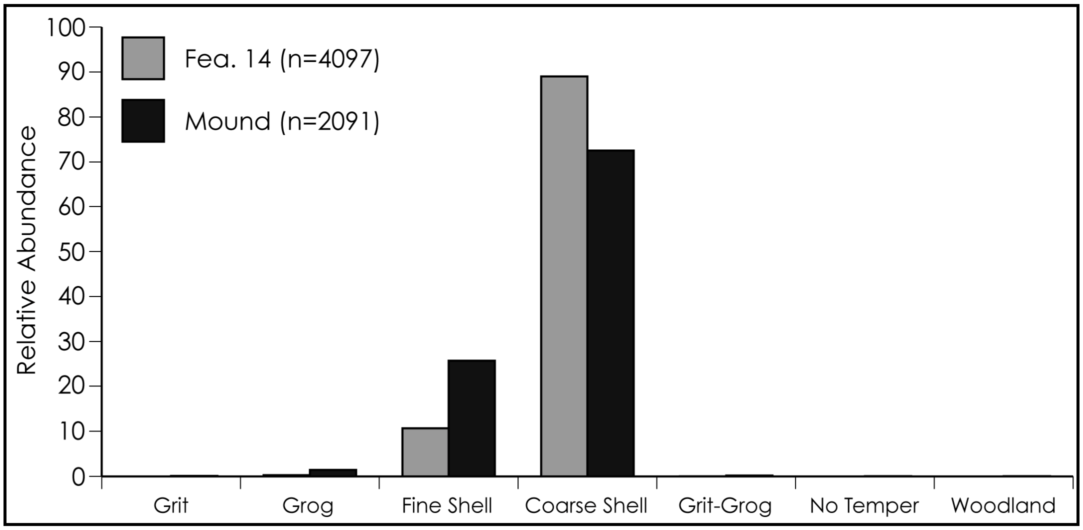

Figure 5. Bar Chart Comparison of Ceramic Temper Types for Fill From Small Mound and Feature 14.

vessels sherds, account for only roughly 13% of each assemblage (Figure 6). Decorated sherds, in particular, account for 0.78% of the Feature 14 assemblage and 1.34% of the small mound fill assemblage. This indicates that these two contexts do not conform to the pattern expected of a Jonathan Creek phase assemblage, in which decoration should be absent. However, the assemblages do match with what would be expected from an Angelly or Tinsley Hill Phase assemblage, with decorated sherds accounting for less than 2% of the assemblage.

The diversity of vessel types recovered from the mound fill and Feature 14 also fit well with the expectations for an Angelly or Tinsley Hill Phase assemblage, with jars, bowls, and pans, which are found in all Mississippian phases, as well as hooded water bottles, plates, and bottles, which are associated with Angelly or Tinsley Hill phase assemblages (Figure 7). Certain vessel types are more common in the mound fill than in the trash pit, particularly bowls, hooded water bottles, bottles, and plates, while typical domestic vessels, like jars and pans, are more common in the trash pit. The handles on jars vary through time in terms of the ratio of handle thickness to handle width. Eleven handles were intact enough to make these measurements and the ratios indicate that loop handles, narrow and wide intermediate handles, and strap handles are present (Table 3). These data are consistent with an assemblage that dates to the Angelly Phase, perhaps with some of the discarded sherds having originated in Jonathan Creek Phase contexts.

In short, the majority of the ceramic data from the small mound and associated trash pit indicate that these features post-date the Jonathan Creek Phase and probably are associated with the Angelly Phase. One final line of evidence lends further support to an interpretation that these features should be associated with the Angelly phase. Wood charcoal from one of the two burned wall-trench structures on top of the small mound was retained by the excavators and, perhaps because of the sudden termination of the project, it was never treated with any kind of preservative. An AMS radiocarbon date was obtained on a sample of the outer rings of one piece of charred wood. This date (Beta-180075, 780±40 BP) calibrates out to a calendrical 2-sigma range of A.D. 1190 - 1290 (1-sigma range of A.D. 1230-1280, intercept = A.D. 1260; Stuiver et al. 1998), spanning the Angelly Phase.

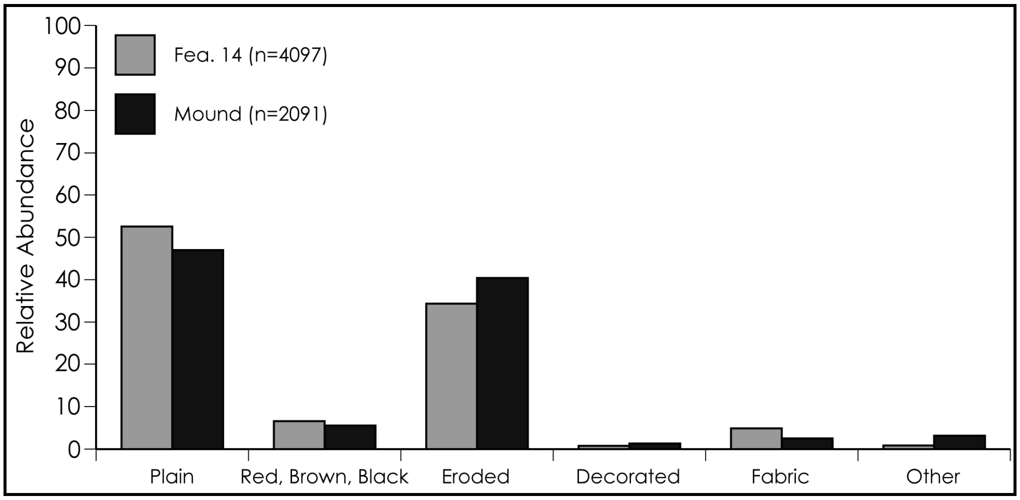

Figure 6. Bar Chart Comparison of Ceramic Surface Treatments for Fill of Small Mound and Feature 14.

The ceramic assemblages from the small mound and Feature 14 also differ in ways that are worth considering. The ceramics from Feature 14 are dominated by jars and pans. In contrast, the mound fill assemblage is dominated by bowls, plates, hooded bottles, and bottles. Fine-shell temper accounts for only 10.67% of the Feature 14 assemblage, while 25.63% of the small mound ceramic assemblage is composed of fine-shell temper. The assemblage from Feature 14 contains 0.78% decorated sherds. Although the numbers are small, the mound fill assemblage has nearly twice the abundance of decorated sherds, with 1.34% of the assemblage consisting of decorated types. Overall, the ceramic assemblage from the small mound is dominated by technological wares and vessel types that are commonly associated with serving and cooking, while wares and vessel types associated with cooking and storage are more abundant in the Feature 14 assemblage (cf. Blitz 1993; Hally 1986; Steponaitis 1983). Certainly, the assemblage from Feature 14 compares fairly well with the quotidian assemblages sampled by Wolforth (1987), who analyzed ceramics from domestic contexts at Jonathan Creek and found relative proportions of coarse-tempered Mississippi wares around 92%, and relative proportions of fine-tempered Bell wares around 7.8%. The ceramic contents of Feature 14 indicate that at least some of the activities that occurred on top of or near the small mound involved the deposition of domestic cooking and storage vessels down the slope of the mound into a large trash pit (note: elsewhere in the Southeast, such refuse pits are not associated with mortuary mounds [Smith and Williams 1994:30], indicating that the relationship between domestic, ritual, and mortuary activities at Jonathan Creek may not have been as clearly separated spatially as at other sites).

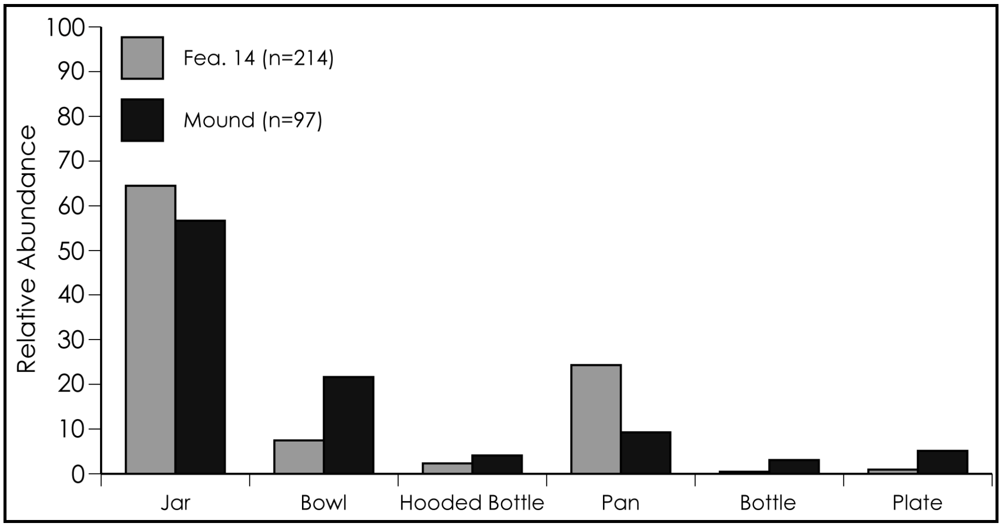

Figure 7. Bar Chart Comparison of Ceramic Vessel Diversity for Fill of Small Mound and Feature 14.

Table 3. Handle Ratios for Jars from Small Mound and Associated Pit Fea. 14

VESSEL NUMBER	HANDLE THICKNESS	HANDLE WIDTH	RATIO	HANDLE TYPE	CONTEXT
53	1.02	2.83	0.36	Strap	Mound
71	1.4	1.7	0.82	Loop	Mound
72	1.2	1.4	0.86	Loop	Mound
73	0.6	1.2	0.50	Wide Intermediate	Mound
74	0.9	1.1	0.82	Loop	Mound
94	0.93	1.14	0.82	Loop	Mound
102	-	1.66	0.00	Unknown	Fea. 14
111	0.75	1.47	0.51	Wide Intermediate	Fea. 14
161	0.8	1.2	0.67	Narrow Intermediate	Fea. 14
291	1.46	1.63	0.90	Loop	Fea. 14
292	1.03	2.7	0.38	Strap	Fea. 14
232	0.84	1.1	0.76	Loop	Fea. 14

SUMMATION

This research clearly demonstrates the potential of old collections to answer new questions and augment our understanding of one significant site in the archaeological literature on the Southeast. The construction, rebuilding, and final destruction of the small mound, its associated trash pit, and other nearby features provided several insights into the occupation history of the Jonathan Creek Site. Webb (1952) suggested that wall-trench houses were associated with an early occupation and single-post structures were part of a later occupation – a proposition that is not supported by my reanalysis of the data. The origins of structural variability at the site are ambiguous, but it is clear that the diversity of structure forms cannot be accounted for by change over time. However, it is also clear that the configuration of the community did shift over time. The district where the low mound is located was, at one time, residential, and at another time it was on the very margins of the town. Later, it was transformed into a sacred space through the burial of an individual, subsequent construction of a mound, and burial of nearly a dozen individuals in the mound. Several stages of rebuilding occurred, at least one in the wake of a major conflagration on top of the mound that destroyed the summit architecture. At least some of the activities that were conducted on top of the mound led to the disposal of trash down the southeast side of the monument. The ceramic debris within the trash pit resembles domestic assemblages elsewhere on the site, while the pottery in the mound fill has more fine wares (Bell paste), a higher diversity of vessel types, and more bowls and plates than were found in the trash pit. The differences between these two assemblages may indicate that at least some of the activities conducted on the mound did not end up being represented in the associated trash pit. A final fire appears to mark the end of the use-life of the mound, and also may have portended the imminent demise and abandonment of the community. Based on the characteristics of the ceramic assemblages from the mound fill and trash pit, and a radiocarbon date from one of the burned structures on the mound summit, the events surrounding the construction and subsequent use of the mound occurred during the Angelly Phase. Jonathan Creek and Tinsley Hill Phase occupations may be present in other areas of the site but, in light of the data presented here, it is difficult to sustain the argument that the site was abandoned during the Angelly phase.

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MAKING BIG ROCKS FROM SMALL ROCKS: METHODS AND RESULTS OF THE LITHIC ANALYSIS AT SITE 15TR289

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ABSTRACT

During the phase II National Register of Historic Places (NRHP) evaluation of site 15Tr289, a multicomponent prehistoric site located in Trigg County, Kentucky, an abundance of lithic artifacts were recovered from two landforms. On a terrace landform, prehistoric and historic artifacts were found mixed in the plow zone. On a floodplain landform, only prehistoric lithic artifacts were buried in a 70 cm thick zone approximately 100 cm beneath the ground surface. The integrity and the site function(s) of the archaeological deposits recovered from the floodplain locality were important considerations for the NRHP evaluation. Four types of artifact analyses: flake attribute, mass analysis, refit, and minimum analytical nodule analysis (MANA) were applied to the lithic assemblage from this locality to investigate the artifact assemblage characteristics. As shown in this research, a combination of analytical methods can be successfully employed, and in some cases may be required, to address questions about site formation processes and site function from a lithic assemblage.

