Archaeobotany of the Late Woodland and Contact Periods at the Barton Site (18AG3), Allegany County, Maryland

by
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Submitted for the degree of

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ABSTRACT

An archaeobotanical study was conducted on macroplant remains from the Late Woodland (AD 900-1550) and Contact (AD 1550-1750) Periods at the Barton site (18AG3), Allegany County, Maryland. The dataset examined for this study included 70 samples collected from 59 features. The features samples were obtained over a 13-year period by students and volunteers working with Dr. Robert Wall of Towson University, Maryland. Results of this study were intended to provide information regarding subsistence activities of the site's inhabitants.

In total, 15,608 macroplant remains were identified and included: tropical cultigens (maize, beans, and squash); nut mast (hickory, walnut/butternut, and acorn); and a variety of wild plant remains that include fleshy fruits (blackberry, blueberry, elderberry, grape, groundcherry maypop, strawberry, and sumac), starchy weeds (goosefoot and knotweed), grasses, and other miscellaneous wild plant seeds.

Archaeobotanical analysis of features from the Barton site provided a wealth of information concerning the dietary patterns practiced by the Late Woodland and Contact Period inhabitants of the site. While interpretations of the data were limited by sampling issues, the assemblage indicates the site's inhabitants practiced a diverse subsistence economy based on gathering of wild plants and cultivation of domesticated plants. Beginning approximately AD1400, the site's inhabitants adopted food storage technology that allowed them to endure periods of food shortage caused by cultural, political, and climate factors. Future studies of

the Barton site's archaeobotanical remains are expected to contribute further to understanding subsistence, settlement, and the paleoenvironment.

(Cover photo courtesy Dr. Robert Wall)

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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This work is dedicated to my parents

Shirley and Leonard Furgerson

CHAPTER 1. INTRODUCTION

The Barton site complex is composed of a cluster of archaeological sites situated on two river terraces on the North Branch of the Potomac River in Allegany County, Maryland (Figures 1 and 2). The complex is over 30 acres in size and is owned by the Archaeological Conservancy. Dr. Robert Wall of Towson University in Maryland has been conducting excavations of one of the sites in the complex, the Barton site (18AG3), over the past 13 years as part of an ongoing research project. Due to its location in a riverine setting, the site contains buried and sealed deposits with excellent preservation of cultural features and organic remains and provides a unique opportunity to examine subsistence strategies of the site's inhabitants.

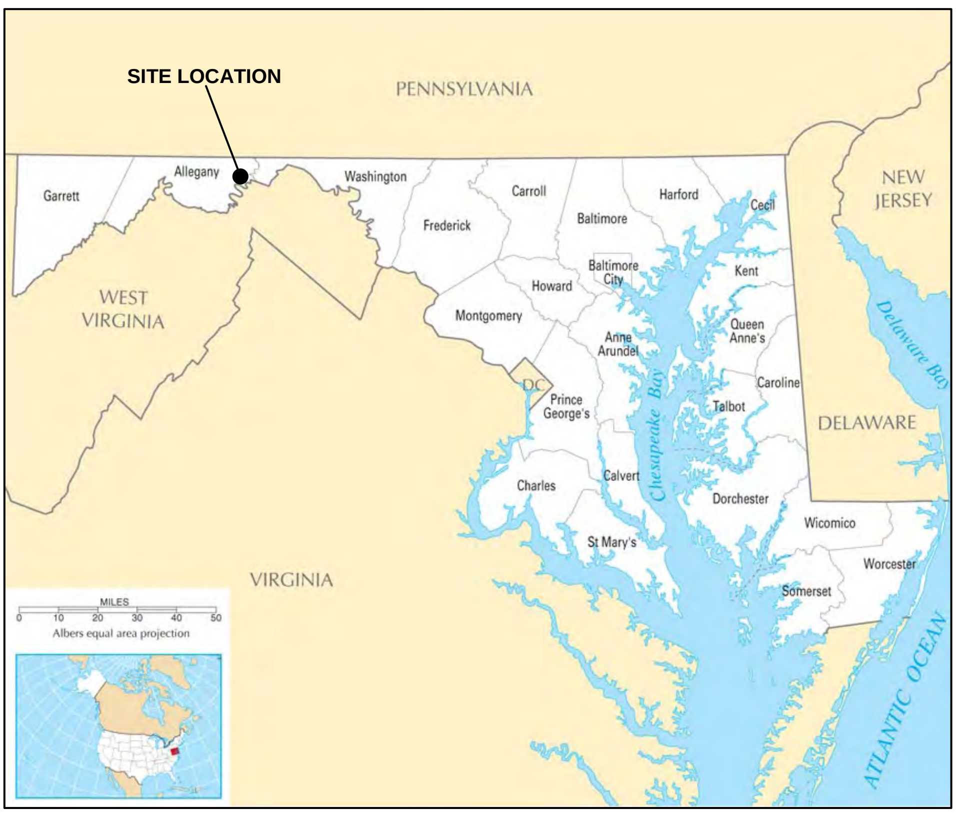

Figure 1. Barton Site Location

(Source: US Department of the Interior 2003)

Figure 2. Aerial View of Barton Site

(Source: Dr. Robert Wall)

PURPOSE OF THE STUDY

The purpose of this study was to conduct archaeobotanical analysis of Late Woodland Period (AD 900-1550) and Contact Period (AD 1550-1750) features from the Barton site. The feature samples from the Barton site were collected and processed by students and volunteers under the supervision of Dr. Wall. This study is intended to provide information regarding subsistence activities of the site's inhabitants.

RESEARCH DESIGN

Analysis of archaeobotanical remains from the Late Woodland and Contact Period features is aimed at addressing two research questions:

1. What can be understood about dietary changes, if any, throughout the Late Woodland and into the Contact Period?
2. What information can the archaeobotanical data yield about food processing and storage, and what does this tell us about site seasonality?

Data generated from this study is expected to contribute to interpretations of the site, as well as foster additional research of Late Woodland and Contact Period subsistence studies in the region.

SCOPE AND LIMITATION OF THE STUDY

The scope of this study includes analysis of food remains only; no wood identification was conducted as part of this study, but will be completed at a later date. Several limitations were encountered during the course of the project. The main limitation was the nature of the dataset: both flotation and water screening were used to process samples and this resulted in recovery bias and comparability issues. In addition, sample volumes generally were not recorded and this hindered quantitative analyses which rely on this type of measurement for data standardization. As a result, the dataset limited quantitative measures to ubiquity analysis and precluded statistical analysis.

ORGANIZATION OF DISSERTATION

This dissertation is organized into the following chapters: Chapter 1, Introduction; Chapter 2, Background; Chapter 3, Laboratory Methods; Chapter 4, Results; and Chapter 5, Discussion and Conclusions. A Bibliography and Appendix A follow Chapter 5.

CONCLUSION

This dissertation summarizes results from archaeobotanical analysis of feature samples from the Barton site. The samples were collected over a 13-year period as part of ongoing site research. Different collection and processing methods resulted in disparate datasets that were subject to limited analysis. Results of the analysis are expected to contribute to regional knowledge of Late Woodland and Contact Period subsistence strategies.

CHAPTER 2. BACKGROUND

This chapter begins with a summary of the natural environment and paleoclimate and is followed by an overview of the Late Woodland and Contact Periods in western Maryland and vicinity. The chapter concludes with a summary of the Barton site excavations.

NATURAL ENVIRONMENT

The Barton site is located in the Ridge and Valley Physiographic Province, which is characterized by sedimentary rock that is folded and faulted, forming high-relief topography (Maryland Geological Survey 2002; Figure 3). Elevations within the province range from 60 to 600 meters above sea level (Roth et al. 1999:3-5). The vegetation regime is an oak-hickory-pine forest (Bernabo and Webb 1977; Gaudreau 1988; Watts 1979). Climate in the region is characterized as temperate, with mild to hot summers (27 to 31 degrees Celsius) and cold winters (-7 to - 4 degrees Celsius; Maryland State Archives 2005). Annual rainfall averages 1.03 meters with peaks in July and August; average seasonal snowfall is over 2.03 meters for Allegany County (Maryland State Archives 2005; Maryland State Climatologist 2006). The growing season in Allegany County averages 178 days (Maryland State Climatologist 2006).

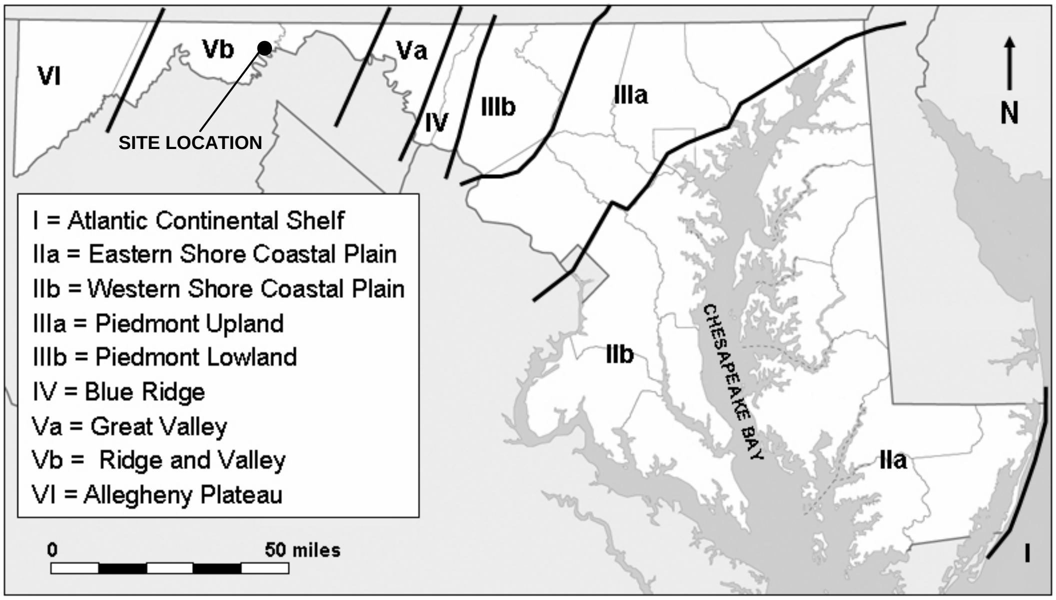

Figure 3. Physiographic Provinces of Maryland

(Source: Maryland Geological Survey 2005, United States Department of the Interior 2003)

Paleoclimate

The environment during the period between AD 900 and 1700 has been characterized as approximating present conditions based on vegetation map reconstructions (Bernabo and Webb 1977; Gaudreau 1988; Watts 1979). This period falls within the Post Sub-Atlantic climatic episode which represents a general trend of climate warming during the late Holocene (Table 1; Bryson and Padoch 1980). The Holocene was thought to have been climatically stable, however, recent research, especially in eastern North America, has demonstrated the Holocene was punctuated by abrupt periods of cooling and/or drought lasting decades or centuries (e.g., Brush and Hilgartner 2000; National Climatic Data Center 2005; Mann et al. 1998; Mayewski et al. 2002; Osborn and Briffa 2006).

Table 1. Late Holocene Climatic Episodes

Climatic Episode	Sub-Episode	Date (Years AD)	Characteristics	Culture Period
		Present		
	Modern		Maximum warmth	
		1900		
	Neo-Boreal		Little Ice Age; alternating periods of mild to cold temperatures	Contact Period
Post Sub-Atlantic		1550		Late Woodland, Luray Phase
	Pacific			
		1200		Late Woodland, Mason Island Phase
	Neo-Atlantic		Little Optimum/ Medieval Warm Period	
		750		

Adapted from Bryson and Padoch (1980), Table 3

The Little Optimum, or Medieval Warm Period, was a phase of global warming that occurred between AD 750 and 1200 (Goudie 1992:165) The period was marked by mild winters and dry summers, creating favorable conditions that promoted agriculture in many parts of the world, including North America (Goudie 1992:165). The Little Ice Age represents a period of several centuries occurring between ca. AD 1200 and 1900 represented by cooler temperatures and glacial advances in many parts of the world (Grove 1990:3). Goudie (1992:167-168) notes that while a period of cool temperatures, conditions were not stable during the Little Ice Age and that complex patterns of cooling and warming conditions existed. Historic records provide detailed accounts of deteriorating climatic conditions during this period throughout Europe and Asia, and for the early historic period in Canada and the United States as well (Bradley and Jones 1995; Goudie 1992; Grove 1990; Wilson et al. 2000).