INTRODUCTION

Lithic artifacts are ubiquitous on most prehistoric sites in Kentucky and often represent the only evidence of past human behavior. Fortunately, lithic artifacts can provide a wealth of information about the activities that made them (e.g., Andrefskey 2001; Hall and Larson 2004; Moloney and Shott 2003; Odell 2000). But, the completeness of an assemblage and the effects of post-depositional processes, especially the potential for mixing with other assemblages (palimpsest effect), are important considerations when assessing the amount and type of information that may be gleaned from any artifact assemblage (cf., Schiffer 1987). When the integrity of the archaeological deposits is questionable, few meaningful interpretations of past human behavior can be made.

Multiple analytical methods can be applied to an assemblage as a way of separating post-occupational patterns from those created by the prehistoric site occupants. Such an approach has been shown to yield favorable results for determining technological strategies used by prehistoric flintknappers – primarily by providing complimentary tests of validity for interpretations derived from any single method (Bradbury 1998; Bradbury and Carr 1995; Carr 1994; Carr and Bradbury 2000, 2004). Methods such as refitting artifacts together, grouping artifacts by raw material similarities, and recording artifact attributes, when combined, can provide information on artifact manufacture as well as site structure and the integrity of archaeological deposits (e.g., Hofman 1992a; Morrow 1997; Villa 1982). The analysis of site 15Tr289's lithic assemblage illustrates one example of how a multiple analytical method approach was used to provide such information.

SITE 15TR289 BACKGROUND

Site 15Tr289 is a multicomponent prehistoric site located along the Little River in the Mississippian Plateaus region of Western Kentucky. The site was identified and excavated as part of the proposed Kentucky Transportation Cabinet's (KYTC) realignment and bridge replacement of KY 272 south of Cadiz in Trigg County. Prehistoric and historic artifacts were initially found scattered on the ground surface or mixed in the plow zone on a terrace landform at the site (King 2002). The subsequent phase II National Register of Historic Places (NRHP) evaluation investigated the archaeological deposits on the terrace while also identifying deeply buried archaeological deposits on the floodplain (Martin 2004).

A concern during the phase II evaluation was that the site crossed two landforms that had archaeological deposits in different depositional contexts. For example, while thousands of artifacts spanning a great deal of time (Early Archaic through Historic periods) were found mixed in the plow zone on the terrace landform (Locality 1), prehistoric lithics were found between approximately 100 and 170 cm below the ground surface (bgs) within alluvium on the floodplain (Locality 2). The archaeological material on the terrace was determined to have poor integrity because of near-surface disturbances (e.g., cultivation). The floodplain archaeological deposits, however, were buried under at least 1 m of alluvium which suggested some degree of good integrity.

Ten bucket augers, three backhoe trenches, and approximately 3.5 cu. m of screened hand excavated units explored the floodplain sediments at Locality 2. The hand excavation consisted of four 1m x 1m units excavated over potential cultural zones in trench walls, as well as two 1m x 1m unit (Units 10 and 11) and one 2m x 1m unit (Unit 12) placed adjacent to one another to form a $4m^2$ block (Block A) adjacent to Trench 8 (Figure 1). The lithic material from the buried archaeological deposits in Block A consisted of flakes, bifaces, retouched flakes, a uniface, and manuports. The remaining 1m x 1m test units and auger probes at Locality 2 revealed a low density lithic scatter. For example, only one flake was recovered from Unit 15, which was only 3m (9.84 ft) north of Block A.

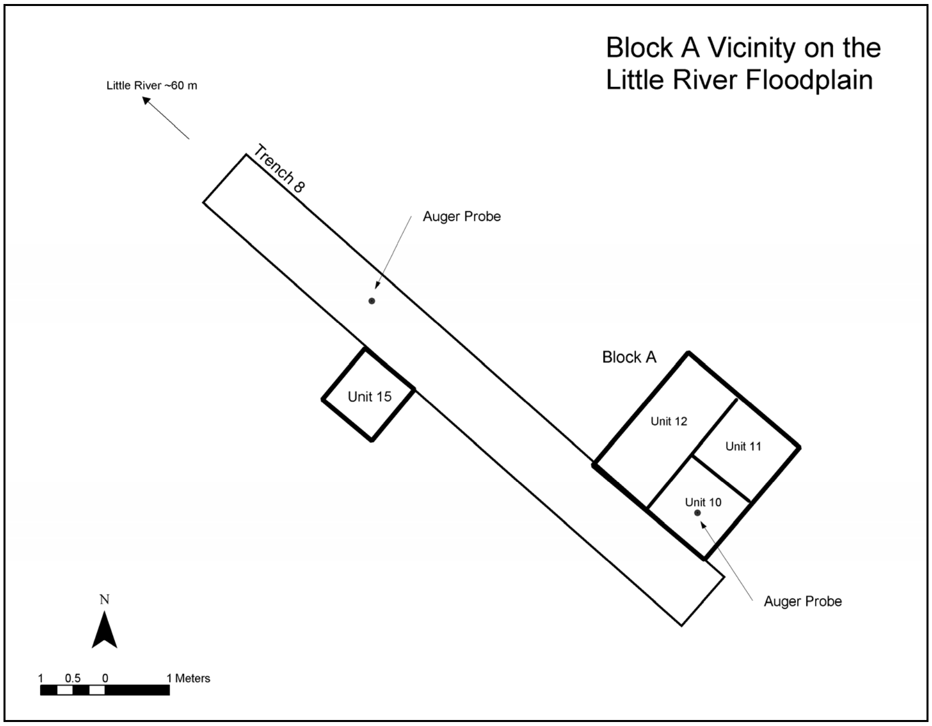

Figure 1. Plan View of Trench 8 and Block A Vicinity at Site 15Tr289.

Ultimately, the thickness of the deposits in which the buried archaeological material was found and the lack of distinct stratigraphic zones associated with the artifacts in the alluvium at Locality 2, particularly at Block A, seemed to limit the associations that could be made with the buried artifacts (Figure 2). Further compounding this assessment was that these archaeological deposits were not radiometrically dated and no temporally diagnostic artifacts or features were found. Therefore, questions regarding the Block A artifacts centered on whether they represented mixed debris from multiple occupations; successive, stratified, occupational surfaces or; a single occupation that has been vertically displaced. The multiple lithic analyses used were essential for answering these questions regarding the context of these buried archaeological deposits and consequently helped develop several hypotheses regarding on-site activities and site structure.

THE LITHIC ASSEMBLAGE

The lithic artifact assemblage from Block A consisted of 707 (1740.9 g) flakes larger than .64 cm (.25 inch), 677 (61.9 g) flakes smaller than .25 inch, five thermally damaged flakes (1.5 g), seven bifaces (109.6 g), two retouched flakes (5.3 g), one unifacial tool (hafted scraper) (67 g), one ground stone tool (22.5 g), and two large, unmodified pieces of chert (manuports) (1185.6 g) (Table 1). Analyses of the Block A materials consisted of mass analysis (e.g., Ahler 1989a, 1989b), as well as a reduction stage determination (e.g., Magne 1985; Magne and Pokotylo 1981), Minimum Analytical Nodule Analysis (MANA) (Larson 1994; Larson and Kornfeld 1997; Larson and Ingbar 1992), and refit analysis (e.g., Cahen, et al. 1979; Hofman and Enloe 1992; Morrow 1996, 1997).

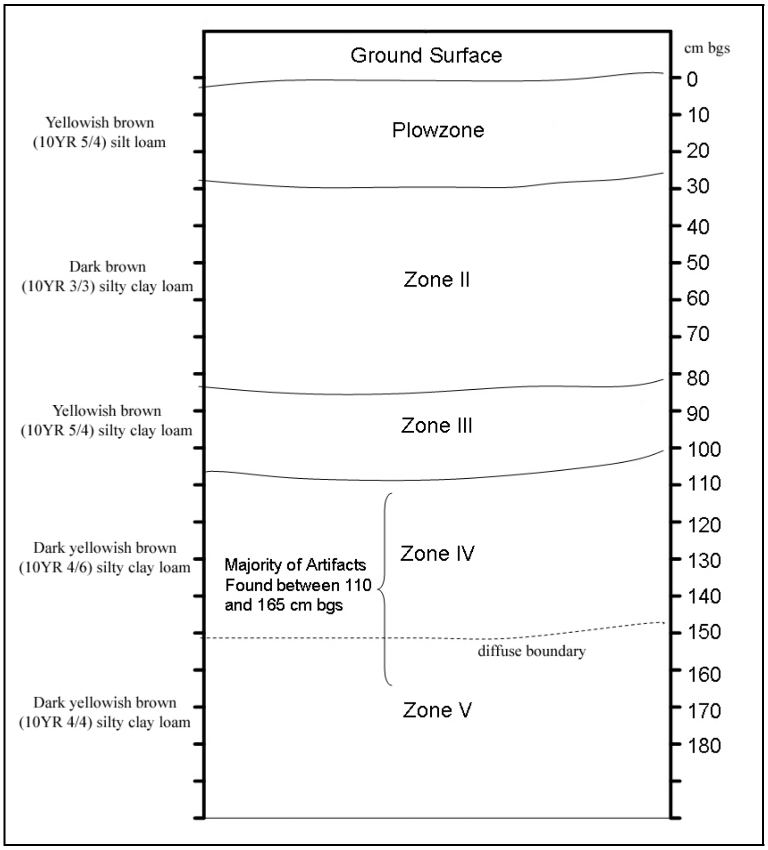

Figure 2. Stratigraphic Profile of Trench 8 at Locality 2 of Site 15Tr289.

Table 1. Block A Artifacts by Level (Note that 31 flakes were recovered from bulk samples and could not be plotted by depth).

Level	Zone	Depth (cm bgs)	Flakes	Thermally Damaged Flakes	Bifaces	Unifaces/ Retouched Flakes	Ground stone	Manuport
1*	I	70-80	1	0	0	0	0	0
2*	II	80-90	1	0	0	0	0	0
3*	II	90-100	5	0	0	0	0	0
4*	II	100-110	48	0	0	0	0	0
5	II	110-120	233	5	0	0	0	0
6	II	120-130	283	0	3	0	0	0
7	II	130-140	315	0	2	1	0	0
8	II	140-150	236	0	2	0	0	0
9	II	150-155	104	0	0	1	1	0
10	III	155-165	90	0	0	1	0	2
11	III	165-170	35	0	0	0	0	0
12**	III	170-180	2	0	0	0	0	0
		Total	**1353**	**5**	**7**	**3**	**1**	**2**

*1m^2 unit (Unit 10)
**1m^2 sample at bottom of unit 11

RAW MATERIALS

Considering that chert flakes and tools were the dominate artifact types found it was important to understand the sources of the raw material available to the prehistoric occupants of Site 15Tr289. The area surrounding the project area is considered raw-material rich, as there is an abundance of raw material sources in close proximity to the site area. The Cadiz geologic quadrangle depicts several geologic formations near the study area that contain chert (Fox 1965). Furthermore, chert from the Mississippian age Ste. Genevieve and St. Louis Limestone formations has been found outcropping in the county and along the Little River upstream from the site in Christian County (Gatus 1980; Sanders 1990). In fact, gravel bars along the Little River often contain residual chert washed from exposures upstream.

Ste. Genevieve chert is generally a fine to medium-grained chert with a moderate luster that has concentric zones of light to medium blue, or olive gray to yellowish gray, color beneath the cortex (Gatus 1980). Inclusions include chalcedony and calcite. This chert occurs as approximately 1 to 8 inch diameter nodules or approximately 2 to 12 inch tabular blocks. St. Louis chert is characterized by Gatus (1987) as having a moderate to semi-vitreous luster and is generally a coarse-grained chert that is mottled blue and olive, white, grayish-blue, and tan in color. Inclusions include brachiopods, bryozoans, and lithostrotionid corals. St. Louis chert occurs as large spherical and elongated nodules or masses up to 10 inches in diameter. The Salem Limestone and Warsaw Limestone formations are also noted to contain chert. These cherts, however, are described as fragmentary and occur in low amounts and small sizes.

Generally, the flake and stone tool material from Locality 2 was fine-grained, cryptocrystalline chert with a low luster and blue-gray and/or olive coloring. The range of inclusions noted consisted of small black speckles, iron-oxide laminations, concentric bands, and crystalline vugs. As a result, while specific raw material characteristics were recorded during the flake and modified implement analyses, no differentiation between St. Lewis or Ste. Genevieve cherts was made.

FLAKE ATTRIBUTE AND MASS ANALYSES

The analysis of the Block A assemblage began with recording attributes for all the flakes which were .25 inch and larger. Eleven attributes were recorded for each flake: size grade, count, weight, portion, platform configuration, platform facet count, dorsal scar count, cortex cover, cortex type, raw material, and thermal alteration. Reduction stage and aggregate trend information were derived from these data.

Reduction stages were determined for the Block A material based on the work of Magne (Magne 1985; Magne and Pokotylo 1981). In Magne's (1985) scheme, early stage reduction is viewed as all core reduction, middle stage reduction is viewed as the first part of the manufacture of tools, and late stage reduction is viewed as the completion and maintenance of tools. Biface thinning is considered a special form of late stage reduction.

In addition, flakes produced from specific technological methods (i.e., blade, bipolar, notching) were also noted.

Of the flake debris larger than .25 inch from Block A (n=707), early stage flakes accounted for 16.8 percent (n=119), 28.9 percent were middle stage (n=205), 48.9 percent were late stage (n=346), and 3.1 percent were bifacial thinning flakes (n=22) (Figure 3). These data suggest that activities associated with tool finishing or tool maintenance produced these flakes. Furthermore, a single notching flake was found in this assemblage. The notching flake was identified by its unique appearance as a small, circular flake with a concave platform that occurs when side or corner notches are chipped in a biface or when blade edges are serrated (Root 2004). The notching flake along with the several biface thinning flakes provides direct evidence that at least one hafted biface was finished here. This supports the result of the reduction stage determination.

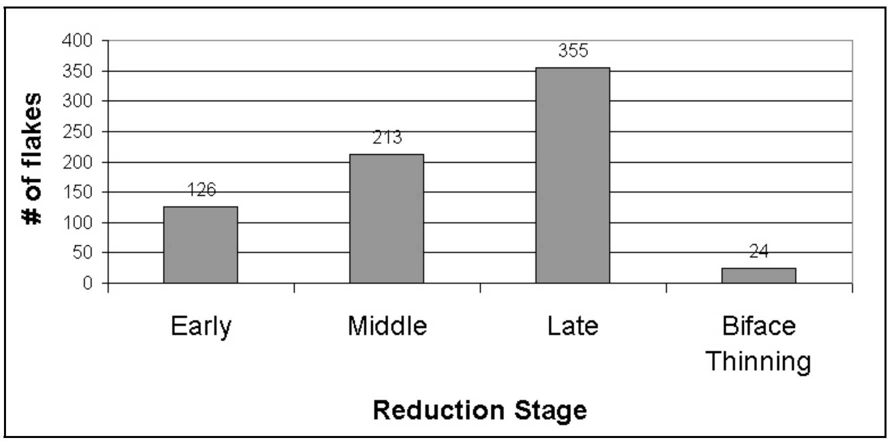

Figure 3. Reduction Stages for Flakes Larger than .64 cm (.25 inch) from the Buried Component of Locality 2 (Blocky flakes [n=15] and thermally damaged flakes [n=5] not included).

Additionally, several general trends have been noted from flake data that can be applicable as another indicator of the technological organization of the assemblage (e.g., Ahler 1989a, 1989b; Ahler and Christensen 1983; Bradbury and Carr 2004; Bradbury and Franklin 2000). It has been noted that as reduction continues, the average weight of .25 inch flakes decreases, the percentage of .25 inch flakes increases, there is a decrease in the percentage of blocky flakes, and there is an increase in the percentage of flakes with two or more platform facets. These trends were calculated for the Block A data from Site 15Tr289 (Table 2). These results were then compared with data derived from experiments conducted by Bradbury and Carr (2004) (Table 3).

Table 2. General Trends for the Flakes from Block A.

Avg. Wt. .25 inch (g)	Percent Count .25 inch	Percent Blocky	Percent 2+ facets
0.49	76.5	2.1	36.2

Table 3. General Trend Data Derived from Experiments Conducted by Bradbury and Carr (2004)

Reduction Type	Ave Wt. .25 inch	Percent Count .25 inch	Percent Blocky	Percent 2+ facets
Core	0.940	60.1	15.2	0.9
Bipolar	0.745	84.6	17.4	0.0
Intermediate Biface	0.555	83.2	1.4	12.1
Biface Thinning	0.348	95.2	0.1	26.0
Final Biface	0.350	100.0	0.0	75.0
Uniface	0.370	97.9	0.0	8.3

Considering the low average weight, the moderate amount of flakes with two or more facets, and the low occurrence of blocky flakes, the general trends of the Block A flake assemblage suggest an emphasis on middle to late stage reduction, which correlate with the flake reduction stage data. Flake assemblage and tool characteristics associated with specific raw material groupings are further discussed with the following refit analysis and MANA results.

MINIMUM ANALYTICAL NODULE ANALYSIS (MANA) AND REFIT ANALYSIS

It was noted during the flake attribute recording of the Locality 2 assemblage that some flakes from one level could be conjoined to flakes within the same level or adjoining levels. Similarly, many flakes and tools exhibited raw material characteristics that were similar to other flakes and tools, suggesting that they originated from the same chert nodule. Therefore, once the attribute recording was completed, a systematic attempt was made to identify refits and record raw material similarities between flakes and other flakes, as well as with flakes and tools from all Block A levels. These observations were viewed as most important for determining the integrity of the deposits, but also as direct evidence for technological organization of the assemblage.

Recording lithic raw material characteristics, recognizing similarities between artifacts in an assemblage, and establishing refits between flakes and tools are ways of aggregating artifacts beyond raw material type to determine specific analytical units (Bleed 2004; Hofman 1992b; Larson and Ingbar 1992). Refitted artifacts and analytical nodules can provide actual observations of the procedure(s) used to reduce and make them. Additionally, artifacts that are associated vertically, either by refitting or recognizing raw material similarities, between different levels or soil strata can provide documentation of natural, post depositional processes that have affected the archaeological deposits. Finally, artifacts that are associated laterally across the site can provide documentation of human-induced site formation processes, where artifacts were made, used, and discarded on the site.

The drawback to refitting artifacts and recording detailed raw material characteristics is that these are time-consuming, albeit often very accurate, methods that are often difficult to conduct in the context of cultural resource management projects that have increasingly tight deadlines and budget constraints. The key to using these analyses with the Site 15Tr289 lithics was to maximize their interpretive power in conjunction with the results of the aggregate and flake attribute analyses, while limiting the amount of time it took to get the desired information. This involved using less comprehensive means, such as only looking at the larger size grades, during these analyses. As such, results might be less-comprehensive but still provide sufficient information for hypothesis development and NRHP significance determinations. The modified procedures used for, and results of, these analyses at Block A are described below.

MANA

MANA represents the recording and grouping of lithic artifacts with intra-raw material characteristics (Larson 1994; Larson and Ingbar 1992; Larson and Kornfeld 1997). The groups of material arrived at during the process of refitting or through identifying inter–raw material similarities are called minimum analytical nodules (MANs). Because of the potential for characteristic variability within any given nodule, these MANs are typically only used as analytical groups and do not necessarily reflect the actual number of nodules represented in the assemblage – unless, typically by conjoining pieces, enough of the actual nodule is apparent.

On-site behavior and technological organization can be inferred from the classification of MANs into one of two basic types: single and multiple item nodules, and by noting the presence or absence of tools associated with the nodule (Larson and Kornfeld 1997:10). For example, a single tool or flake representing one MAN would suggest off-site production and on-site use and discard of the item (the tool), or maintenance or limited production of a tool (a late stage flake). Several flakes and tools associated with a nodule would suggest on-site production or maintenance and tool use and/or discard. Several flakes without tools would again suggest on-site tool production or maintenance but off-site transport of tool(s).

An understanding of the available time and intended use of the material can be further derived from identification of the type of nodule(s) represented (Larson and Kornfeld 1997:12-14). For example, in the case of a short occupation where future activities were not planned at that location with that material, little evidence of tool production (few flakes overall) should be evident in the nodule and tool use would be prevalent (only late stage flakes and discarded or broken tools found).

Finally, the distribution of MAN flakes and tools can be used to interpret site formation processes. For example, lithic artifacts that are scattered within a 70 cm deposit may be considered disturbed and lacking integrity. Although, even though they are vertically displaced, if it can be demonstrated that the artifacts are related through raw material similarities, and MANs can be formed within the lithic assemblage, the assemblage would indicate good context and analytical potential. Often, refitting of lithics artifacts assists this process by demonstrating the validity of the MANs.

The methods used for the MANA of the Block A assemblage generally conform to other such studies (e.g., Hall 2004; Larson and Kornfeld 1997). However, only flakes larger than 1.27 cm (.5 in) (n=145) and all tools (n=8) from excavated levels in Block A were analyzed. Qualitative data such internal flaws, inclusions, and cortical characteristics were recorded macroscopically for each piece following Luedke's (1992) descriptions. Raw material colors were determined using the Geological Survey of America's *Rock-Color Chart* (Geological Society of America 1995). The exclusion of flakes smaller than .5 inch speeds up the analysis but reduces its effectiveness to provide information about the technological organization of the assemblage. This shortcoming is overcome with complimentary lines of evidence provided by the results of the flake attribute and mass analyses.

Five MANs were identified from the assemblage at Block A of Locality 2. Each MAN contained a readily distinguishable collection of characteristics that allowed for quick grouping (Table 4). Tools were associated with four of the nodules (Figure 4). Some nodules have more quantity and variety of items than others, but none had traditional cores. These data generally agree with the mass analysis and reduction stage analysis of the assemblage, which suggest that tool production or finishing was a prominent activity. The MANA results further indicate that cores were either transported elsewhere after being used here or that traditional cores were not used. Also, these data suggest that tools produced from some nodules were being transported elsewhere, either on or off-site. Some maintenance and discard of tools is also evident. A description and interpretation of each MAN is provided below.

Table 4. Raw Material Characteristics Identified for Each MAN.

Nodule	Color	Cortex	Inclusions	Flaws
1	Light olive gray (5Y 5/2) with yellowish gray (5Y 8/1) to pale yellowish brown (10YR 6/2) interior coloration. Light bluish gray (5B 7/1) mottles are found in the small crystalline inclusions	Chalky white limestone with black speckles	Black speckles, red laminations, concentric banding, and small crystalline vugs	Interior granular structure
2	Medium bluish gray (5B 5/1)	Red film over chalky white limestone	Red laminations and iron-oxide inclusions predominate. Small white and black speckles, as well as concentric banding, are evident on some pieces	Large crystalline vugs evident on some pieces.
3	Light olive gray (5Y 5/2) to medium bluish gray (5B 5/1), with blended colors	Thin red and granular limestone	Small black speckles, red lamination, as well as concentric banding evident on some pieces	None apparent
4	Light olive gray (5Y 5/2) to medium bluish gray (5B 5/1), with distinct break in colors	A red film over a chalky white limestone	Small black and white speckles, red lamination, as well as some iron-oxide inclusions	None apparent
5	Light bluish gray (5B 7/1).	A chalky white limestone.	Small black and white speckles and concentric banding.	Large crystalline vugs.

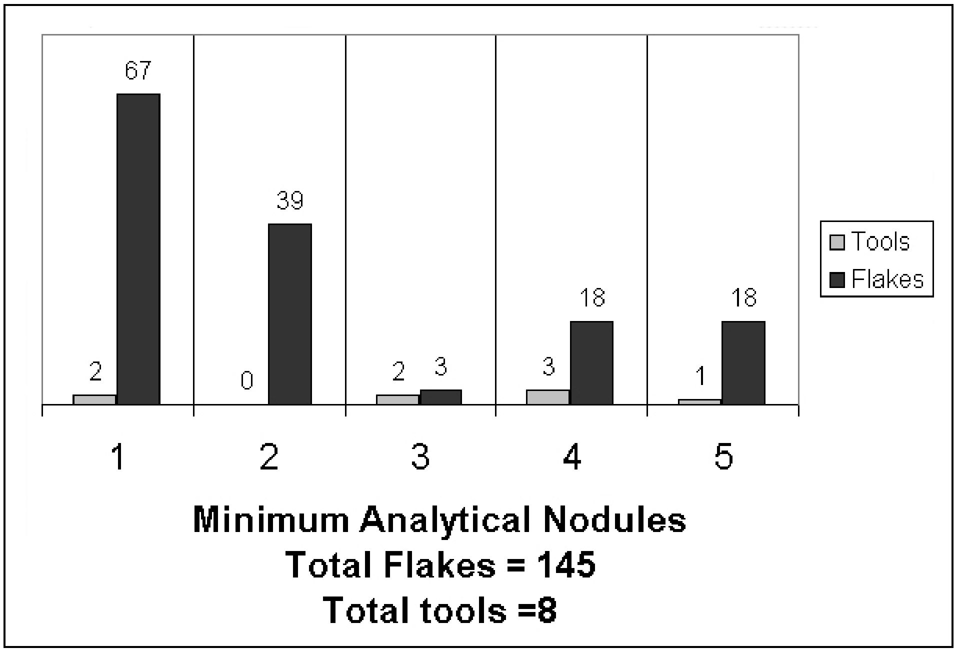

Figure 4. Distribution of Flakes and Tools for Each Minimum Analytical Nodule.