A wealth of physical data has been collected that documents the climate history of North America before European exploration and settlement. Data has been gathered from numerous sources including geomorphological, dendrochronological, and palynological studies, with the timing of events dated through radiocarbon assays (e.g., deMenocal 2001; Gaudreau 1988; Stahle et al. 1988; Stahle et al. 1998; Watts 1979; Willard et al. 2005). These studies have provided evidence that the Little Optimum and Little Ice Age affected the environment and also human occupation. Specifically, some have argued that the Little Optimum provided the impetus for the adoption of maize agriculture in eastern North America (Wilson et al. 2000), while the Little Ice Age may have influenced settlement and subsistence strategies (e.g., Anderson et al. 1995; Blanton et al. 1999:104; deMenocal 2001; Walker and Miller 1992). The role of climate in culture change remains problematic; however, refinements in paleoenvironmental reconstruction have allowed stronger inferences concerning the effects of climate change on human culture.

LATE WOODLAND AND CONTACT PERIOD CONTEXT

The prehistoric culture history of the region has been divided by archaeologists into sub-periods or phases based on changes in material culture, settlement patterns, and subsistence strategies. While the Barton site provides for 12,000 years of occupation, only the Late Woodland and Contact Periods will be summarized (Table 2). The divisions of these periods are based primarily on changes in ceramic styles; diagnostic markers used to characterize ceramic styles include tempering agents (e.g., shell or rock), exterior surface treatments, decoration, and vessel shapes.

Table 2. Late Woodland and Contact Period Summary

Period	Phase	Ceramic Tradition	Dates (Years AD)	Historically Known Group
Late Woodland	Mason Island	Page	900-1450	Unknown
	Luray	Keyser	1400-1550	
Contact	Schultz	Schultz	1550-1630	Susquehannock
	Washington Boro	Washington Boro	1615-1630	

Source: Maryland Archaeology Conservation Lab (MACL) 2002; Stewart 1982; Wall 2001; Wall 2006; Wall and Lapham 2003

Late Woodland Period

The Mason Island and Luray phases characterize the Late Woodland Period in western Maryland; both phases take their names from their type sites in the Virginia Piedmont to the southeast. Mason Island and Luray groups used stone tools, including small triangular projectile points, bifaces, unifaces, and other tool forms. Tools manufactured from bone (and possibly wood) also were used. The Mason Island Phase is the earlier of the two cultures and is represented by a tradition of ceramics with limestone temper and cordmarked exterior surfaces called Page ware (Kavanagh 1982:69; MACL 2002; Stewart 1982; Wall 2001). Decoration, located on the lip and rim exterior of pots, includes incising and cord-wrapped stick impressions (MACL 2002). Mason Island components on sites in the region have been radiocarbon dated AD 900-1450, and there is some overlap with the Luray Phase (Wall 2001). The Luray Phase is representative of the end of the Late Woodland Period, and is characterized by Keyser ceramics, which have shell temper and cordmarked or plain exterior surface treatments (Kavanagh 1982:69; MACL 2002; Stewart 1982; Wall 2001; Wall and Lapham 2003). Keyser wares tend to be undecorated, but when present, decoration is confined the lip and rim area and consists of lip notching, punctations, incising, and cordmarking (MACL 2002).

The Late Woodland Period is the first time in the prehistory of the region that people lived in semi-sedentary hamlets and villages (Wall 2001, 2006; Wall and Lapham 2003). In western Maryland, these habitations were established on the floodplains of valleys along major rivers such as the Upper Potomac, Youghiogheny, and Casselman rivers (Wall 2001, 2006), a pattern which appears to occur in nearby areas as well (Hantman and Klein 1992; Kavanagh 1982). These settlements were supported by agriculture, specifically maize, beans, squash, and other cultigens. There appears to be evidence for decreased use of upland areas for hunting and gathering, and an increased focus on these activities in the floodplains (Wall 2001, 2006).

Mason Island Phase occupations are characterized by small hamlets and limited maize horticulture which were replaced by Luray Phase palisaded villages and intensive agriculture (Wall 2006:4). The Mason Island occupation at the Barton site is represented by a series of successive hamlets (Wall 2001:17). East of the Barton site, in the Piedmont of Maryland, Kavanagh (2001:8) notes the presence of a few sites with Mason Island occupations that appear to be contemporaneous with the Montgomery complex of that region. These two groups lived in dispersed, unfortified communities or hamlets and apparently co-existed peacefully.

The Luray Phase palisaded village represents a new type of settlement in the region that may have represented the need for defensive fortifications against attacks from outside groups (Dent 1995; Potter 1993; Wall 2006:4; Wall and Lapham 2003:153). Wall and Lapham (2003:153) note that the Luray Phase villages are circular plans of densely clustered structures, burials, middens, and pit features surrounded by a palisade. Archaeological evidence for heavier reliance on agriculture is found on Luray Phase sites throughout the region, and includes maize, beans, squash, little barley, marsh elder, and goosefoot, which some interpret as evidence for longer term, more sedentary settlements Wall (2006:4).

The origins of the Mason Island and Luray Phase groups are beyond the scope of this study. Some researchers (e.g., Blanton et al. 1999; Potter 1993:125-137) theorize that the Mason Island and Luray Phase people migrated into the area. Stewart (1990:89-91), however, notes a general continuity of material culture traits and settlement patterns in the Appalachian region from Virginia north into New York during the early part of the Late Woodland. The stark difference in community patterning and intensification of agriculture between the Mason Island and Luray Phases is suggestive of population movements (Kavanagh 2001:9-11; Potter 1993:130). The adoption of village fortifications is viewed by some as evidence of "uncomfortable immigrants" into the area, who had "residual concerns from their homeland as well as uncertain relations with local groups" (Blanton et al. 1999:92-93).

Stewart (1990:97) notes the appearance of fortifications and planned villages ca. AD 1300 and attributes this to a variety of influences that include "population growth, changing political conditions, economic strategies involving more tightly integrated work groups, and changes in fertility and mortality rates as a consequence of agriculture." Climate change (i.e., the Little Ice Age), while not the *sine qua non* of culture change, had an influence on events during this period. Wall (2001:28) notes that archaeological evidence in the region suggests less agriculturally productive areas were occupied after AD 1400, and this perhaps is a reflection of deteriorating environmental conditions caused by the Little Ice Age.

Evidence for increasing inter-group hostilities after approximately AD 1400, with endemic warfare by AD 1500, is documented throughout the Middle Atlantic region (Potter 1993:147). By the 16th century Luray Phase villages are abandoned due to the movement of Susquehannock groups into the region from the lower Susquehanna River valley in southeastern Pennsylvania (Kavanagh 2001:11; Potter 1993:175-176). Wall and Lapham (2003:154) note that Luray Phase occupations are the latest known in the Upper Potomac Valley before European contact ca. AD 1650. Historic records left by the earliest European explorers from the mid-17th century do not mention any occupation of the region by native groups, which may indicate the area was abandoned prior to the 1630s (Wall 2006:5; Wall and Lapham 2003:170). The reasons for abandonment of the area are unclear, although could be due to environmental factors or social pressures from surrounding populations (Wall 2006:4).

Contact Period

The Contact Period in western Maryland is neither well understood nor well documented. The Schultz and Washington Boro phases characterize the Contact Period; both phases take their names from type sites in Pennsylvania. Contact Period material culture is characterized by Schultz and Washington Boro ceramics, glass trade beads, and a variety of metal (iron, copper, and brass) artifacts for tools and adornment (Wall 2001, 2006; Wall and Lapham 2003:151). Schultz ceramics are shell tempered, have cordmarked exterior surface treatment, castellated rims, and are highly decorated with plats of incised decoration forming triangular or diamond-shaped patterns (MACL 2002). Washington Boro ceramics are similar to Schultz, but also have stylized face effigies on the rim castellations (MACL 2002). Stone tool technology was in use, and resembled the preceding Late Woodland, with small triangular projectile points, as well as bifaces and unifaces used for a variety of purposes (Wall 2006). Settlement and subsistence remain largely the same as the preceding phase. Storage technology appears to have evolved, with bell-shaped and deep cylindrical pits found in association with Contact Period occupations (Wall and Lapham 2003:154).

The Susquehannock, who originated in the upper Susquehanna River Valley in Pennsylvania in the 1500s, historically is associated with the Contact Period in western Maryland (MACL 2002; Wall and Lapham 2003). The Susquehannock expanded into the Upper Potomac River Valley by the 1600s, but had disappeared from this area by the 1630s based on historic records (Wall and Lapham 2003:170-171). The discussion that follows refers to the Barton site Contact Period group as Schultz Phase since the Washington Boro Phase appears to be a minor component at the Barton site (Wall 2006).

Archaeological evidence indicates the Monongahela culture, located northwest of the Barton site briefly expanded into the Upper Potomac Valley between 1620 and 1640 (Wall and Lapham 2003:171). The changing cultures in the region during this time may reflect population decimation from warfare or disease (caused by European contact), with the result being population shifts across the region as native groups attempted to recover (Wall and Lapham 2003). In the 1690s, Europeans recorded the presence of the Shawnee Indians in western Maryland; however, by the 1730s the Shawnee abandoned the area. The Barton site has a possible Shawnee occupation which will be examined during future investigations (Wall 2006; Wall and Lapham 2003).

BARTON SITE

The Barton site was the subject of limited archaeological investigation ca. 1960 by Henry Wright (1963), who excavated one trench along the river bank to examine the site's stratigraphy (Wall 2001). No further investigations were conducted until Dr. Wall developed the research program in the early 1990s. Archaeological investigations during the 1993-1994 period resulted in excavation of six 5-by-5 meter test units spread across the landform (Figure 4). These excavations identified Mason Island and Luray Phase occupations. The Mason Island occupation was represented by a series of successive small hamlets and base camps which Wall (2001:17) interprets as evidence for intensive use of the area during the early to middle portion of the Late Woodland Period. The Luray and Schultz occupations were represented by palisaded villages; all three components appear to have practiced maize horticulture. Excavations of the Late Woodland and Contact Period components yielded hundreds of artifacts, including ceramics, lithic debitage and tools, bone artifacts (tools, beads), as well as faunal and macroplant remains. In addition, the Contact Period component has yielded a variety of European trade goods, such as glass beads, brass or copper tubes and jinglers, and other metal artifacts (Wall 2001:17; Wall and Lapham 2003).

A variety of feature types are associated with the Late Woodland and Contact Period occupations; examples of some of the features are illustrated in Figure 5. Assignment of

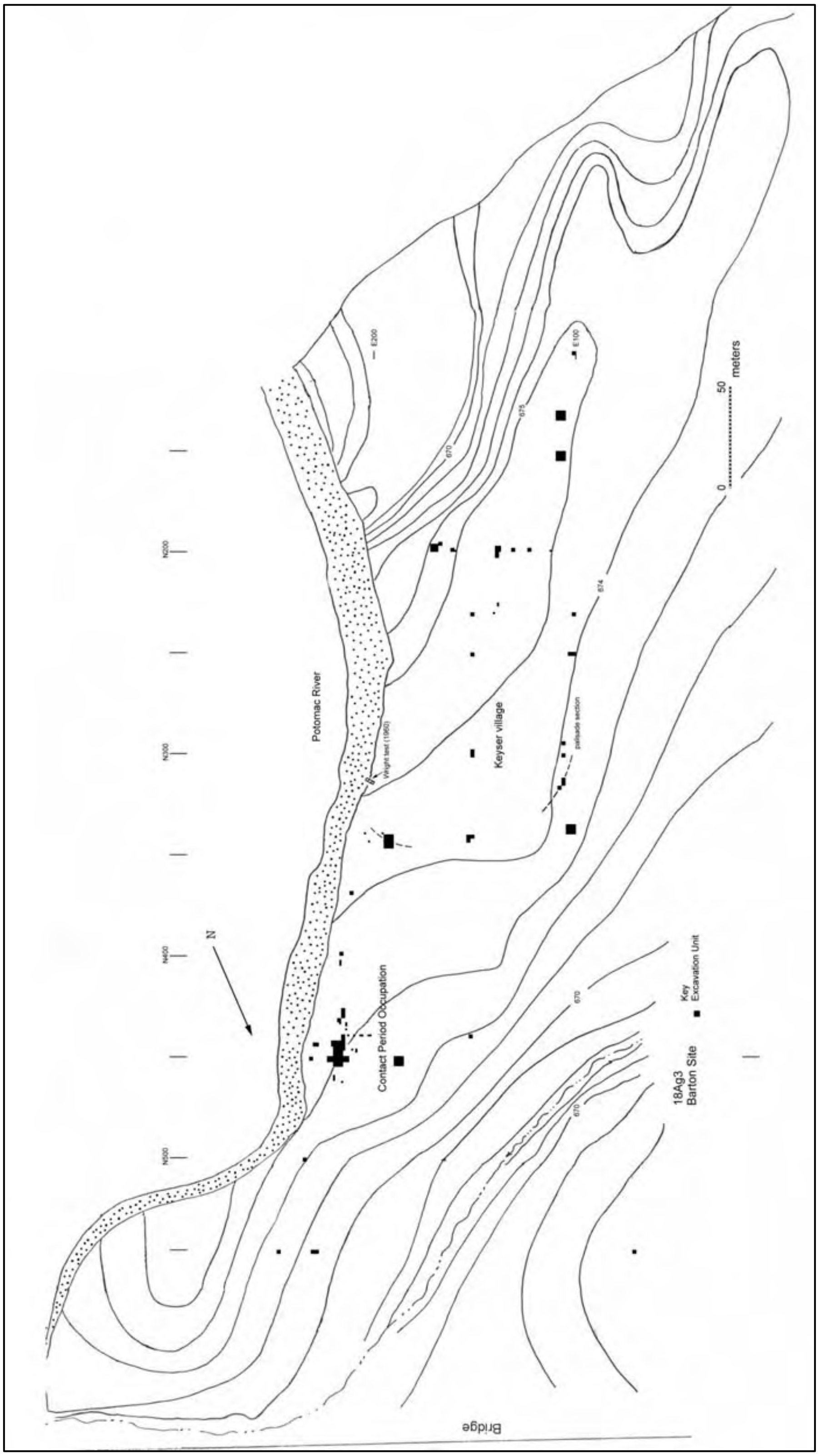

Figure 4. Barton Site Excavation Plan

(Source: Dr. Robert Wall)

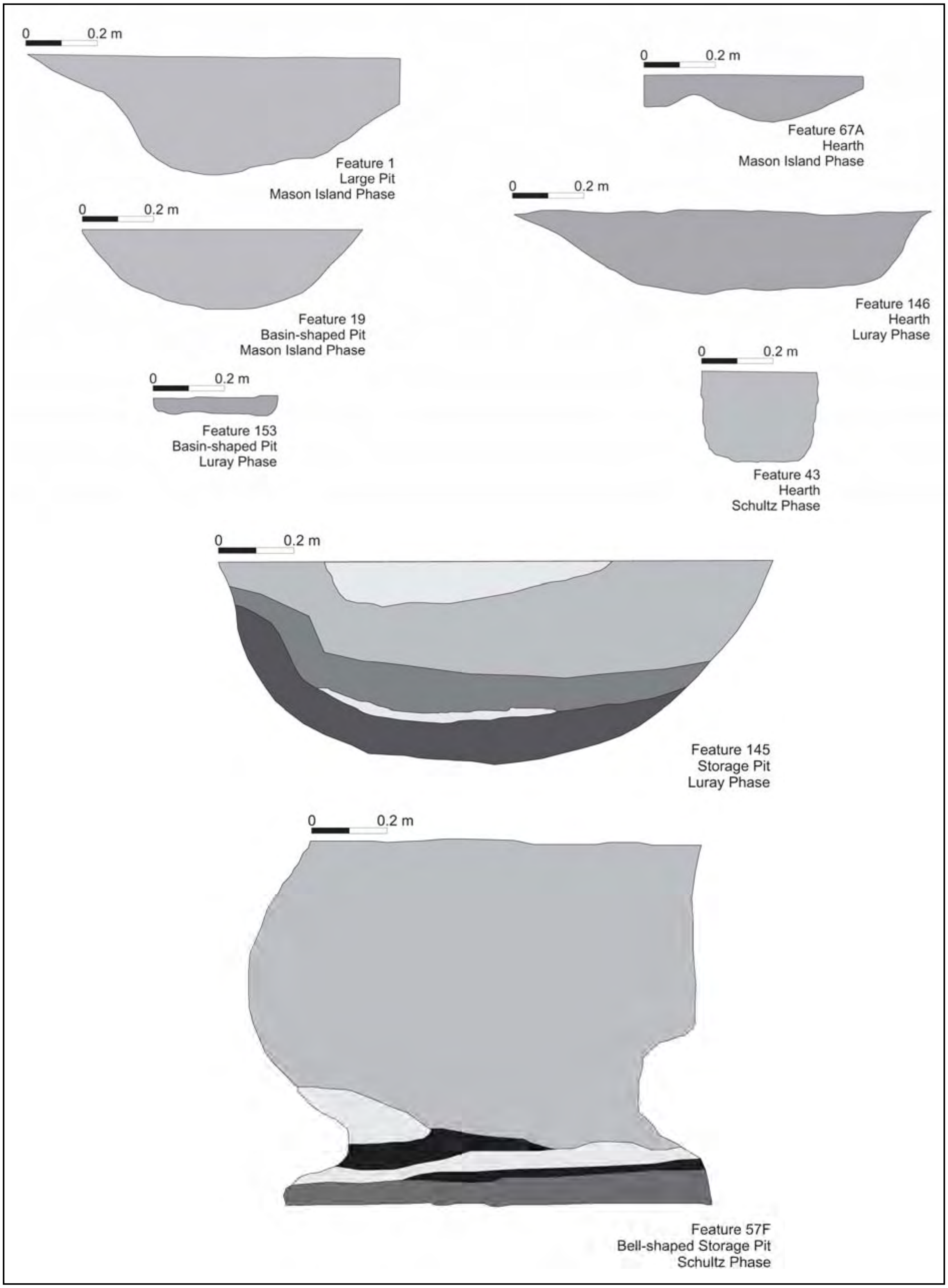

Figure 5. Sample Feature Profiles

feature types was completed by Dr. Wall during field excavations. Designation are based on both profile form and function and include: basin-shaped pits; burials; hearths; a house floor; midden; palisade trench; pits of unknown function and variable form; a pottery concentration; a possible house trench; and storage pits (both deep and bell-shaped).

The Late Woodland and Contact Period features have yielded a diverse assemblage of features and macroplant remains which form the basis of this study. Archaeobotanical studies generally have not been the focus of archaeological investigations of sites in the Piedmont, Ridge and Valley, or Coastal Plain Provinces in Maryland and Virginia. Several of the more well-known sites in the area were excavated in the 1930s through 1950s, before the advent of flotation, so limited data are available and typically include reporting of corn, beans, and squash. Few archaeobotanical studies have been conducted on similar sites, and none have been published for public consumption. Several archaeobotanical studies have been conducted on sites in nearby Pennsylvania (e.g., Blake and Cutler 1983; Raymer and Bonhage-Fruend 1999); however, these are associated with a contemporary, yet different, culture, the Monongahela.

The lack of comprehensive flotation programs and paucity of data concerning Late Woodland and Contact Period subsistence in the Maryland and Virginia is beginning to be rectified. This study, it is hoped, will be one step towards fleshing out the history and archaeology of the region.

CONCLUSION

The Late Woodland and Contact Periods at the site are represented by changes in material culture, settlement patterns, and subsistence strategies reflective of cultural developments in the area, as well as influences from outside groups. Recent evidence indicates that while the late Holocene was an overall period of warming, it was punctuated by abrupt episodes of cooling and/or drought. The Little Ice Age is one such episode that likely affected human occupation of the area.

CHAPTER 3. LABORATORY METHODS

In total, 70 samples, representing 59 features, were analyzed as part of this study. This chapter summarizes sampling, sorting and identification procedures, and discusses analytical methods.

PROCEDURES

Feature Sample Processing

Feature samples were either water-screened through 3.175 mm hardware cloth or were processed by flotation. Data concerning type of flotation systems used were not available at the time of this study. Sixteen flotation samples, collected between 1993 and 2006, were processed by flotation by the author using a manual flotation system as described in Pearsall (1989:20-23).

Flotation is the best method for recovery of all sizes of macrobotanical data; water screening is biased towards recovery of specimens that are larger than the gaps in the hardware cloth, and also towards remains that are not fragile since the pressure of the water from the hose can result in damage or destruction of more fragile remains (Pearsall 1989:17, 19; Wagner 1988:19). Forty-two samples were water-screened and 28 were floated; for each of the three cultural phases (e.g., Mason Island, Luray, and Schultz), both water-screened and floated samples comprise the dataset (Table 3).

Table 3. Summary of Sample Processing

Cultural Component	Processing Method: Water-screening	Processing Method: Flotation	Total Samples	Number of Features
Mason Island	25	10	**35**	**32**
Luray	6	15	**21**	**16**
Schultz	11	3	**14**	**11**
Total	**42**	**28**	**70**	**59**

Two problems arose during inventory of the samples. Firstly, the different processing methods resulted in two disparate datasets. This in turn resulted in issues with comparability; while comparison of large-sized classes of remains (e.g., nutshell or maize) could be undertaken for the entire dataset, the data generated from light fractions was only comparable with other floated features. Secondly, the lack of sample volume data and sample control resulted in issues of comparability between remains. This type of control allows for the data to be standardized and subject to quantitative measures that could reveal patterns in the data. Both issues resulted in severe limitations on quantitative methods that could be applied to the data.

Sorting Methods

Equipment used in the analysis included a trinocular, stereo-zoom microscope, fiber optic lamp, geological sieves, forceps, small paintbrushes, and dental picks. Samples were weighed prior to analysis; all data were recorded on a pro forma. All samples were sieved into 2.00 mm, 1.00 mm, 0.50 mm, and less than (<) 0.50 mm size fractions for sorting. Size grading allows for more efficient sorting since it is easier on the analyst's eyes to sort and identify similar-sized materials (Pearsall 1989:110). Charred macroplant remains were removed and sorted by taxon and were quantified. Uncharred seeds were presumed to be modern, especially since several invasive species were noted, and therefore were not included in the analysis (Keepax 1977; Minnis 1981).

Processed samples varied in size dramatically and subsampling was conducted on large samples weighing 100 gm or more. For large and dense samples, a 50 percent subsample was obtained from the heavy or water-screened fractions. For the other heavy and water-screened fractions, as well as all light fractions, 100 percent of each sample was sorted.

Samples from the 2.00 mm fraction were fully sorted with the naked eye, aided by light from a fiber-optic lamp; unidentifiable remains from this size split were examined under low power (10x) magnification for identification. All charred macroplant remains were removed from the 2.00 mm fraction. Samples from the 1.00, 0.50 mm, and < 0.50 mm fractions were scanned under low power (10-25x) magnification. Only identifiable seeds, nutshell, or other reproductive parts were removed for analysis from these three size fractions. Both raw counts and weights were recorded for macroplant remains removed for analysis. In several instances, the weight of small seeds was less than the minimum (0.01 g) the electronic balance could record; a standard weight of 0.01 g was used since it was not expected to bias the analysis.

Identification Methods

All carbonized taxa (excluding wood) were identified to the lowest taxonomic level possible (i.e., family, genus, or species level). Taxa that could not be identified to genus or species with 100 percent confidence were preceded with "cf." following Pearsall (1989:149). Macroplant remains categorized as "unidentified" include specimens that could not be identified with certainty, such as: seed fragments or those seeds lacking a seed coat (testa); distorted or degraded specimens; and seeds with no correlates in reference sources or the comparative collection. Modern reference comparative collections were used to identify macroplant remains; reference texts (Martin and Barkley 1961; Montgomery 1977; Young and Young 1992) and online databases (e.g., USDA, NRCS 2007) were also consulted to aid in identification.

Macroplant remains were classified into two main groups – seed or nut. *Seed* includes the broad category of reproductive parts (e.g., achene or caryopsis), as well as the "true" seed (i.e., includes the fertilized ovule, endosperm or cotyledon, and testa; Harris and Harris 2001). Seeds were further classified into subgroups: cultigen (e.g., maize); fleshy fruit (e.g., blueberry); starchy weed (e.g., goosefoot); miscellaneous (seeds of uncertain use or those identified to family level only); and unidentified. *Nut* includes only those hard-shelled, one-seeded fruits such as hickory and other tree nuts.

QUANTITATIVE METHODS

A variety of methods are used to quantify macrobotanical data, and all are subject to biases introduced by deposition, preservation, and recovery (Pearsall 1989:194; Rose 2004:43). Raw counts or weights alone are unreliable measures of archaeobotanical data as they may not show data patterning (Pearsall 1989:194; Popper 1988:60; Rose 2004:43). The data therefore need to be standardized before applying more rigorous quantification methods.