Nodule #1 (Refits=14; Associated Flakes=53, Associated tools=2)

Nodule #1 constitutes the largest number of refits and inter-nodule matches (Figure 5). Several of the refit flakes had cortical edges. To get a minimum diameter for the nodule, these pieces were placed on a rim-diameter template typically used for determining the diameter of historic plates. Based on the distance between cortical flakes and the angle at which they were oriented, the nodule was determined to have originally been at least 4 inches in diameter.

The two tools from this nodule represent bifaces that were broken during production, likely as a result of the internal flaw apparent in this nodule. This suggests that the bifaces were made directly from the nodule, not off a traditional core. Given the large quantity of refits and associated flakes in this nodule, a significant amount of nodule reduction or biface production, or both, can be implied from it. The presence of two middle stage, laterally snapped, bifaces suggests that they were broken during production and discarded at the site. Ultimately, the majority of late stage reduction flakes and limited early stage flakes, and the presence of two middle stage bifaces suggest that middle to late stage biface reduction was predominately occurring with this material (Table 5). Ultimately, these data indicate that this nodule was preliminarily reduced at another location (few early stage flakes), then brought to the site for on-site tool production (production failure bifaces, presence of biface thinning flakes, and 61.1 percent late stage reduction flakes). Considering the amount of flakes found and the presence of biface thinning flakes associated with the nodule, it is likely that a biface was finished with this material and transported either elsewhere on site or off site.

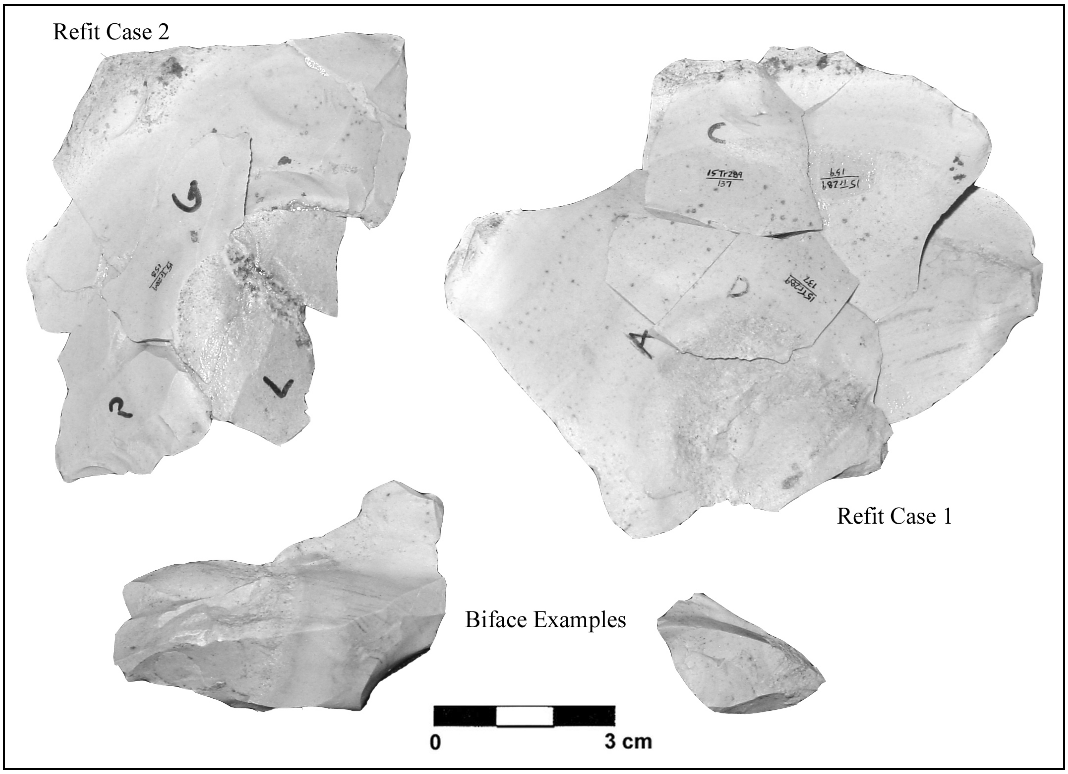

Figure 5. Representative Examples of Nodule 1 Flakes and Tools; also Showing Refit Cases.

Table 5. Size and Reduction Stage of Flakes Associated with Nodule 1.

Size / Reduction Stage	3 (.5 in)	4 (.75 in)	5 (1 in)	Total	%
Early	6	3	0	9	13.4
Middle	9	3	3	15	22.3
Late	32	9	0	41	61.1
Biface Thinning	1	1	0	2	2.9
Total	**48**	**16**	**3**	**67**	

Nodule #2 (Refits=0; Associated Flakes=39, Associated tools=0)

Nodule #2 constitutes the second largest number of inter–raw material matches (Figure 6). No refits or associated tools were identified in this nodule. Given the large quantity of flakes, but lack of tools or cores associated with this nodule, it likely represents maintenance of a previously manufactured tool that was transported to this location, maintained here, and then discarded elsewhere. The abundance of late stage reduction flakes from this material further suggests this (Table 6).

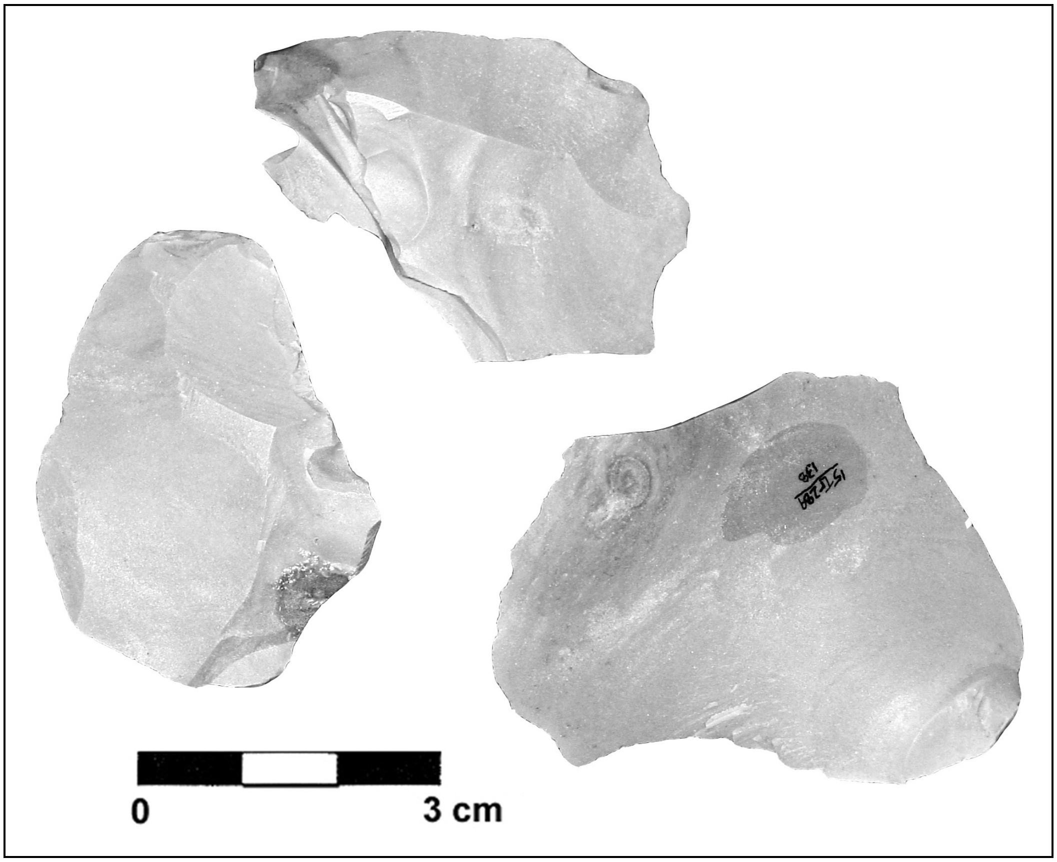

Figure 6. Image of Nodule #2 Showing Raw Material Similarities.

Table 6. Size and Reduction Stage of Flakes Associated with Nodule 2.

Reduction Stage \ Size	3 (.5 in)	4 (.75 in)	5 (1 in)	Total	%
Early	2	0	1	3	7.6
Middle	4	2	0	6	15.3
Late	22	8	0	30	76.9
Biface Thinning	0	0	0	0	0.0
Total	**28**	**10**	**1**	**39**	

Nodule #3 (Refits=2; Associated Flakes=1, Associated tools=2)

Nodule #3 had two refits, but few inter-nodule matches (Figure 7). All three flakes were .75 inch (N=2) or 1 inch (N=1) flakes, with three or more facets or dorsal scars (late stage). However, two were cortical flakes, and the other refit to the dorsal face of one of the cortical flakes (indicating that it was removed prior to the cortical flake removal). Two associated tools, a large unbroken and patinated distolateral scraper and a biface fragment (production failure), were also identified from this nodule. Both tools from this nodule also have cortical limestone still on them.

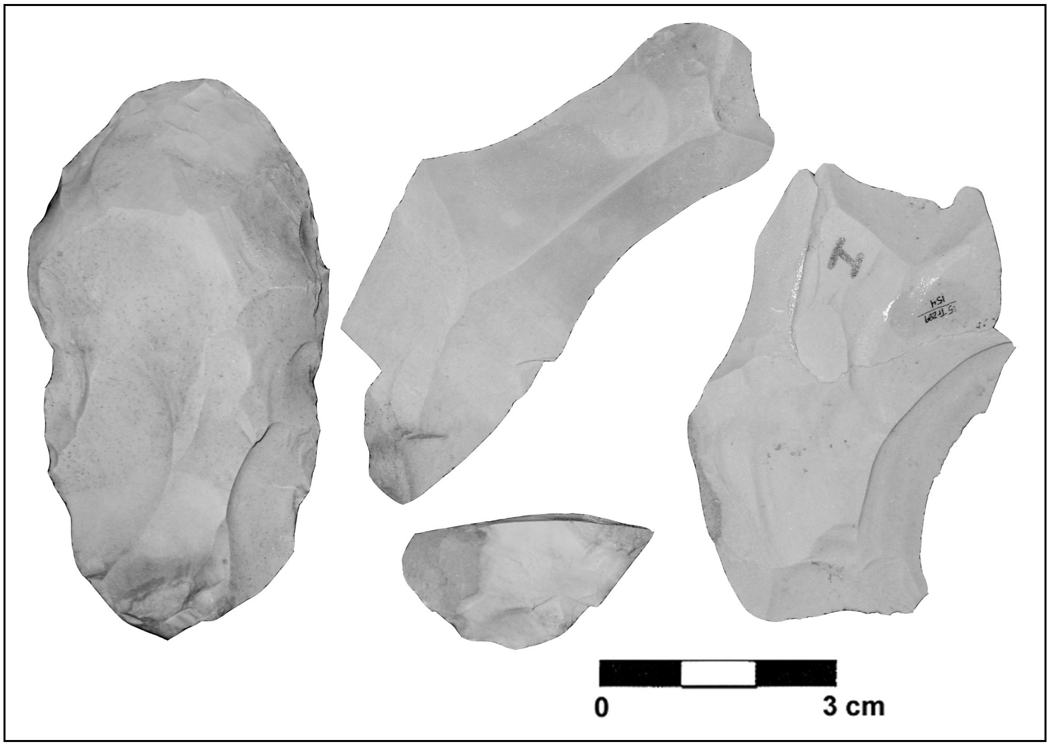

Figure 7. Representative Examples of Nodule 3 Flakes and Tools; Also Showing Refit Case 3.