Researchers have stressed the need to choose quantitative methods that are most suitable for a particular dataset since different assumptions, biases, and results are associated with each method (Pearsall 1989:196-217; Popper 1988:53-54, 60).

For the Barton site data, the disparity in recovered remains caused by different processing methods introduced a level of bias into the dataset that in turn posed challenges in the application of the various quantification methods used to identify patterns in the data. Moreover, sample volumes were not recorded for the majority of the samples so that effects of sample size on the macroplant assemblage could not be factored into the analysis. Wagner (1988:30) warned against direct comparisons of archaeobotanical data derived from different processing methods and also stressed the importance of relative measures versus direct comparisons of raw data. In addition, Pearsall (1989:195-196) cautioned against using approaches that cannot be sustained by the dataset. As a result, it was determined that the application of absolute quantification methods or multivariate techniques would be inappropriate for the Barton site dataset.

It was hoped that relative measures could be useful in characterizing the archaeobotanical data. Three of the more common relative measures were evaluated that are commonly used on assemblages with comparability issues – ubiquity, ratios, and diversity. Of these, ratios and diversity are influenced by sample size (Miller 1988:82). A review of research concerned with ratio, diversity, and richness issues was conducted to assess the appropriateness of these measures for the Barton dataset (e.g., Kintigh 1984; McCartney and Glass 1990; Plog and Hegmon 1993; Rhode 1988; Sullivan and Tolonen 1998). In every case, the importance of sample size control was stressed, and since the Barton site dataset lacked this control, these measures were determined to be inappropriate.

Despite the severe limitations imposed by the dataset, ubiquity appeared to be a suitable relative measure to characterize the Barton site data. In its simplest form, ubiquity records the presence of a taxon in an assemblage. A more commonly used variation is to convert the data into a score that expresses the presence of a taxon as a percentage (Pearsall 1989:212). This score can be expressed as an equation:

$$\frac{\text{Number of contexts containing a particular taxon}}{\text{Total number of contexts}} \text{ X } 100 = \text{Ubiquity Score}$$

Ubiquity analysis allows raw data to be converted to relative measures that can be used to characterize an archaeobotanical assemblage and understand how plant use and site activities varied over time. Pearsall (1989:215) stressed that ubiquity scores are a more appropriate measure to use when dealing with assemblages from different contexts or with varying depositional, preservation, or recovery conditions since the raw data is not comparable. Archaeobotanists have noted that ubiquity scores allow taxa within an assemblage to be evaluated independently since the scores are not interdependent. Popper (1988:63) and Rose (2004:48), however, noted that ubiquity analysis does not remove biases and that it can cause over-estimation of taxa present in low numbers, especially with small datasets. Popper (1988:63) suggested removing uncommon taxa from analysis of small datasets to avoid over-estimation.

Ubiquity scores were calculated separately for each taxon, for each group (e.g., nut mast, cultigen, wild plant) by culture period, and for each group by feature type. Unidentified seeds were excluded from analysis. Since the wild plant data were likely to be recovered from flotation contexts only, ubiquity scores for the wild plant group were calculated using only flotation sample data. Ubiquity scores were for cultigen and nut mast groups were calculated using both flotation and water screening data since these remains are generally larger and recovered from both processing methods. Comparability was not an issue since mesh sizes used for the flotation heavy fraction and water-screening were the roughly similar (2.00 mm and 3.175 mm). Since ubiquity does not rely on absolute counts, any bias contributed by grouping specimens recovered from the light fraction was negligible.

CONCLUSION

Seventy samples from the Barton site were selected for analysis, and represent 59 features associated with the Mason Island, Luray, and Schultz occupations of the site. Sorting and identification was completed to gather data for quantitative analyses. Ubiquity was determined to be the only appropriate measure for characterizing the Barton site data.

CHAPTER 4. RESULTS

This chapter summarizes the overall macroplant assemblage and discusses plant taxa identified from the feature samples and their documented historical uses by Native American groups. Following these sections is presentation of the quantitative results for each culture period.

MACROPLANT SUMMARY

In total, 15,608 macroplant remains were identified and include 20 plant taxa (Table 4). Appendix A contains the raw data (counts and weights). Six features (5, 24, 73, 89, 95, and 110B) contained only charred wood and three features (44, 48, and 68A) contained no charred macroplant remains. Three taxa (bean, maize, sunflower) were identified to the species level; of the remaining 18 taxa, 14 were identified to the genus level, and four were identified to the family level.

The food remains from the site include nut mast, cultigens, wild plants, and unidentifiable seeds (Figure 6). The assemblage composition (based on raw counts) for each culture period is heavily weighted towards cultigens (i.e., maize) and nut mast (i.e., hickory); this is partly due to data bias. Higher maize and nutshell percentages are noted on other eastern woodland sites in the region (e.g., Bush 1996; Gremillion 2003). Raymer and Bonhage-Fruend (1998), however, note a trend towards reduced nutshell ubiquity towards the end of the Woodland Period and into the Contact Period. This pattern does not appear to be reproduced in the Barton dataset, although analysis of flotation samples gathered from future excavations may show a different pattern.

Table 4. Barton Site Macroplant Summary

Group	Subgroup	Taxa	Count	Percentage
Nut Mast		Acorn	7	0.04
		Hickory	8,901	57.02
		Walnut	77	0.49
		Walnut family	32	0.21
Cultigen		Bean	586	3.75
		Maize	5,845	37.45
		Squash	2	0.04
		Sunflower	62	0.40
Wild Plant	Starchy Weed	Goosefoot	9	0.06
		Knotweed	4	0.03
	Fleshy Fruit	Blackberry	2	0.01
		Blueberry	2	0.01
		Elderberry	2	0.01
		Grape	2	0.01
		Groundcherry	3	0.02
		Maypop	2	0.01
		Strawberry	1	< 0.01
		Sumac	23	0.15
	Grass	Grass Family	5	0.03
	Miscellaneous	Bean Family	2	0.01
		Mallow Family	1	0.01
Unidentifiable	Seed	Unidentifiable	38	<0.24
Grand Total			**15,608**	**100.01**

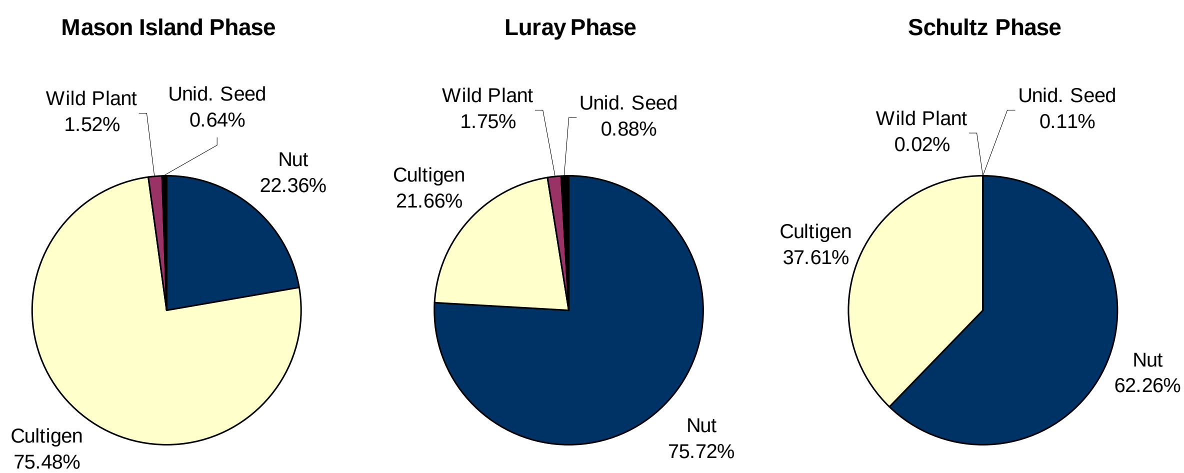

Figure 6. Macroplant Percentages by Culture Period

PLANT TAXA RECOVERED

Native Americans used plants in a variety of ways, including for food, utilitarian objects, medicine, and ritual purposes. While the same part of a plant could serve multiple purposes, an assumption made here is that the dataset represents consumable parts of plants that were harvested, processed, and eaten. Historically documented uses of the plant taxa identified from the Barton site are summarized below (Table 5). Photographs of a sample of taxa are located in Figures 7 and 8.

Table 5. Plant Seasonality

Taxon	Edible Portion	Seasonality	Habitat
Nut Mast			
Acorn	nut	late summer-late autumn	dry woodlands
Hickory	nut	autumn	alluvial and upland woodlands
Walnut/butternut	nut	late summer-autumn	alluvial and upland woodlands
Cultigens			
Maize	kernel	early summer-frost	cleared fields
Bean	seeds, pod	late summer-early autumn	fields, disturbed areas
Squash	fleshy fruit, seeds	late summer-frost	fields, disturbed areas
Sunflower	seed	early summer-autumn	fields, disturbed areas
Starchy Weeds			
Goosefoot	seeds, leaves	summer-early winter	disturbed areas
Knotweed	seeds, leaves	late spring-early winter	disturbed areas, fields
Fleshy Fruits			
Blackberry	fleshy fruit	summer	forest edge, disturbed areas
Blueberry	fleshy fruit	summer	wet or dry soils, woodlands, stream banks, bogs, thickets
Elderberry	fleshy fruit	late summer	alluvial woods, stream banks, thickets
Grape	fleshy fruit, young leaves	early summer-autumn	woodlands, disturbed areas
Groundcherry	fleshy fruit	late summer-autumn	fields, woods, clearings, disturbed areas
Maypop	fleshy fruit	late summer-early autumn	dry soils, fields, thickets
Strawberry	fleshy fruit	late spring-summer	moist woodlands, fields
Sumac	fleshy fruit	summer-autumn	woodlands, disturbed areas
Miscellaneous			
Grass family*	various	summer-autumn	fields, woodlands, disturbed areas
Bean family*	various	late summer-early autumn	fields, woodlands, disturbed areas
Mallow family	greens	spring-summer	fields, disturbed areas

*N.B. too many species to enumerate all uses; not all members of these families were edible

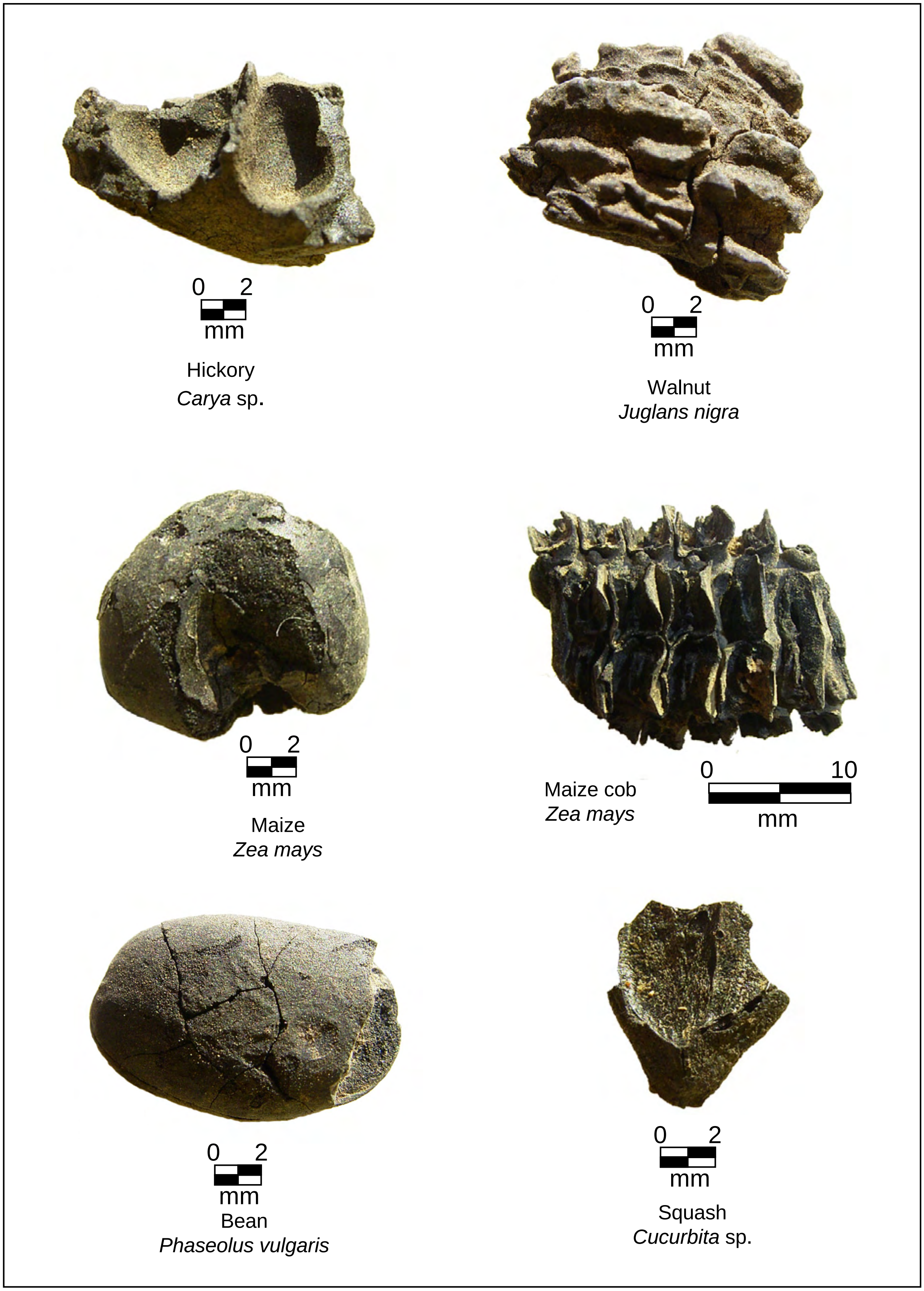

Figure 7. Photographs of Sample Taxa

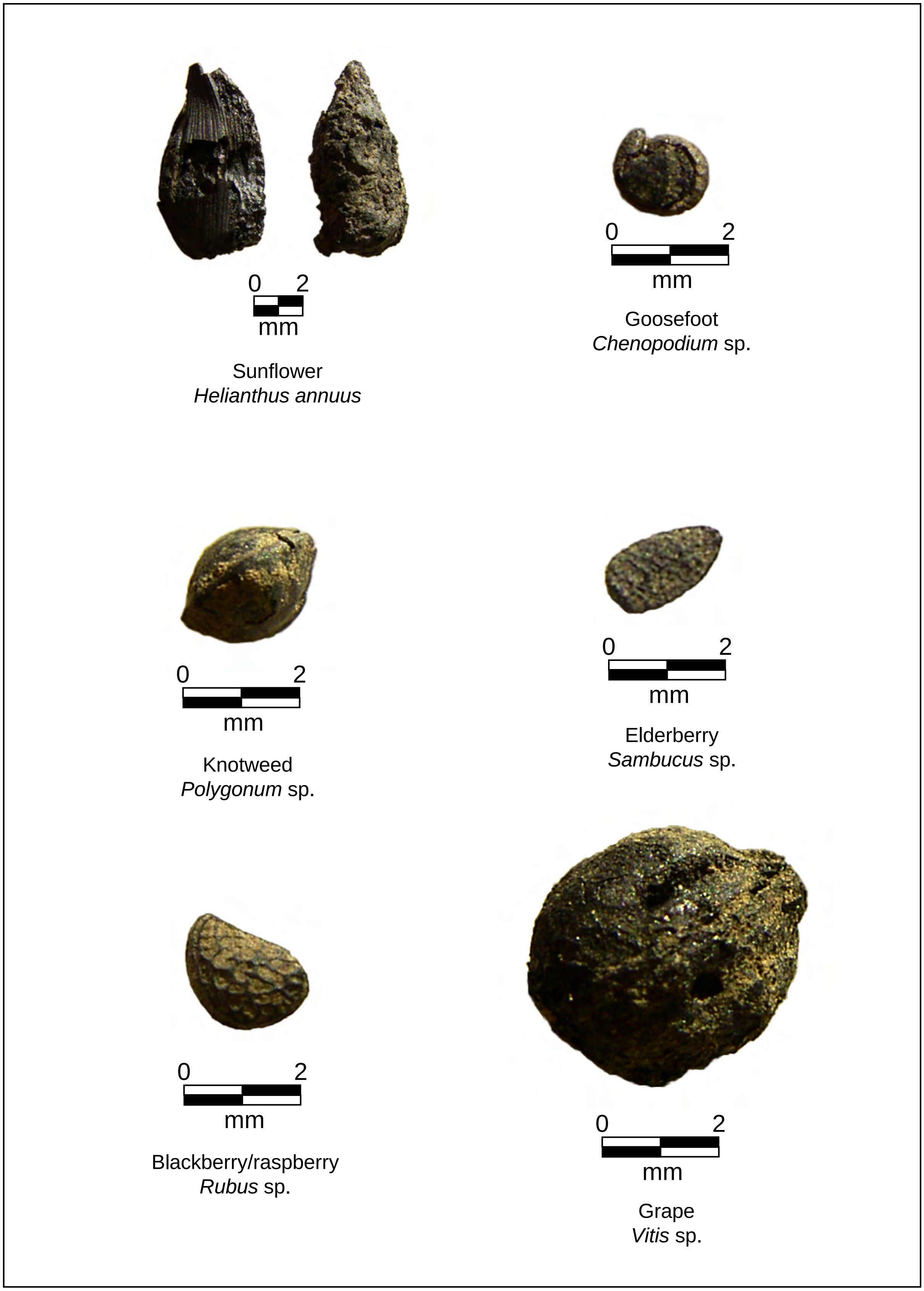

Figure 8. Photographs of Sample Taxa

Nut Mast

Acorns (*Quercus* spp.), harvested from oak trees, were a starchy food source. Historic documents indicate that acorns were bitter due to the tannin content, and had to be boiled in water before consuming (Erichsen-Brown 1979:62-68). Acorn shell is thin and is less likely to preserve archaeologically than species with thicker shells (Bush 1997).

Hickory (*Carya* spp.), **walnut** (*Juglans nigra*), and **butternut** (*J. cinerea*) are all members of the family Juglandaceae. Walnut and butternut are not always distinguishable archaeologically. The fragments from the Barton site appeared to be *J. nigra*. Hickory, walnut, and butternut were consumed for food, and were eaten raw, cooked, or ground into flour and added to water to make a milky type of drink. Walnuts and butternuts also were processed to extract the oil; there is some early historic evidence that butternut oil was used for medicinal purposes (Erichsen-Brown 1979:69-76). Hickory nutshell was used for fuel (Erichsen-Brown 1979:69-76; Talalay 1984).

Cultigens

Maize (*Zea mays*) is a tropical domesticate from Mesoamerica, where its documented use dates back to several thousand years before it appears in the Middle Atlantic region ca. AD 900 (Piperno and Flannery 2001; Smith 2001, 2006). The edible portions of the maize plant include the endosperm (kernels), pollen, and silk. Maize was processed and cooked in a variety of ways, including roasting, parching, boiling, and fermenting, but also could be consumed raw in its immature state. It was also used as medicine for a variety of ailments by grinding the kernels into a meal and mixing with water; other parts of the maize plant were used for medicinal and ritual purposes (Moerman 2007).

Beans (*Phaseolus vulgaris*), also a tropical domesticate from Mesoamerica, were introduced to eastern North America ca. AD 1100 (Smith 1989; Steponaitis 1986). Both the cotyledon (seed) and legume (pod or shell) are edible. Beans were eaten raw or cooked, and along with maize and squash, were dried and stored for later use. There is historical evidence for use of beans for medicinal and ritual purposes (Moerman 2007).

Squash (*Cucurbita* spp.) is another exotic domesticate from Mesoamerica. There is increasing evidence that certain species in the Cucurbitaceae family grew wild or were cultivated in eastern North America before the adoption of maize agriculture (e.g., Gremillion 2003; Hart and Sidell 1997; Hastorf 1999; Perkl 1998; Petersen and Sidell 1996; Smith 2006; Watson 1997:21). Initial exploitation of squash was likely for the seeds as a food source and the thin, hard rind (gourd-like) for use as containers. By AD 1100, squash was cultivated in the eastern woodlands for its fleshy fruit (Cutler and Whitaker 1961; Smith 2006). Edible portions of squash include the blossom, fruit, and seeds, which could be dried and stored. Squash was cooked and eaten alone, or was combined with other foods in stews, gruels, and cakes. Blossoms were added to stews and seeds were eaten raw or cooked, alone or with other food (Moerman 2007).

Sunflower (*Helianthus annuus*) is native to North America and is represented by a number of species. Sunflower is one of the members of the "Eastern Agricultural Complex" (EAC) that was domesticated by Native Americans several thousand years before maize agriculture was adopted (Crites 1993; Fritz 1993; Gremillion 1996, 2003; King 1999; Smith 2006; Struever 1962; Yarnell 1963). The EAC includes seven species: goosefoot (*Chenopodium* *berlandieri*), erect knotweed (*Polygonum erectum*), little barley (*Hordeum pusillum*), marshelder (or sumpweed, *Iva annua*), maygrass (*Phalaris caroliniana*), squash (*Cucurbita pepo*), and sunflower (*Helianthus annuus*; Cowan 1997:63; Smith 1984). Smith (1989:1566) argues for the domestication of four of these plants (goosefoot, marshelder, squash, and sunflower) in eastern North America approximately 4,000 years ago, and that subsistence economies were not based on these local crop plants until between 250 BC and AD 200.

The seed of the sunflower was eaten, as were the leaves and the pith of the stem. Seeds were eaten raw, roasted, or ground into flour, and were winnowed and parched for storage. The roots or tubers were harvested, parched or roasted, and stored for winter use. Oil was extracted from the seed and used for a variety of purposes. The roots and flowers were used for medicinal and ritual purposes (Moerman 2007).

Wild Plants

Starchy Weeds

Goosefoot (*Chenopodium* spp.), includes numerous weedy species that are native to North America (Clemants 1992; Erichsen-Brown 1979:413-416; Peterson 1977:152-154). The seeds and leaves of goosefoot were eaten; seeds were eaten raw or ground and made into flour (sometimes combined with other ground plants), while the leaves were cooked as a green (like spinach) or eaten raw (Erichsen-Brown 1979:413-416; Moerman 2007; Peterson 1977:152-154). Chenopods are reportedly high in Vitamin C (Smith 1933; Zennie and Ogzewalla 1977). The seeds and leaves of goosefoot were also used for medicinal and ritual purposes (Erichsen-Brown 1979:413-416; Foster and Duke 1999:216; Moerman 2007).

Knotweeds (*Polygonum* spp.) are weedy plants with edible leaves, roots, shoots, and seeds. Edible parts were eaten raw or cooked; some species were used for medicinal and ritual purposes (Smith 1933:70-71; Moerman 2007). Knotweed, specifically *P. erectum*, is part of the EAC.

Both goosefoot and knotweed produce large quantities of wind-dispersed seeds. Since both thrive in disturbed areas (e.g., villages and agricultural fields), it is possible that the specimens identified in the Barton site assemblage represent wild species that were introduced through accidental charring. This is especially so since so few seeds were recovered from each taxa.

Fleshy Fruits

Blackberry (*Rubus* spp.) includes blackberry, raspberry, and dewberry. These are prickly and bristly shrubs that produce abundant edible berries. Berries were eaten fresh, cooked with other foods, dried and stored for winter use, and also were processed for their juice. Berries also were preserved in animal fat (Bush 1997). Young shoots of the plant were also eaten, and the entire plant was used for a variety of medicinal purposes (Erichsen-Brown 1979:471-475; Foster and Duke 1990:234; Moerman 2007; USDA NRCS 2007).

Blueberry (*Vaccinium* spp.) includes blueberry, cranberry, farkelberry, huckleberry, deerberry, bilberry, and lingonberry (USDA, NRCS 2007). Like blackberry, blueberries were eaten fresh, cooked with other foods, dried and stored for winter use, or preserved in fat, and were also made into a drink (Erichsen-Brown 1979:184-187). The entire plant was used for a variety of medicinal purposes (Erichsen-Brown 1979:184-187; Foster and Duke 1990:248; Moerman 2007).

Elderberry (*Sambucus* spp.) is the fruit of the elder, a woody shrub. The flowers and ripe berries are edible; berries were processed and consumed in a variety of ways (Erichsen-Brown 1979 121-125; Peterson 1977:172). The unripe berries and other parts of the plant are toxic (Foster and Duke 1999:240); however, all parts of the elder plant were used by Native Americans for medicinal purposes (Erichsen-Brown 1979 121-125; Foster and Duke 1999:240).