Given the associated tools and few flakes associated with this minimum analytical nodule, a couple possible behaviors are inferred. The complete distolateral scraper associated with the flakes suggests that the tool was previously manufactured somewhere else, brought to this location, and modified here. The late stage associated flakes support this. But, the broken biface (laterally snapped) suggests tool production from this nodule as well. It is possible that another nearby area of production for this nodule is present, but under-represented in the assemblage at hand.

Furthermore, the large distolateral scraper is suggestive of an early prehistoric technology and a similar stylistic trend has been observed elsewhere in the southeast (Kimball 1996:165). These large "teardrop scrapers" have been temporally associated with Paleoindian, Dalton, and Kirk cultures at Tellico along the Little Tennessee River (Kimball 1996:165). Similar large distolateral scrapers were found in Early Archaic deposits at the Longworth-Gick site in Jefferson County, Kentucky (Collins 1979:551, Plate 5.40) and at the Rose Island Site in Monroe County, Tennessee (Chapman 1975:137, Plate XXXIV).

Nodule #4 (Refits=1; Associated Flakes=17, Associated tools=3)

Nodule #4 had one refit and several inter-nodule matches. The refit flake attaches to one of the tools, a broken biface (Figure 8). Two broken and heavily patinated, retouched flakes were also found to be associated with this nodule. Given the refits and associated flakes with this nodule, core reduction or biface production, or both, can be implied from it. The presence of one laterally snapped biface suggests that it was broken during production. The two retouched flakes of this material were both broken, but well used, suggesting that they were made, utilized, and broken here. Furthermore, the majority of late stage reduction flakes and limited early stage flakes suggest that later stage biface reduction was predominately occurring (Table 7).

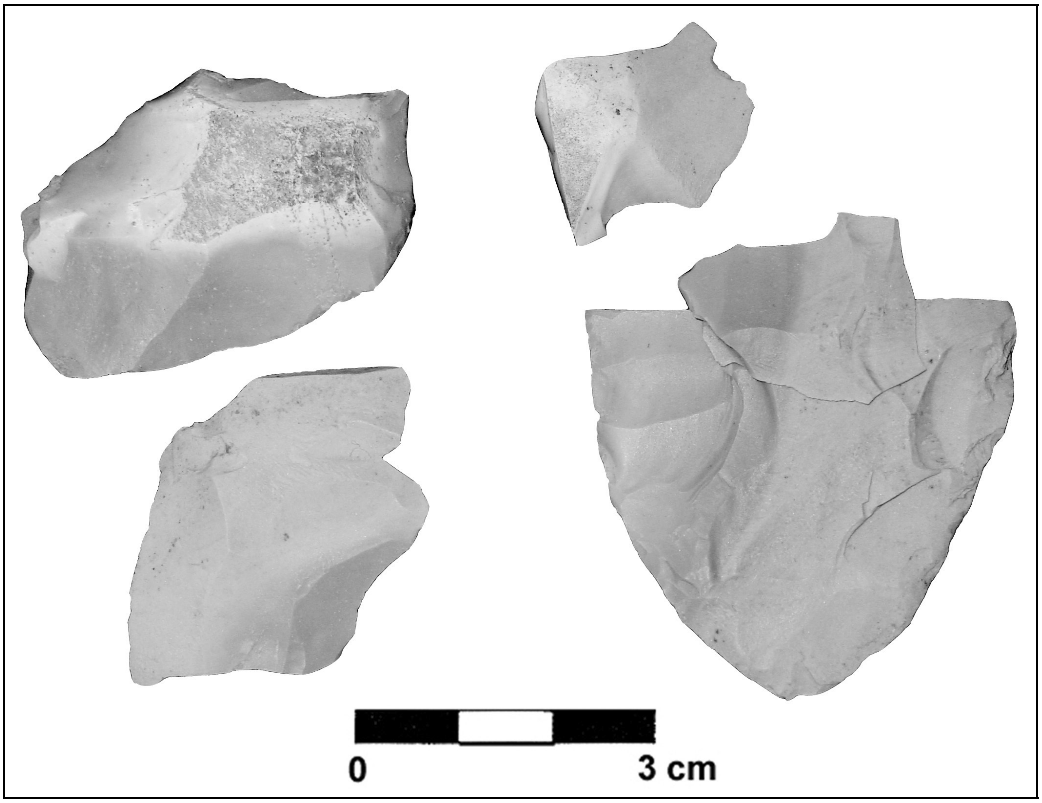

Figure 8. Representative Examples of Nodule 4 Flakes and Tools; Also Showing Refit Case 4.

Table 7. Size and Reduction Stage of Flakes Associated with Nodule 4.

Reduction Stage \ Size	3 (.5 in)	4 (.75 in)	5 (1 in)	Total	%
Early	3	0	0	3	16.6
Middle	2	0	0	2	11.1
Late	8	3	0	11	61.1
Biface Thinning	0	1	1	2	11.1
Total	**13**	**4**	**1**	**18**	

Ultimately, these data indicate that this represents a nodule that was preliminarily reduced at another location (few early stage flakes), and then brought to the site for on-site tool production (indicated by the production failure biface, the presence of biface thinning flakes, retouched flakes, and a majority of late stage reduction flakes). The lack of a core could be a result of the limited area excavated or that the bifaces acted as a core.

Nodule #5 (Refits=0; Associated Flakes=18, Associated tools=1)

Nodule #5 had several inter-raw material similarities and one associated tool, a broken late stage biface (Figure 9). The biface appears to have been broken during a late stage production. The majority of late stage reduction flakes and limited early stage flakes further suggest that later stage biface reduction was predominately occurring (Table 8).

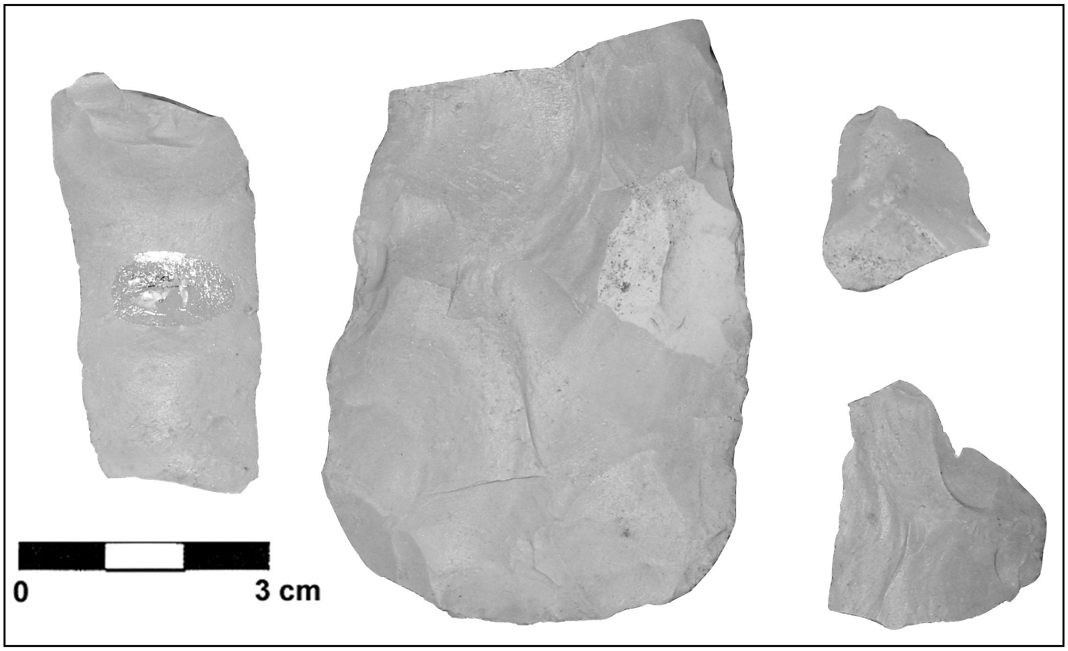

Figure 9. Image of Nodule #5 Showing Raw Material Similarities and Biface.

Table 8. Size and Reduction Stage of Flakes Associated with Nodule 5.

Size / Reduction Stage	3 (.5 in)	4 (.75 in)	5 (1 in)	Total	%
Early	1	0	0	1	5.5
Middle	2	0	0	2	11.1
Late	8	6	0	14	77.7
Biface Thinning	1	0	0	1	5.5
Total	**12**	**6**	**0**	**18**	

These data indicate that this represents a nodule that was preliminarily reduced at another location (few early stage flakes), and then brought to the site for on-site tool production (indicated by the presence of a production failure biface, the presence of a biface thinning flake, and a majority of late stage reduction flakes). The lack of a traditional core could be a result of the limited area excavated or use of bifacial cores.

REFIT ANALYSIS

The specifics of the refit analysis methodology generally followed that of other similar studies (e.g., Cahen, et al. 1979; Hofman 1992a; Morrow 1996, 1997). Materials from one level of the excavation block were set out and arranged according to raw material similarities and an attempt was made to refit each piece from a level to all other pieces in that level. Once all the materials within each individual level were compared, an attempt was made to refit pieces between adjacent levels within the block. This process continued until all the material from each level was compared with the material from all the other levels in the block.

It should also be noted that the field methodology at the phase II level was focused on determining the intactness of the deposits, their significance to the regional archaeological record, and the relative impacts the proposed bridge construction project would have on them. Additionally, the field investigation was limited to a narrow corridor with explicit funding and time limits. As such, the field methods dictated that fine-grained information such as artifact orientation and precise depth of each artifact was not obtainable. Other differences with the current study compared with similar research were the lack of piece plot artifacts during the excavation and the subsequent sampling of only 1.270 cm (.5 inch) and larger artifacts (166 flakes [817.6 g]) to identify refits. While the use of larger sized materials helped speed up the analysis process, this method still allowed for inferences regarding site formation processes even though the exclusion of smaller sized refitted material prevents a complete sequence of lithic reduction to be modeled. Fortunately, complimentary lines of evidence from other analyses helped supplement this methodological gap.

It should be noted that since artifacts were not piece-plotted in the field, the finest level of precision for discussion of the refit data is within a one-meter unit and a 10 cm level. As such, refits between two contiguous horizontal proveniences could be less than 1 m (3.28 ft) but no greater than 2 m (6.56 ft) apart. For refits between two consecutive vertical proveniences, refits could be less than 10 cm but no greater than 20 cm apart.

Several of the flakes larger than .5 inch from Block A were refit to other flakes (n=16, 10.9 percent) or bifaces (n=1, .5 percent). All refits were found within the four square meter area of Block A and occurred between 110 and 165 cm bgs, with the majority (n=13, 72.2 percent) occurring in the lower depths (130 - 165 cm bgs). An important part of this analysis was the investigation of the vertical distribution of the refit cases and their relationship with the minimum analytical nodules.

Case 1 and Case 2

A majority of the refits (n=14) identified in this assemblage were associated with Nodule 1 and were distributed throughout all the levels of the 70 cm thick zone in Block A with little variation in density (Figure 10). These refits represent two cases of conjoined flakes and they appear to be from the same “actual” nodule and were likely reduced during the same occupation.

Refit Case 1 had eight flake refits consisting of two early stage flakes, four middle stage flakes, and one late stage flakes. Refit Case 2 had six flake refits consisting of one early stage flake and five late stage flakes. The reduction stage analysis for the flakes in these refit cases suggests an emphasis on middle stage reduction with Case 2 and late stage reduction with Refit Case 1. The small number of early reductions stage flakes suggests that primary core reduction occurred elsewhere prior to the reduction that occurred at this location.

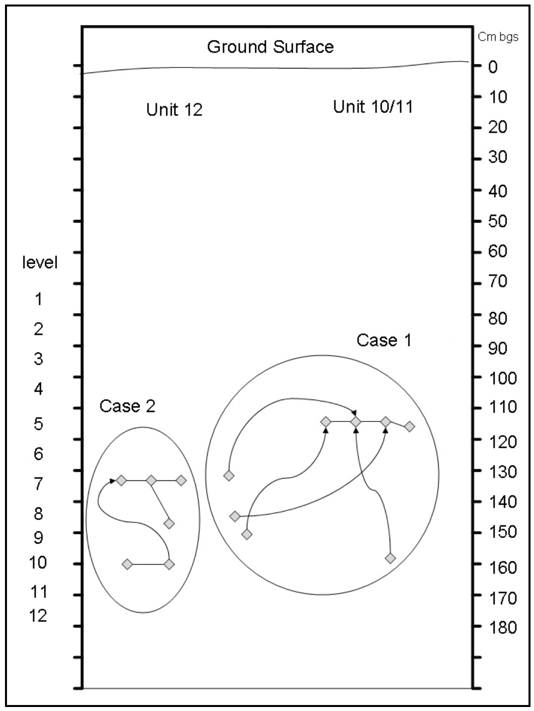

Figure 10. Vertical Distribution of Refit Cases 1 and 2.