Grape (*Vitis* spp.) grows in clusters on vines; the leaves and fruit are edible, and the vine yields a sap that is potable. Grapes were harvested and eaten fresh, dried for later use, or cooked and eaten. All parts of the plant were used for medicinal purposes (Foster and Duke 1999: 300; Moerman 1998).

Groundcherry (*Physalis* spp.), also known as husk tomato, is a low-growing plant that yields its fruit in a loose, papery calyx (husk). The fruits were eaten raw, cooked, or dried for winter use, although the unripe fruit is poisonous (Peterson 1977:68). The fruit, seeds, leaves, young shoots, and roots were used for a variety of medicinal purposes (Foster and Duke 1999:98; Moerman 2007).

Maypop (*Passiflora* spp.), or wild passionflower, is a trailing or climbing vine that produces a yellow, edible fruit. The fruit was eaten raw or cooked; the young shoots and leaves were also edible and were boiled or fried and eaten with other greens, and the entire plant was used for a variety of medicinal purposes (Foster and Duke 1999:170; Moerman 2007; USDA, NCRS 2007).

Strawberry (*Fragaria* spp.) is an herbaceous perennial plant with edible fruits and leaves. The berries were eaten fresh, cooked, or dried for later use. The berries were processed for their juice and made into a beverage and a tea was made from infusion of the leaves. All parts of the strawberry plant were used for a variety of medicinal and ritual purposes (Erichsen-Brown 1979:464-466; Foster and Duke 1999:38; Moerman 2007; USDA, NCRS 2007).

Sumac (*Rhus* spp.) is a deciduous large shrub or small tree. The berries of the sumac were processed into a beverage, and sometimes were eaten (Erichsen-Brown 1979:114-120; Moerman 2007; Peterson 1977:186). In addition, the berries, as well as other parts of the plant, were used for medicinal and ritual purposes (Erichsen-Brown 1979:114-120; Foster and Duke 1999: 250; Moerman 2007; USDA, NRCS 2007). Sumac is high in tannin, and some researchers have postulated its presence on archaeological sites represents use of the plant for tanning animal hides (Bush 1996).

Miscellaneous

Seeds in the miscellaneous group include the grass (Poaceae), mallow (Malvaceae), and bean (Fabaceae) families. In each case, seeds from multiple species resemble each other closely, and taxonomic identifications were not possible. There are too many genera within each family, some of which were used by Native Americans, to provide a concise summary here. These species could have been used as food sources or could have served strictly utilitarian uses; for example, some grasses were used to line storage pits.

QUANTITATIVE ANALYSIS

Results of the quantitative analysis are presented below by culture period. The raw data from which the analyses are derived are located in Appendix A.

Mason Island Phase

Thirty-five samples, representing 32 features, were analyzed; of these, 10 samples were processed by flotation and 25 were water-screened (Table 6). Four samples were from the same feature (Feature 53) and the data were combined for analysis. Nine features contained no seed or nut remains. Feature types, assigned by Dr. Wall, include basins (n=4), burials (n=2), hearths (n=7), middens (n=12), and pits (n=7).

In total, 2,178 macroplant remains were recovered. Hickory and maize together comprise 95.36 percent of the assemblage; the remaining taxa comprise less than 5 percent of the assemblage. While these numbers reflect the underlying data bias, the proportions are mirrored when just flotation sample data are examined, with hickory and maize comprising roughly 90 percent of the assemblage.

Table 6. Mason Island Phase Summary, Raw Counts

			Cultigen			Starchy Weed	Fleshy Fruit							Misc.		Unid.	Nut Mast				
Feature	Feature Type	Processing Type*	Maize	Bean	Sunflower	Goosefoot	Blackberry	Blueberry	Elderberry	Groundcherry	Maypop	Strawberry	Sumac	Grass Family	Bean Family	Unid. Seed	Hickory	Walnut-Butternut	Acorn	Unid. Nut	Total
1	Pit, large	F	51										13			4	36	2			106
5	Burial	W																			0
6	Midden?	W	2														5				7
9	Midden	W	7													2	8	1			18
16	Midden	F	35										3		1	3	32	3			77
19	Basin	F	9														18		5		32
20	Pit, shallow	F	53	1													32	1			87
22	Pit, shallow	F	34														21				55
23	Midden	F	264	4		1			1	3			2	1		4	83				363
24	Pit, shallow	F																			0
25	Pit, small	F				1										1				7	9
26	Basin	F																			0
35	Midden	F	4				1	1			2	1		1						4	14
44	Basin	W																			0
48	Pit, small	W																			0
53	Hearth	W	2														12				14
62	Midden	W	1154	6												1	9	5			1175
63	Burial	W			1												60				61
67	Midden	W															25				25
67A	Hearth	W	1														37	5			43
67B	Hearth	W																			0
68A	Midden	W																			0
73	Midden	W																			0
78A	Pit, small	W															7				7
86	Basin	W	8														6				14
89	Hearth	W																			0
94	Hearth	W															25				25
97	Hearth	W	2													2	11				15
98	Hearth	W															3				3
99	Midden	W															4				4
113	Midden	W	3										1			1	1				6
119	Midden	W	3													4	10	1			18
COUNT			**1632**	**11**	**1**	**2**	**1**	**1**	**1**	**3**	**2**	**1**	**19**	**2**	**1**	**22**	**445**	**18**	**5**	**11**	**2178**
PERCENTAGE			**74.93**	**0.51**	**0.05**	**0.09**	**0.05**	**0.05**	**0.05**	**0.14**	**0.09**	**0.05**	**0.87**	**0.09**	**0.05**	**1.01**	**20.43**	**0.83**	**0.23**	**0.51**	**100.00**

*F = Flotation, W = Water-screening; Misc. = Miscellaneous; Unid. = Unidentified

Taxa Ubiquity

Ubiquity scores were calculated for each taxa (Table 7; Figure 9). While the percentages based on raw counts show that maize dominates the Mason Island assemblage, the ubiquity scores show that hickory nut mast dominates the assemblage at 66 percent, followed by maize at 50 percent. These results illustrate clearly why raw data alone is not an accurate representation of taxa abundance. The high hickory ubiquity could reflect both food and fuel use, but more likely is a product of the processing method used to extract the nut meat from the shell. Early historic accounts, as documented in Erichsen-Brown (1979:69-76) and Talalay et al. (1984), indicate hickory was crushed and boiled to separate the nut meat from the shell, as well as to extract the oil from the meat. This would produce a large number of shell fragments that could have been dumped into the fire upon which the extraction activities were taking place.

Table 7. Mason Island Phase Macroplant Percentages and Ubiquity

Group	Taxon	Percentage (raw counts)	Ubiquity Score (%)
Nut	Hickory	20.43	66
	Walnut	0.83	22
	Walnut family	0.87	6
	Acorn	0.23	3
Cultigen	Maize	74.93	50
	Bean	0.51	9
	Sunflower	0.05	3
Wild Plant	Sumac	0.87	30
	Grass Family	0.09	20
	Goosefoot	0.09	20
	Bean Family	0.05	10
	Strawberry	0.05	10
	Maypop	0.09	10
	Groundcherry	0.14	10
	Elderberry	0.05	10
	Blueberry	0.05	10
	Blackberry	0.05	10
	Unid. Seed*	0.64	–
Total		**100.02**	–

* N.B. Unidentified remains not included in ubiquity analysis

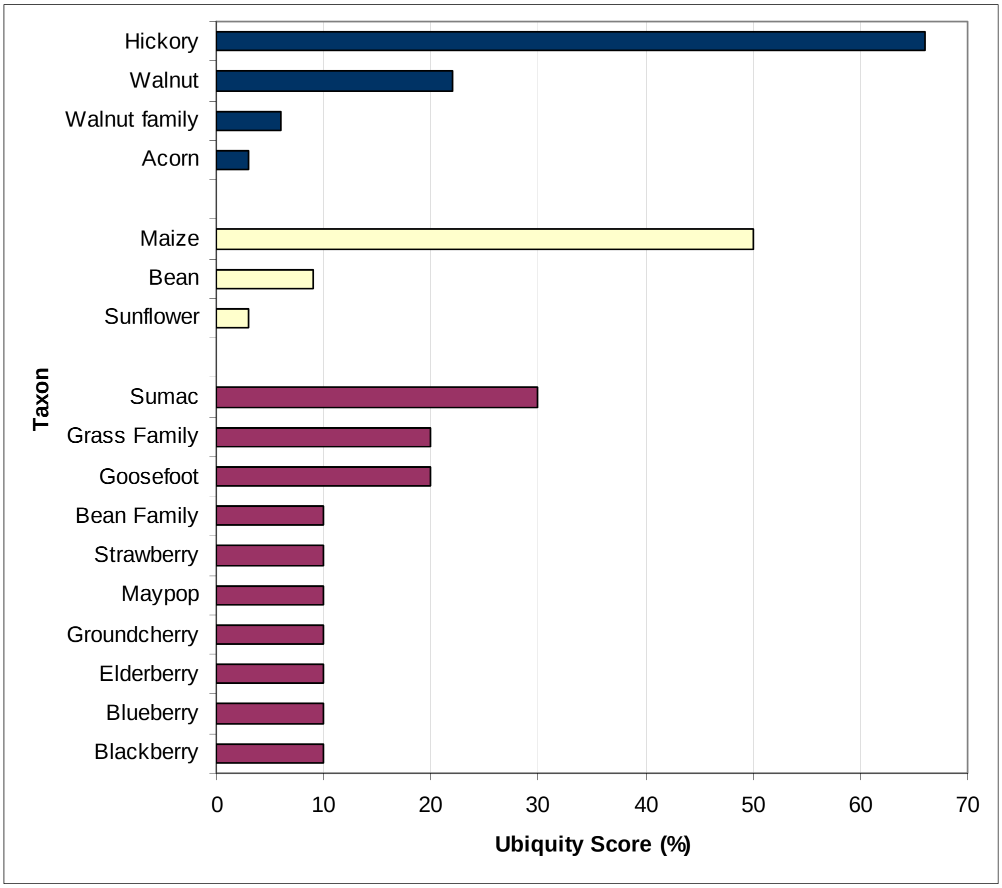

Figure 9. Mason Island Phase Ubiquity Scores

The low ubiquity of acorn could be a preservation issue since the shell of the acorn is thin and not as likely to preserve as hickory or walnut. The low ubiquity of walnut could be due to preservation, but could also reflect how walnuts were processed and consumed by Native Americans. Early historic accounts indicate these nuts were extracted directly from the shell by pounding or crushing, but were not boiled as were hickory nuts (Erichsen-Brown 1979:69-76; Talalay et al. 1984). The discarded shells may have been less likely to end up in a cooking fire and subsequently preserved through charring.

The maize ubiquity at 50 percent is not surprising since maize agriculture was introduced into the area during the Late Woodland Period. Further examination of the maize fragments reveals that the remains include 474 kernels (whole and fragments), 1,139 cupules, and 19 cob fragments (Appendix A-1). The majority of the cupule and cob fragments were recovered from Feature 62, a midden. The presence of cob and cupule fragments indicates whole ears of maize were brought back to the site for processing, versus off-site processing and transport of kernels only. In addition, it is likely the cupule and cob fragments represent spent fuel, as, like hickory nut, maize cobs were used as a fuel source. The low bean and sunflower scores, as well as the lack of identified squash remains, could be an indicator of preservation, as these taxa do not typically preserve well in archaeological contexts. Squash and sunflower especially were known to have been cultivated in the region before the introduction of maize, and it is unlikely their lack of representation in the dataset is a reflection of their importance to the site's inhabitants.

The lower percentage and ubiquity scores for the remaining taxa are very likely due to data bias and not cultural factors. Sumac, at 30 percent ubiquity, was recovered primarily from Feature 1, a large pit. It is difficult to discern the exact nature of the sumac remains from this feature; they could represent food waste or evidence for other activities (e.g., animal hide tanning).

Feature Ubiquity

Percentages of nut mast (principally hickory) and cultigens (principally maize) across feature types show the highest scores for midden contexts, which is not surprising since middens are, by definition, places where refuse was dumped (Table 8). Nut mast shows higher percentages across feature types than cultigens. Ubiquity scores, however, exhibit a fairly even distribution of nut mast and cultigens (Figure 10). The higher ubiquity scores for nut mast and cultigens in midden contexts are, again, not surprising. The high ubiquity of hickory in hearth contexts is also not surprising for reasons discussed before.