Case 3

Two late stage flakes of Nodule 3 refit within in the same 10 cm level at the bottom of the deposits (155-165 cm bgs in Unit 10/11). These refits helped establish the context of this material and strengthen the assertion that inferences derived from the MANA are valid.

Case 4

Finally, one late stage flake was refit to a broken biface and associated with Nodule 4. The flake was found near the middle of the deposit (140-150 cm bgs in Unit 12) while the biface was 30 cm above it in Unit 10/11. Like Case 2, this refit case also supports the results of the MANA while also showing direct evidence of biface manufacture with this material.

DISCUSSION

The use of multiple lithic analyses with the Block A lithic artifact assemblage provided complimentary ways of understanding the site formation processes and subsequent integrity of the archaeological material; as well as interpreting past human behavior and site structure.

DEPOSITIONAL CONTEXT

The raw material similarities and the flake refits between levels at Block A demonstrate the good integrity of the deposits. Aside from the limited vertical movement of artifacts, archaeological deposits at Block A have been generally preserved in a distinct zone between 100 and 170 cm bgs on the floodplain. A significant alluvial disturbance (i.e., high-energy water movement) is not indicated since no natural gravels of similar size as the cultural material were found in the deposits. Also, the relatively short lateral distances between identified refits suggest that the artifacts originated close to where they were found. The ability to refit some of the artifacts from Block A and then associate them with other artifacts by raw material similarities between several levels strengthens the assertion that these deposits are from a single occupation. Most informative was the distribution of the Nodule 1 refits, which span all but two of these levels and clearly indicate that these refit cases originated during the same knapping episode.

Furthermore, although no apparent buried surface was visible, the size sorting of artifacts within these deposits can provide another indication of the original occupation surface. Experimental studies have shown that post depositional processes move larger items less and that these items would be found in a closer proximity to their original cultural pattern than smaller items (Villa and Courtin 1983). In Block A, the largest items in the artifact assemblage were two unmodified chert nodules (722g and 463g respectively) that were both found in the same level toward the bottom of these deposits (155-165 cm bgs). In addition, the majority of the flakes (n=1266, 86.5 percent), as well as all 11 tools and the four refit cases, were found between 110 and 165 cm bgs; with a distinct spike in artifact count occurring between 110 and 150 cm bgs. This suggests that the paleo-ground surface from which these artifacts originated was somewhere between these depths.

Vertical and horizontal artifact movement in these deposits was most-likely caused by the cumulative effect of several natural processes. The shrinking and swelling of soils induced by a fluctuating water table, freeze-thaw action on the sediments, earthworm activity, small burrowing animals, and plant roots may all have contributed to artifact movement (i.e., Hofman 1984, 1992a; Johnson and Watson-Stegner 1990). In aggrading soil settings, such as floodplains, natural formation processes such as these would continue to displace the archaeological deposits until the deposits become buried deeper than the processes can affect them. The rate of archaeological deposit burial, therefore, would be dependant upon the rate of sedimentation on the floodplain through time. During times of increased low-energy flooding, archaeological deposits would be buried more-rapidly and influenced less by post-depositional disturbances. Inversely, the more stable the land surface becomes, the more disturbances that would occur, and the greater the chance of later occupations becoming mixed with earlier deposits.

The Block A setting suggests that low-energy flood sedimentation slowly buried the archaeological deposits allowing for subsequent bioturbation but not landform stability during and shortly after the occupation(s) took place. Then, approximately 1 m (3.28 ft) of culturally sterile sediments was deposited above the archaeological material, effectively preserving the deposits from later disturbance and mixing. The results also indicate that inferences regarding site activities and structure could be gleaned from the vertically separated artifacts.

BEHAVIORAL INFERENCES

Based on the results of the refit and reduction stage analyses, and considering the site depositional context, the tool and flake assemblage found in Block A is likely a reflection of the assorted activities associated with a single occupation or multiple occupations during a short period of time. Excluding primary core reduction, the tools and flakes represent a wide range of chert reduction and tool production stages. Furthermore, the data from the flake debris analysis suggest that all stages of tool production except initial cortex removal are represented here. The recovery of five mid to late stage bifaces also suggests that later stage biface thinning and finishing was taking place. A high percentage of water-worn cortex was also noted from cortical flakes indicating that the chert was procured from a water source such as the Little River.

The high percentage of refits and raw material associations that could be made among the nodules allowed for interpretations of specific activities with the different materials represented. The results from Nodules 1, 4, and 5 indicate that each of these nodules was preliminarily reduced at another location (few early stage flakes) and then brought to the site for on-site tool production (indicated by the presence of production failure bifaces, the presence of biface thinning flakes, and a majority of late stage reduction flakes). The two broken bifaces from Nodule #1 are likely a reflection of the inherent flaw in the raw material (i.e. the large granular and crystalline inclusion). These biface fragments may be from the same biface that was re-worked and broken again, or may represent separate biface failures from the same nodule.

Replacement of expedient items or maintenance of curated tools is also suggested with the presence of two broken retouched flakes from Nodule #4. Since other non-utilized flakes and a biface in Nodule #4 are associated with these retouched flakes, it is suggested that they were expedient items that were produced, used, and broken before being discarded on-site. Nodule 2 also had a high percentage of late stage flakes but no indications of biface finishing (biface thinning flakes or broken tools). The flakes from this nodule are therefore interpreted as likely being a result of on-site tool maintenance. The lower amounts of Nodule 3 flakes from Block A, as well as the presence of a complete scraper and a production failure biface from this nodule either suggest that there is a nearby production area or that this material was secondarily discarded here (e.g., dropped or swept). Ultimately, Nodules 1, 4, and 5 suggests that the occupants were producing specific, known items and transporting the finished products elsewhere. Larson and Kornfeld (1997:13) suggest that:

> In the case of the occupation of a site in which plenty of time is available for the production of items needed in the future and in which the specific tools needed are known, one would expect the complete production of specific tools

Furthermore, the results from Nodules 2 and 3 suggest maintenance, use, and discard of tools brought to the site and used here. These MANs, as well as the presence of ground stone items and the hafted scraper, indicate that other activities that may or may not have been directly related to the procurement of chert for tool manufacture or maintenance were occurring at the site. Furthermore, five thermally altered flakes and charcoal flecking found in the deposits suggest a nearby fire, such as hearth. Taken together, this evidence suggest that the artifacts found in the Block A deposits may be within, or near, a displacement zone of a knapping area and/or a general work area near a hearth.

SITE STRUCTURE

The types of activities and features suggested by the lithic analysis results are usually associated with a much larger occupation, such as a base camp. As pointed out by Stevenson (1991:271), "refuse allowed to accumulate beside hearths may be periodically displaced by hand or foot toward the perimeters of intensive use and activity." At Rose Island, Kimball (1993) identified the Archaic site structure based on a spatial analysis of artifacts distributed across the site. These data can be used to evaluate other sites' structure. In this model of Early Archaic site structure, bifaces broken during manufacture and utilized tools are distributed, probably tossed, away from major lithic debitage concentrations (knapping areas). Furthermore, unmodified chert nodules, broken tools, and large amounts of flake debris (as seen in Block A at site 15Tr289) also represent items that would be dropped within, or discarded near, a knapping area (Kimball 1993:104). Considering these, the area investigated within Block A at Locality 2 could represent the periphery of a knapping area or general work area, where items are being tossed after breakage (broken bifaces) and abandoned or moved during or after production (flake debris), as well as broken and/or dropped after use (scraper, retouched flakes). Hearths occur close to these activity areas in Kimball's model (1993:112) and areas of relatively low-density artifact concentrations (e.g. shelter, hide working areas) would occur nearby, but are clustered away from the flint knapping and general work areas. In light of the Rose Island Model, the data from site 15Tr289 are intriguing. A low density of additional cultural material was recovered from backhoe trenches, units, and auger at Locality and at the same depth as the activity area in Block A. These remains may be evidence of additional activities that are associated with the Block A archaeological deposits, but are low in archaeological visibility.

CONCLUSIONS

The phase II work at Locality 2 of Site 15Tr289 has demonstrated that the Little River floodplain sediments do have a good potential to contain intact archaeological deposits. As such, these deposits can provide significant information regarding prehistoric human settlement and subsistence in the Lower Cumberland River valley. Through multiple lines of evidence, several strong assertions were made regarding the intact and buried component at Site 15Tr289.

First, the flakes and tools that were refit or related between all levels of Block A during the lithic analysis demonstrated the integrity of the archaeological deposits and that the material was deposited during a single occupation or through repeat visits during the same time period. Second, the MANA and refit analysis indicate that the five minimum analytical nodules in the flake assemblage from Block A represent chert that was preliminarily reduced at another location and then brought to the site for on-site tool production, use, discard, and/or transportation to another location, either on or off-site. Also, late stage flakes and broken tools in the assemblage suggest that the area excavated was near a knapping or general work area of the site where tool production and/or maintenance were occurring.

Such an assemblage suggests behaviors that are usually associated with a larger occupation, such as a base camp, where other on-site activities would be taking place. However, given the small area of excavation of these deposits, the conclusions regarding site behavior and structure represent hypotheses for further research. These hypotheses also represent examples of the type of information that could be gathered from sites in similar settings.

ACKNOWLEDGMENTS

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CHANGING METHODS, CHANGING RESULTS: RECENT RESEARCH AT AND A REVIEW OF THE FORT CAMPBELL, KENTUCKY ARCHAEOLOGY PROGRAM

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ABSTRACT

This paper discusses recent results of Site Detection survey and Eligibility Evaluation testing conducted at Fort Campbell, Kentucky. This research has used a number of methods and techniques new to Fort Campbell, including intensive, close-interval shovel testing; Global Positioning System recording at the shovel test and surface inspection levels; geomorphological investigations of alluvial settings; and a battery of analytical techniques including microwear and serological analyses. This paper focuses on the application of these techniques and the resulting improvements in the cost efficiency and accuracy of data collection at Fort Campbell.

INTRODUCTION

The Fort Campbell Military installation is located in portions of Stewart and Montgomery counties, Tennessee, and Trigg and Christian counties, Kentucky (Figure 1). As a government installation, Fort Campbell has the responsibility to inventory the cultural resources located within its boundaries (Section 110 requirements). As such, and as part of a Programmatic Agreement (Fort Campbell 2004) between the Kentucky State Historic Preservation Officer, Tennessee State Historic Preservation Officer, and the Advisory Council on Historic Preservation, the Fort Campbell cultural resource program has been involved in a continuous and systematic inventory, survey, and eligibility evaluation program over the last decade. During that time, approximately 53,000 acres have been surveyed. Over the past ten years, the survey methods and their supporting technologies have changed at Fort Campbell. Examining these changes in methods and technologies offers an opportunity to understand and interpret the reliability and cost effectiveness of these procedures. In the following discussion, the authors will examine which methods are most reliable and cost effective, based on recent project experience.