Table 8. Mason Island Phase Macroplant Percentages and Ubiquity by Feature Type

Feature Type	Number of Features	Nut Mast		Cultigen	
		Percentage	Ubiquity	Percentage	Ubiquity
Basin	4	6.78	50	1.03	50
Burial	2	12.32	50	0.06	50
Hearth	7	19.51	71	0.30	43
Midden	12	39.63	77	90.15	62
Pit	7	21.77	50	8.45	50
Total	**32**	**100.01**		**99.99**	

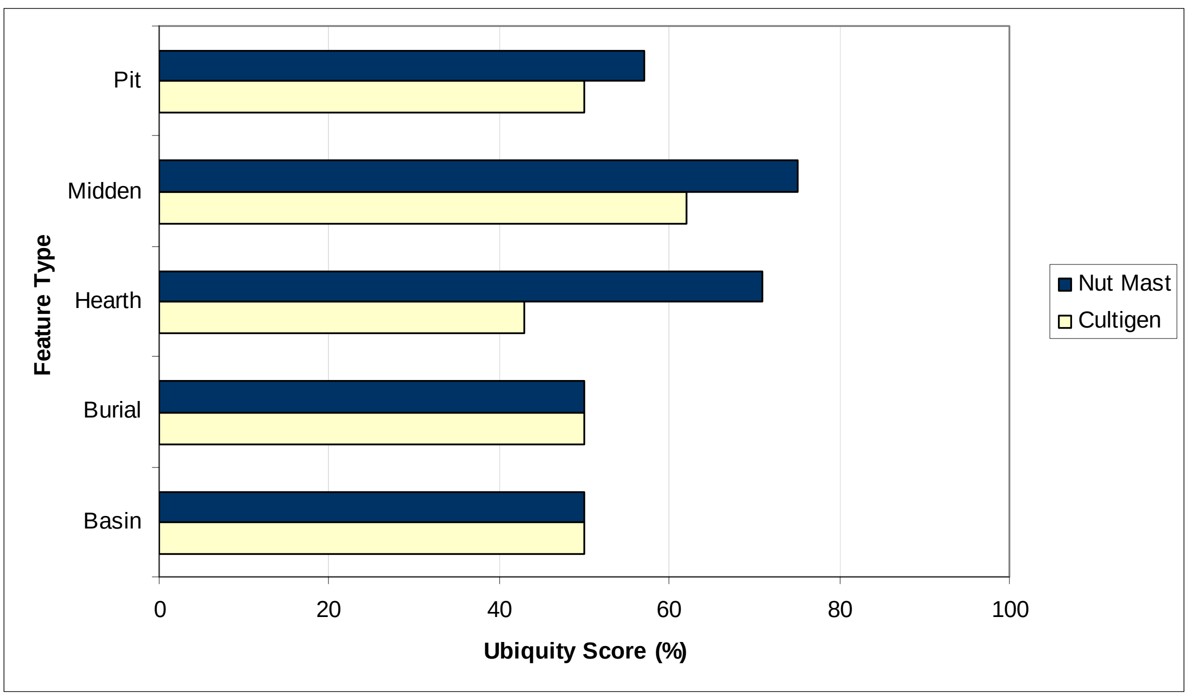

Figure 10. Mason Island Phase Macroplant Ubiquity by Feature Type

Luray Phase

Twenty-one samples, representing 16 features, were analyzed; of these, 15 samples were processed by flotation and six were water-screened (Table 9). Two features (Features 143A and 146) had two samples each that were combined for analysis. Feature types included basins (n=2), hearths (n=3), house floor (n=1), possible house trench (n=1), middens (n=4), palisade trench (n=1), pit (n=1), pottery concentration (n=1), and storage pits (n=2). In total, 1,256 macroplant remains were recovered. Hickory and maize together comprise 95.22 percent of the assemblage; the remaining taxa comprise less than 5 percent of the assemblage.

Taxa Ubiquity

Ubiquity scores were calculated for all taxa (Table 10; Figure 11). The percentage of hickory is significantly higher than maize. The ubiquity scores also indicate hickory dominates the assemblage; it is present in 90 percent of the features while maize is present in 75 percent of the features. The low scores for the remaining taxa are comparable to the Mason Island Phase samples.

Table 9. Luray Phase Summary, Raw Counts

Feature	Feature Type	Processing Type*	Cultigens					Fleshy Fruits					Misc.*			Unid.*	Nut Mast				
			Maize	Bean	Sunflower	Goosefoot	Knotweed	Blackberry	Blueberry	Elderberry	Grape Family	Sumac	Grass Family	Bean Family	Mallow Family	Unid. Seed	Acorn	Hickory	Walnut-Butternut	Walnut family	Total
17	Midden	F	27									3						49			79
17A	House trench?	W	2															12			14
33	Storage pit	W	3															23			26
34	Palisade trench	F	9	1										1			1	54			66
128	Pit, large	W			1													41			42
130	Midden	W	3															13			16
131B	Midden	W	3															7	4	7	21
143	Midden	W	2													1		126	6		135
143A	Hearth	F																12			12
143B	Hearth?	F	2															14			16
144	Pottery concentration	F	2															17			19
145A	Storage pit	F	11		3		3					1				1		79			98
145B	Storage pit	F	63			3				1			1					109			177
145C	Storage pit	F	103	1		1										4		160	3		272
145D	Storage pit	F	26			3			1		1				1	1		159			192
146	Hearth	F	1													1		40			42
150	Basin	F														1		11			12
153	Basin	F	9					1										4			14
LHF*	House floor	F											1			2					3
Count			**266**	**2**	**4**	**7**	**3**	**1**	**1**	**1**	**1**	**4**	**2**	**1**	**1**	**11**	**1**	**930**	**13**	**7**	**1256**
Percentage			**21.18**	**0.16**	**0.32**	**0.56**	**0.24**	**0.08**	**0.08**	**0.08**	**0.08**	**0.32**	**0.16**	**0.08**	**0.08**	**0.88**	**0.08**	**74.04**	**1.04**	**0.56**	**100.00**

*F = Flotation, W = Water-screening; Misc. = Miscellaneous; Unid. = Unidentified

LHF = Luray House Floor (no feature number assigned)

Table 10. Luray Phase Macroplant Percentages and Ubiquity

Group	Taxon	Percentage (raw counts)	Ubiquity Score (%)
Nut	Hickory	74.05	90
	Walnut	1.04	15
	Walnut family	0.56	6
	Acorn	0.08	5
Cultigen	Maize	21.17	75
	Bean	0.16	10
	Sunflower	0.32	10
Wild Plant	Goosefoot	0.56	15
	Grass Family	0.16	10
	Knotweed	0.24	5
	Sumac	0.32	5
	Grape	0.08	5
	Elderberry	0.08	5
	Blueberry	0.08	5
	Blackberry	0.08	5
	Mallow Family	0.08	5
	Bean Family	0.08	5
	Unid. Seed*	0.88	–
Total		**100.02**	–

* N.B. Unidentified remains not included in ubiquity analysis

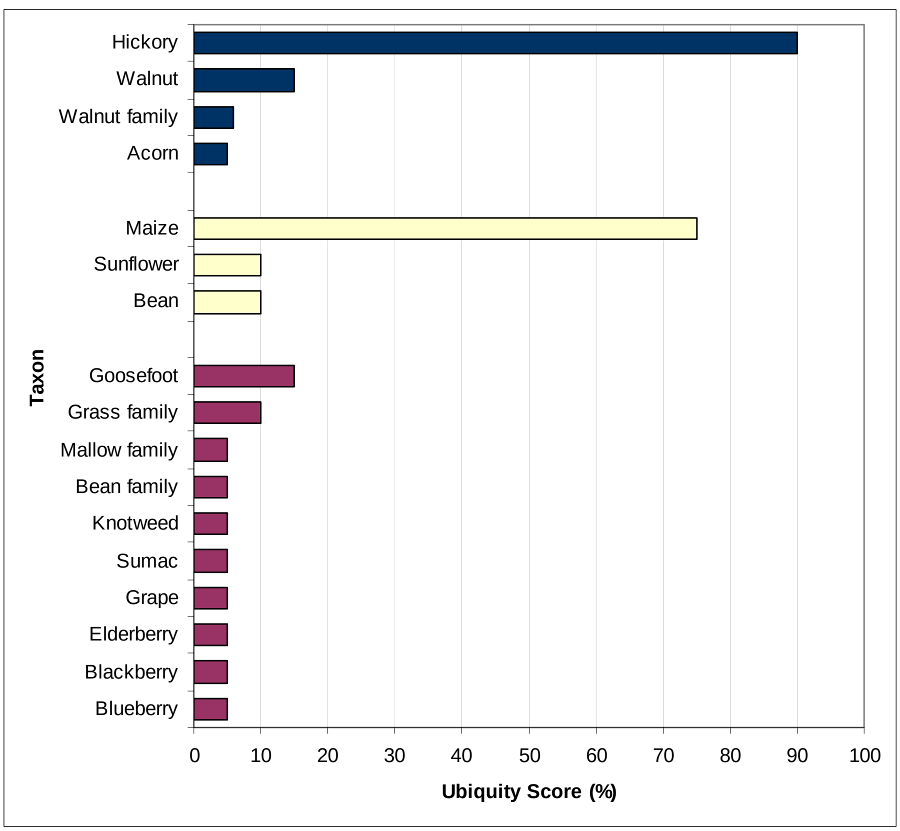

Figure 11. Luray Phase Ubiquity Scores

Feature Ubiquity

Percentages of nut mast (principally hickory) and cultigens (principally maize) across feature types are the highest for midden and storage pit contexts (Table 11). No nut mast or cultigens were recovered from the house floor sample. Only one Poaceae and two unidentified seeds were recovered from this feature. The Poaceae may represent grass matting and its presence in this context is not unexpected. The paucity of remains from the house floor may reflect housekeeping activities to keep the living area vermin-free.

Table 11. Luray Phase Macroplant Percentages and Ubiquity by Feature Type

Feature Type	Number of Features	Nut Mast		Cultigen	
		Percentage	Ubiquity	Percentage	Ubiquity
Basin	2	1.58	100	3.31	50
Hearth	3	6.94	100	1.10	67
House floor*	1	0.00	0	0.00	0
House trench	1	1.26	100	0.74	100
Midden	4	22.29	100	12.87	100
Palisade trench	1	5.78	100	3.68	100
Pit	1	4.31	100	0.37	100
Pottery concentration	1	1.79	100	0.74	100
Storage Pit	2	56.04	100	77.21	100
Total	**16**	**99.99**		**100.02**	

*N.B. the house floor contained one Poaceae and two unidentified seeds

Nut mast is 100 percent ubiquitous across feature types, indicating its importance in the Luray Phase subsistence economy (Figure 12). With the exception of basins and hearths, cultigens are 100 percent ubiquitous across all feature types. The lack of cultigens from one basin and one hearth feature could be related to how the features were used, but could also be related to housekeeping activities where features were cleaned out and re-used. Overall, nut mast and cultigens show higher ubiquity than for the Mason Island Phase features. Also, Woodland and Contact Period storage pits typically have excellent preservation and recovery of a variety of macroplant remains, so the high scores for nut mast and maize fall within what is expected for this feature type.