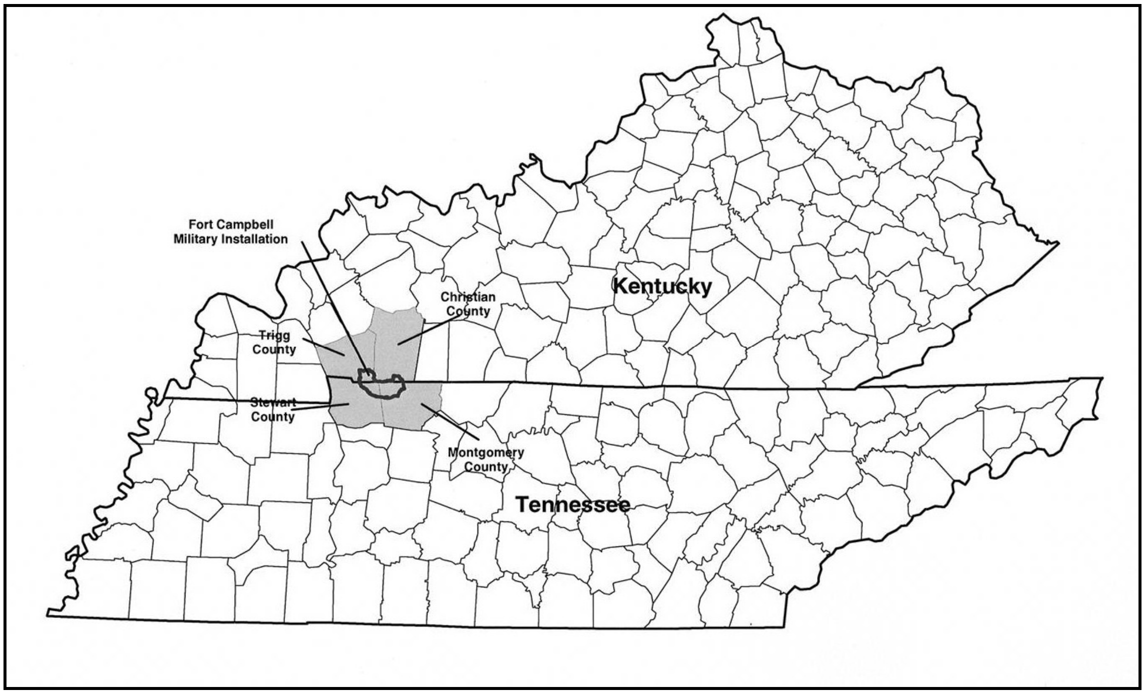

Figure 1. Location of Fort Campbell.

OVERVIEW OF THE FORT CAMPBELL ARCHAEOLOGY PROGRAM

Fort Campbell occupies over 105,000 acres of land, approximately 60,000 acres of which is available for survey. The remaining 55,000 acres is inaccessible for survey, located in either impact zones or the cantonment (residential and office area). Of the acreage available for survey, 53,000 acres have had some level of Site Detection Survey completed (Figure 2). As of 2004, those surveys have identified over 1350 archaeological sites, almost 300 of which have been determined either eligible or potentially eligible to the National Register of Historic Places (NRHP). Approximately 700 sites are prehistoric, 300 historic, and 350 multicomponent; in addition there are over 100 historic cemeteries located on Fort Campbell. All of these sites are recorded in two separate (but linked) databases; ESRI's Geographic Information System (GIS) ArcView, and Microsoft's Access database.

In spite of the considerable effort expended on archaeological studies to date, the program still has much to do both in the field and in the office. Historic Context Statements for the prehistory (Bergman and Comiskey 2005), history (Patton, et al. 2006), World War II (Chanchani and Leary 2006), and Cold War (Chanchani, et al. 2006) components on Fort Campbell are currently completed or in development, and there remains 7000 acres of land that requires Site Detection survey – not to mention some land that may require supplemental survey. In addition, 300 inventoried sites require further research to ascertain an eligibility for the NRHP.

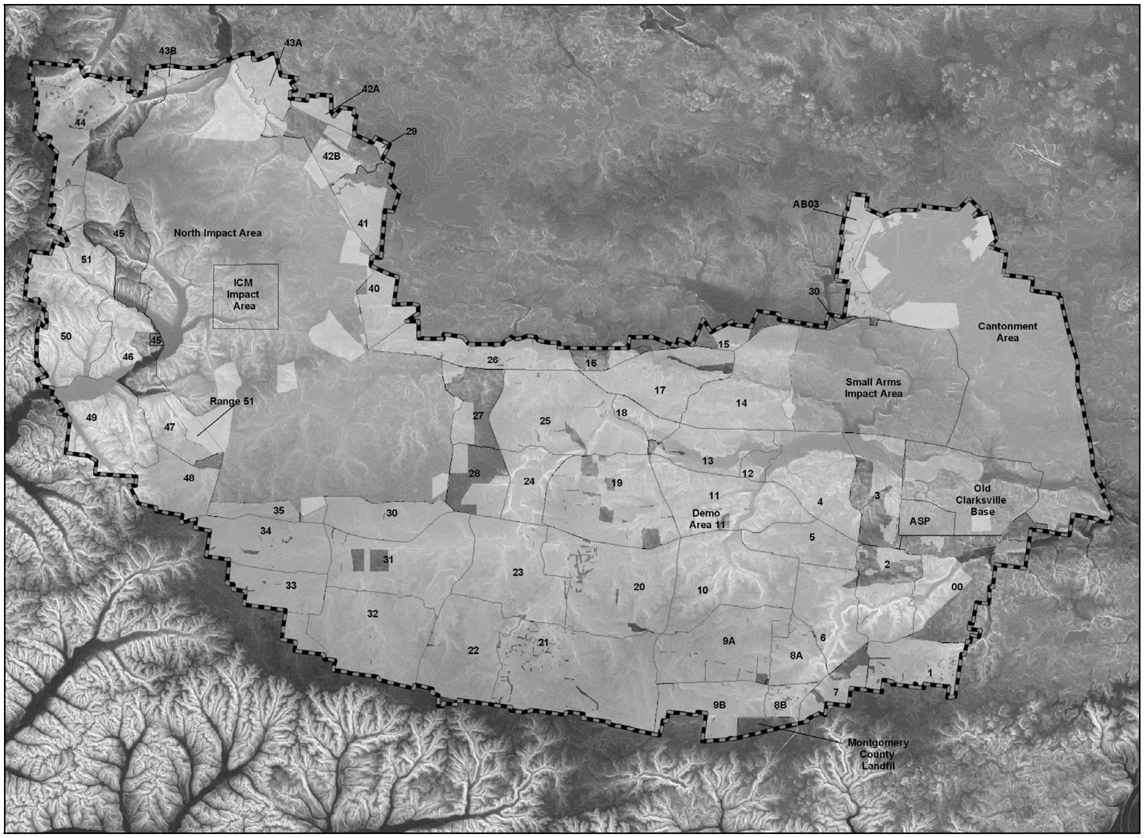

Figure 2. Surveyed Areas (in light gray) at Fort Campbell.

The Fort Campbell Cultural Resource Program has been engaged in continuous Site Detection and Eligibility Evaluation for almost a decade. However, as the earliest research at the installation was conducted over twenty years ago, techniques, methods, and technology have continually changed and improved. It was the production of Fort Campbell's Historic Context Statement for Prehistory (Bergman and Comiskey 2005) that made it apparent that the ongoing management of the sites at Fort Campbell required information that was customarily not recovered by standard Site Detection surveys or Eligibility Evaluations. For example, the routine recordation of site information without any context to the integrity of the surrounding area in Site Detection surveys and the termination of research once an evaluation could be made does not effectively address the requirements of the Fort Campbell program, where sites are being studied for preservation rather than mitigation.

With the realization that standard survey techniques were insufficient for Fort Campbell's need, the methods employed with the current Site Detection survey and Eligibility Evaluation were re-assessed. The new techniques include background research prior to excavation; intensive, close-interval shovel testing; Global Positioning System (GPS) recording at the shovel test and surface inspection levels; geomorphological investigations of alluvial settings; and a battery of analytical techniques including microwear and serological analyses.

Prior to conducting field work, a Statement of Expected Finds (SOEF) is developed that considers the specific project area selected for Site Detection survey. The SOEF includes a discussion of inventoried archaeological and architectural history resources within the immediate vicinity of the project environs. For the prehistoric period, background information is largely confined to a review of the Fort Campbell archaeological inventory, state archaeological inventory forms, and environmental and geomorphological GIS-based data, including soil mapping, hydrology, elevation, landform settings, and distance to water. This basic GIS data for historic resources is further enhanced by historic era maps, aerial photographs, and narrative descriptions collected during local oral history interviews. This information is combined to form a picture of the archaeological record of the survey area, which can then be synthesized into a site location model that targets sensitive areas for prehistoric and historic occupation. This model is then used during fieldwork to more effectively identify the cultural resources.

Once in the field, one of the most important technological additions to both the Site Detection Surveys and Eligibility Evaluations was the more rigorous and extensive use of a more accurate GPS unit – a Trimble-XR Pro unit with sub-meter accuracy. For the Site Detection survey, instead of recording GPS coordinates only at the site datum, every fifth shovel test and every positive shovel test was recorded, as well as the beginning and ending of each transect and at significant reference points on the landscape. This allowed for accurate, electronic mapping of survey coverage transects, site boundaries, as well as isolated finds (Wilson, et al. 2005) (Figure 3).

This rigorous recording identified that the assumed standard estimate of ten shovel tests per acre for a 20 m interval is incorrect. The actual expected number is over ten and greatly depends on how large of an area is being surveyed (Table 1). In addition, both topography and the irregular shape of the sample area increase the number of shovel tests required per acre. The illustrated projections of shovel tests per acre also do not take into account the additional radial shovel tests added for site delineation. Therefore, a standard 12 shovel tests per acre was used as the uniform estimate.

The use of GPS equipment for mapping purposes proved not only accurate, but less expensive than traditional methods. Accuracy of the equipment was sub-meter, lending a level of precision beyond ordinary sketch maps. Indeed, while there was additional time spent using the GPS equipment, the need for sketch maps with prehistoric sites was obviated because the GPS unit was employed to map positive shovel tests and delimit site boundaries. Although it was still necessary to sketch the historic features, the GPS provided base map reduced the time required and improved the accuracy. The efficiency of this method continued into report preparation. GPS data with transects, positive shovel tests, and site boundaries formed a layer that was combined with information from USGS topographic maps superimposed on geo-referenced aerial photographs. The use of GPS data avoided mistakes that can occur in transferring field data to its final format as the information collected electronically during the survey was directly applied to site mapping. In addition, it was also quick, easy, and accurate to add this electronic information into the Fort Campbell GIS database.

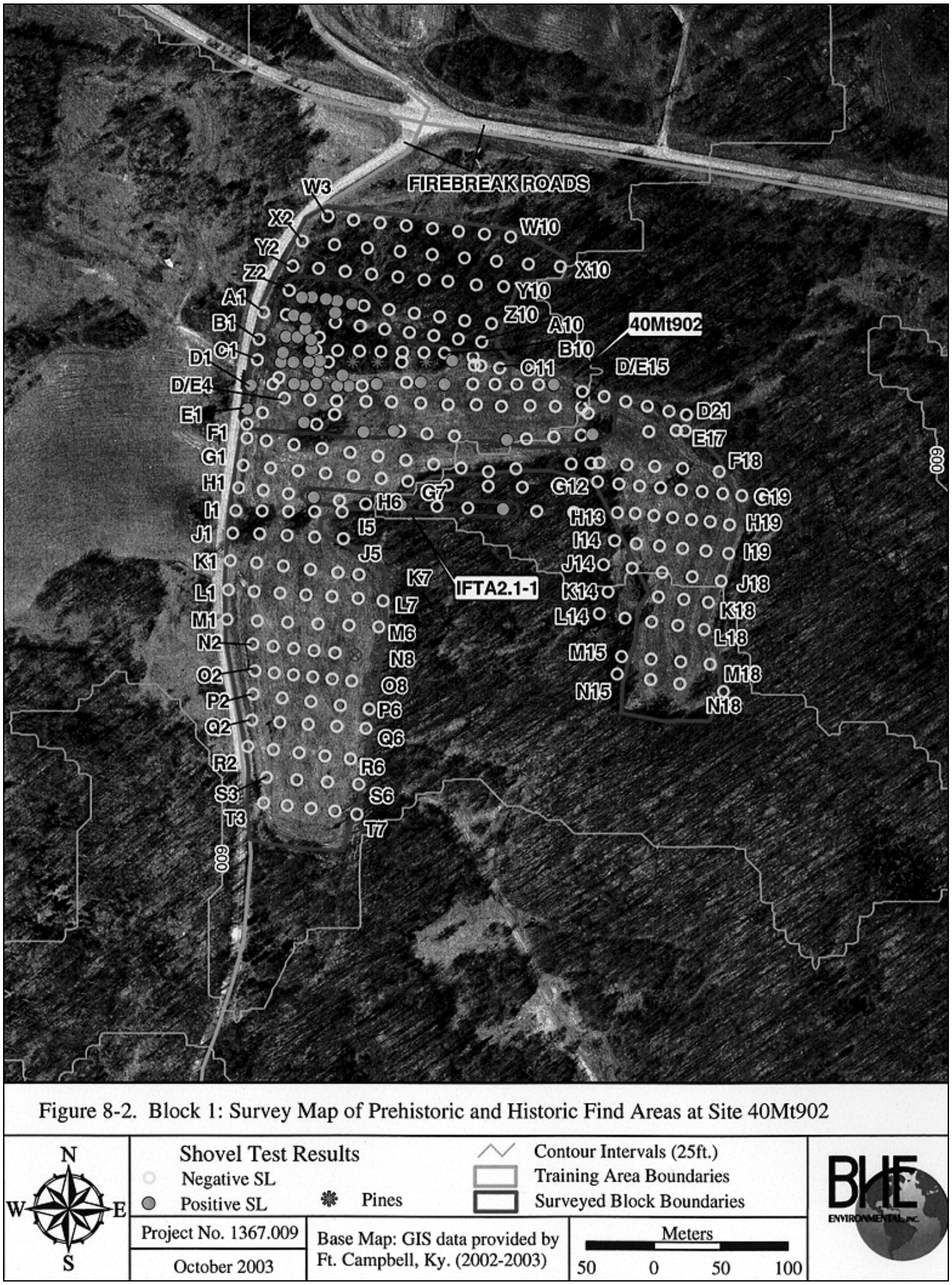

Figure 8-2. Block 1: Survey Map of Prehistoric and Historic Find Areas at Site 40Mt902

Figure 3. GIS Transect and Site Boundary Map.

Table 1. Number of Shovel Tests (Vertices) per Acre by Acreage.

Formula for Tests in a Square Area at 20 Meter Intervals: (S/I + 1)(S/I + 1) = Vertices pre Acre							
Acres	Area (Sq. Meters)	Length of Side	Side/ Interval (S/I)	Cells in Area	S/I + 1	Vertices	Vertices per Acre
1	4046.873	63.615	3.181	10.117	4.181	17.479	17.479
2	8093.745	89.965	4.498	20.234	5.498	30.231	15.115
5	20234.363	142.248	7.112	50.586	8.112	65.811	13.162
10	40468.726	201.168	10.058	101.172	11.058	122.289	12.229
12	48562.471	220.369	11.018	121.406	12.018	144.443	12.037
15	60703.089	246.380	12.319	151.758	13.319	177.396	11.826
25	101171.815	318.075	15.904	252.930	16.904	285.737	11.429
50	202343.631	449.826	22.491	505.859	23.491	551.842	11.037
75	303515.446	550.922	27.546	758.789	28.546	814.881	10.865
100	404687.261	636.150	31.808	1011.718	32.808	1076.333	10.763
250	1011718.153	1005.842	50.292	2529.295	51.292	2630.880	10.524
550	2225779.936	1491.905	74.595	5564.450	75.595	5714.640	10.390
1000	4046872.610	2011.684	100.584	10117.182	101.584	10319.350	10.319
2000	8093745.220	2844.951	142.248	20234.363	143.248	20519.858	10.260
10000	40468726.100	6361.503	318.075	101171.815	319.075	101808.966	10.181
100000	404687261.000	20116.840	1005.842	1011718.153	1006.842	1013730.837	10.137

Another important change in the approach to using GPS technology was downloading and reviewing the data daily. By plotting the transect lines into ArcView while fieldwork was still ongoing, areas that had larger than acceptable gaps in the transect intervals were identified and additional shovel tests were then excavated to adequately fill in these gaps.

The decision to GPS every fifth and positive shovel tests and beginning/ending transects was one of cost/benefit. Obviously, recording every shovel test would provide an even greater degree of accuracy. It was decided that the cost of recording every shovel test was not worth the benefit. However, there are problems with not using the GPS to record every shovel test. Negative shovel tests are drawn at equidistant intervals between the positive tests, therefore these tests are drawn schematically. However, since every fifth test is recorded with certainty and precision, the payoff is reasonable.

During Eligibility Evaluation – which was conducted mostly on sites within agricultural fields – we used the same GPS unit to record the site datum, the 1m x 1m excavation units, and piece plots of artifacts collected on the surface. It was found that it was just as time efficient to collect and map artifacts individually as to set up a collection grid and bag artifacts in 5 m x 5 m lots. The procedure worked best when the field team flagged artifact locations and later collected them as the GPS technician recorded their location and description.

Precise collection methods such as this allow for close comparison of artifacts recovered from surficial and buried plowzone contexts. At 15Ch398, a predominantly Early Archaic site, there is close parity between a zone of biface thinning and finishing flakes identified during surface collection and similar flakes recovered during test unit excavation. Specifically, the accurate recording of individual flakes from the surface, rather than in gross 5 m x 5 m collection blocks, provided a better comparison of artifacts collected in similarly tight provenience units within the 1 m x 1 m test units. This, in turn, has allowed for a more precise identification of activity zones related to different manufacturing trajectories.

GEOARCHAEOLOGICAL APPLICATIONS

Geoarchaeological investigations were conducted that focused upon both geomorphology and the bedrock structure underlying the base. The focus was upon floodplain settings, characterizing stratigraphic profiles, depositional regimes, and landform development. The initial results suggest that many floodplains at Fort Campbell were frequently inundated and channelized due to overbanking. They also seem to have been frequented mainly during the later stages of prehistory. Indeed, portions of the floodplain stratigraphic sequences of studies now in progress suggest basal ponding episodes that may explain why there are no cultural materials deposited in such settings during the early stages of prehistory. Middle Archaic sites, for example, are relatively rare throughout Fort Campbell. The basal ponding may be one factor in the lack of utilization of the Fort Campbell landscape during that temporal period. Radiometric dating of landform development with prehistoric settlement is one potential future avenue of research at Fort Campbell.

The other thrust of the geoarchaeological studies has been concerned with bedrock geology, specifically raw material outcrops, and potential quarry locations. Chert is ubiquitous in certain locations on the base, a fact commented upon by almost every researcher acquainted with Fort Campbell (e.g., Albertson and Buchner 1999, 2001; Albertson, et al. 1999; Bergman and Comiskey 2005; Bradbury, et al. 1998; Miller, et al. 2004; O'Malley, et al. 1983; Wilson, et al. 2005). However, little headway has been made in identifying and characterizing Raw Material Extraction Zones. Through the use of geostratigraphic modeling, preliminary indications suggest that there are some extraction activities associated with *Felsenmeer* (boulder sea) structures (Figure 4). The Fort Campbell *Felsenmeer* are literally pavements of chert nodules and several of these "ore rich" locations have been identified on base. The detailed characterization of prehistoric technological organization at sites situated near *Felsenmeer* is helping to characterize lithic assemblage components associated with material testing and preliminary reduction. One pattern that is emerging at likely extraction zones is a high incidence of shatter in the lithic assemblages. Some cherts on the base are characterized by fabrics that display numerous unsealed fractures. Cherts with unsealed fractures, that have not undergone recrystallization, literally shatter into fragments when being flaked.

LABORATORY APPLICATIONS

Data from the Prehistoric Context Statement indicate that over 98 percent of all Fort Campbell prehistoric sites may be termed "Open Habitation" and over 83 percent occur in upland settings involving former or currently active plow zones. Almost all of these localities are lithic scatters with varying degrees of artifact discard intensity.


Figure 4. Photo of *Felsenmeer,* Fletcher's Fork Creek.

In developing the prehistoric context statement (Bergman and Comiskey 2005), the range of information that may be contained in "lithic scatters," their importance, and how to reliably assess and classify these sites was discussed. One of the most basic questions for archaeologists concerns the nature of the activities conducted at a given locality in the past. In terms of harnessing the information potential of lithic materials, especially artifacts or sites that have known temporal associations, both microwear analysis and serological studies have been applied.

The results of microwear analysis at two sites with Early Archaic components, 15Ch398 and 40Mt599, indicate that interpretable wear traces are preserved and that they can be used to distinguish past activity at superficially similar sites (Leary, et al. 2005).

At 15Ch398, Early Archaic Kirk and Thebes cluster PPKs (Figure 5) were multifunctional (e.g., like a Swiss Army knife) and served as projectiles, as well as tools to process meat, hide, and wood. A single adze sharpening flake was covered with wood polish, while all the end-scrapers studied displayed dry hide polish, presumably from preparing leather. Interestingly, the two bifaces analyzed from 15Ch398 did not display any wear traces, a fact supported by the serological analysis that yielded negative results for reaction to plant and animal proteins. This suggests these tools were being curated for later conversion into PPKs (Leary, et al. 2005).

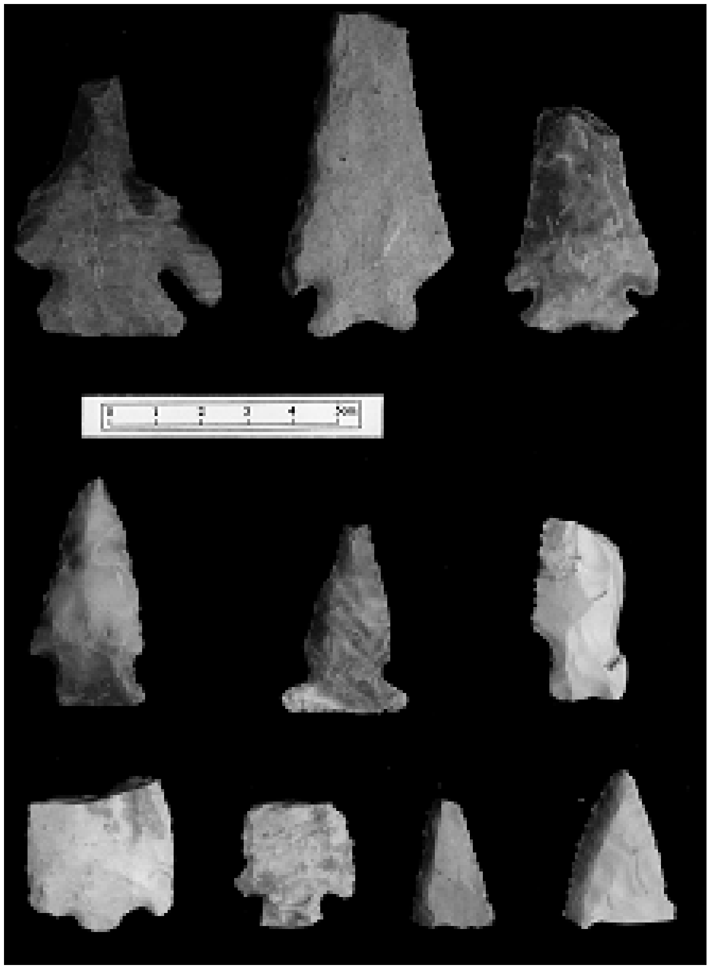

Figure 5. Photograph of PPKs.

Site 40Mt599 also contained an Early Archaic component, but the range of activity evidenced by microwear analysis was more restricted than at 15Ch398. Only four artifacts displayed microwear traces and these were all collected from the same location at the northern end of surface collection. One possible Lost Lake or Kirk PPK was used as a drill, while an unidentified PPK and a Big Sandy PPK were used as projectiles. Finally, an end-scraper produced wear traces that indicated its use as a hide scraper. This same tool also tested positive for reaction to pine resin. Pine resin was frequently used by prehistoric peoples as mastic for fixing stone tools to handles in both Old and New World contexts. Aside from these activities, there is some evidence to suggest that the site is associated with raw material procurement, perhaps involving the Tuscaloosa Gravel underlying the site area, as well as *Felsenmeer* deposits (Leary, et al. 2005).

Both 15CH398 and 40MT599 are classified as a property type called "Activity Loci Involving Discard of Multiple Artifact Types" (Bergman and Comiskey 2005). This means they both share the characteristic of containing artifact assemblages that contain at least two discrete artifact classes, in this case debitage and cores with retouched tools. The various investigative techniques applied to these sites, including microwear and serological analyses; suggest that any similarity is confined to this simple level of classification only. Given the intensity and diversity of artifact discard, 15Ch398 appears to have been occupied on numerous occasions. The multi-focal character of the activities is suggestive of a site more substantial than a simple upland resource procurement station, perhaps a base camp. In contrast, lithic reduction of a nearby raw material source seems to have been the focus of activity at 40Mt599 throughout prehistory. Relatively few tools displayed microwear traces and these were confined to a limited range of activity (Leary, et al. 2005).

CONCLUSIONS

The past two field seasons at Fort Campbell has seen an increase in use and intensity in several different methods, techniques, and technologies. Not surprisingly, this increase has produced more information with greater accuracy. Nevertheless, the question we always have to address is at what costs do these benefits come? Obviously, some of what we have described does cost more money – geomorphological studies, microwear analysis, and serological studies are not free. However, the costs are minor compared to the results; and in the end if we understand our study area better today, our decision process for eligibility and other management decisions become cheaper tomorrow. Still, the metadata suggests that some of the new techniques – the increase use of GPS technology – actually pays for itself; and, in fact, may even be cheaper than the traditional method of project/report production.

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