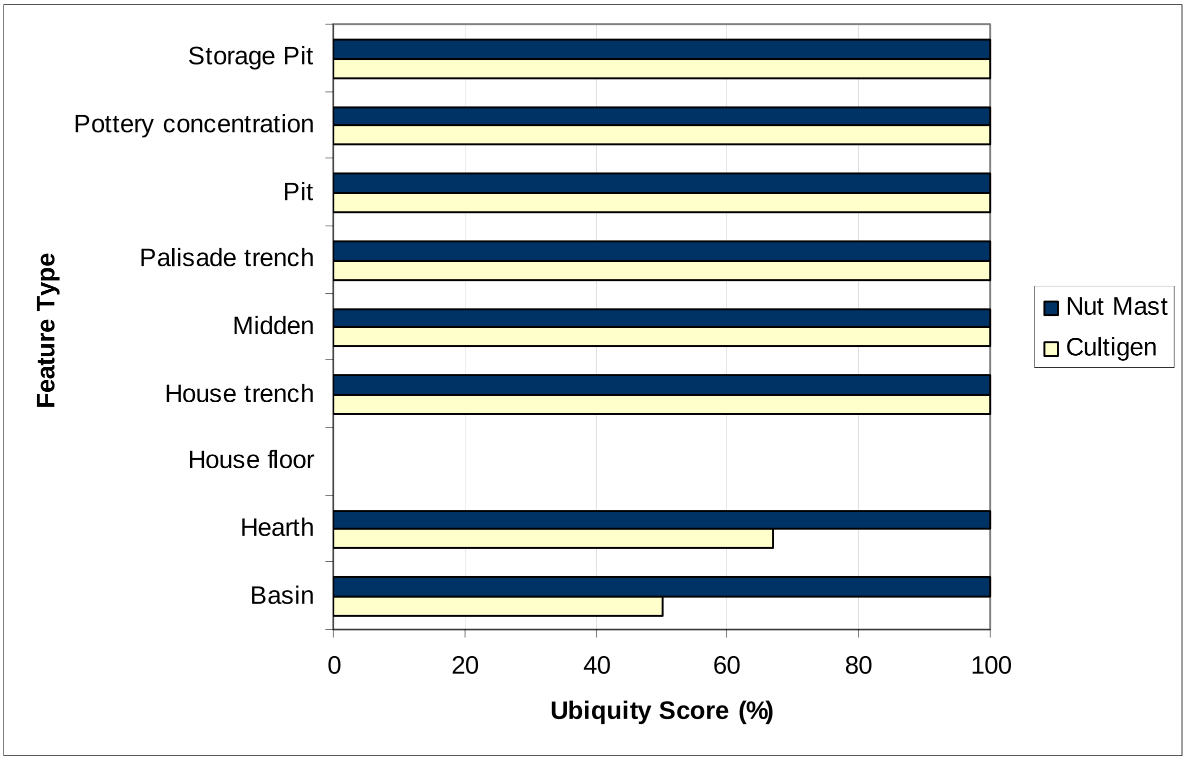

Figure 12. Luray Phase Macroplant Ubiquity by Feature Type

Schultz Phase

Fourteen samples, representing 10 features, were analyzed; of these, three samples were processed by flotation and 11 were water-screened (Table 12). One feature (Feature 43) had two samples that were combined for analysis. Feature types included hearths (n=2), palisade trench (n=1), pits (n=2), storage pits (n=3), and bell-shaped storage pits (n=2). In total, 12,174 macroplant remains were recovered. Hickory and maize together comprise 94.24 percent of the assemblage, which echoes the percentages for the Mason Island and Luray Phases. The remaining taxa from the Schultz component comprise less than six percent of the assemblage.

Table 12. Schultz Phase Summary, Raw Counts

Feature	Zone	Feature Type	Processing Type*	Cultigens				Starchy Weed	Fleshy Fruit	Misc.*	Unid.*	Nut Mast				Total
				Maize	Bean	Squash	Sunflower	Knotweed	Grape	Grass Family	Unid. Seed	Acorn	Hickory	Walnut-Butternut	Unid. Nut	
28		Pit, medium	W	105			56				9	1	19			190
43		Hearth	F	3				1		1			18	3		26
57E		Storage pit	W	4	2								6			12
57F		Storage pit, bell-shaped	W	1296	440						2		964	17		2719
57F	Zone A	Storage pit, bell-shaped	W	479	65				1				554	9		1108
57F	Zone D	Storage pit, bell-shaped	W	92	2	1							26			121
57F	Zone E	Storage pit, bell-shaped	W	44	4								32	2	2	84
57F	Zone F	Storage pit, bell-shaped	W	16	3	1					2		10			32
59		Storage pit	W	1421	45								460	1		1927
93		Storage pit	W	16									65			81
95		Hearth	W													0
96		Storage pit, bell-shaped	W	470	12		1						5372	17		5872
110B		Palisade trench	W													0
147		Pit, medium	F	1											1	2
Count				**3947**	**573**	**2**	**57**	**1**	**1**	**1**	**13**	**1**	**7526**	**49**	**3**	**12174**
Percentage				**32.42**	**4.71**	**0.02**	**0.47**	**0.01**	**0.01**	**0.01**	**0.11**	**0.01**	**61.82**	**0.40**	**0.02**	**100.00**

*F = Flotation, W = Water-screening; Misc. = Miscellaneous; Unid. = Unidentified

Taxa Ubiquity

Ubiquity scores were calculated for all taxa (Table 13; Figure 13). While ubiquity scores were calculated for the wild plant group, only two seeds (grass family and knotweed) were identified from one flotation feature; therefore, wild plant taxa were excluded from the ubiquity analysis as the score is meaningless. Another seed from the wild plant group (grape) was recovered from a water-screened feature (Feature 57F) and was not included in the ubiquity analysis since it is a taxon that is typically recovered from flotation contexts.

Table 13. Schultz Phase Macroplant Percentages and Ubiquity

Group	Taxon	Percentage (raw counts)	Ubiquity Score (%)
Nut	Hickory	61.82	70
	Walnut	0.38	40
	Walnut family	0.05	30
	Acorn	0.01	10
Cultigen	Maize	32.42	80
	Bean	4.71	40
	Sunflower	0.47	20
	Squash	0.02	10
Wild Plant	Knotweed	0.01	50
	Grass Family	0.01	50
	Unid. Seed	0.11	–
Total		**100.02**	–

* N.B. Unidentified remains not included in ubiquity analysis

Cultigen and nut mast ubiquity was calculated on all 11 samples; two samples were from the same context and were combined for analysis. Percentage scores indicate hickory, followed by maize, dominate the assemblage. Ubiquity scores, however, indicate maize is present in 80 percent of the features while hickory nut is present in 70 percent of the features. Ubiquity scores overall are higher for the Schultz Phase samples than the Mason Island and Luray Phase samples; it is possible this is a reflection of the lower number of features examined from the Schultz Phase. It is also possible these numbers are a reflection of better preservation or are due to the effects of sampling.

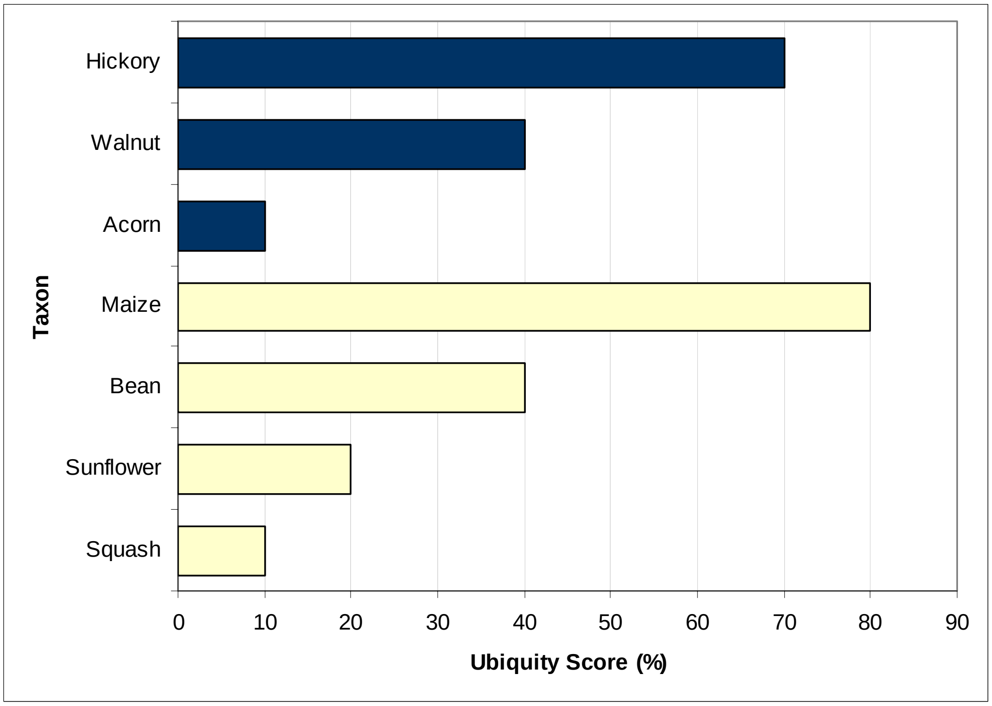

Figure 13. Schultz Phase Ubiquity Scores

Feature Ubiquity

Nut mast (principally hickory) percentages were highest with bell-shaped storage pits, while high percentages of cultigens (principally maize) were highest with storage pits and bell-shaped storage pits (Table 14). On such a small set of samples it is difficult to weigh the importance of the ubiquity scores; however, ubiquity is highest for nut mast and cultigens in storage pits and bell-shaped storage pits (Figure 14). The scores overall show a slightly higher ubiquity for cultigens. This conforms to observations on other sites in the region that show maize increasing in importance over hickory through time. The palisade trench contained no macrobotanical remains and will not be discussed further.

Table 14. Schultz Phase Macroplant Percentages and Ubiquity by Feature Type

Feature Type	Number of Features	Nut Mast		Cultigen	
		Percentage	Ubiquity	Percentage	Ubiquity
Hearth	2	0.28	50	0.07	50
Palisade trench	1		0		0
Pit	2	0.26	50	3.54	100
Storage pit	3	7.02	100	32.50	100
Storage pit, bell-shaped	2	92.44	100	63.90	100
Total	**10**	**100.00**		**100.01**	

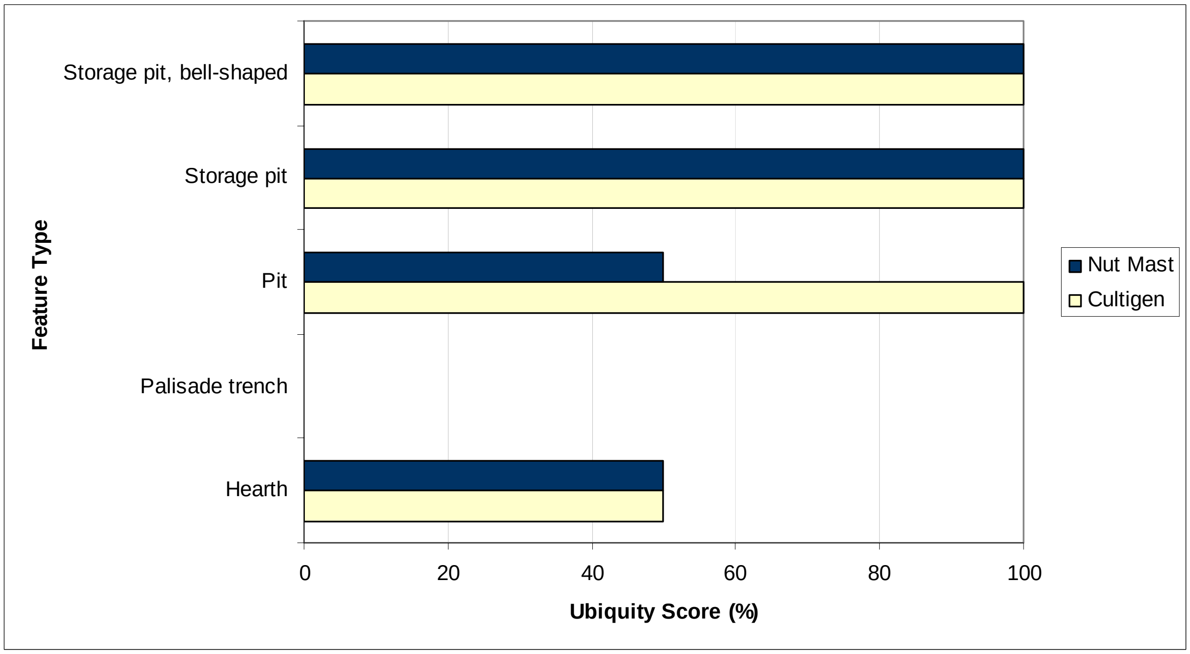

Figure 14. Schultz Phase Macroplant Ubiquity by Feature Type

BARTON SITE COMPONENT COMPARISON

Cultigen and nut mast ubiquity scores were calculated for all contexts by culture period (Figure 15). Cultigen ubiquity, which primarily includes maize (beans, sunflower, and squash were represented in very low quantities), is lowest for the Mason Island Phase and is about the same for the Luray and Schultz Phases. Archaeobotanists have noted that maize ubiquity scores increase over time, reflecting a change to near reliance on maize in the subsistence economy. This is a trend that appears to be reflected in the Barton site data. The slightly lower ubiquity score for cultigens during the Schultz Phase may be a reflection of sampling bias, as the assemblage is reflected by twice as many Luray Phase features as Schultz Phase features.

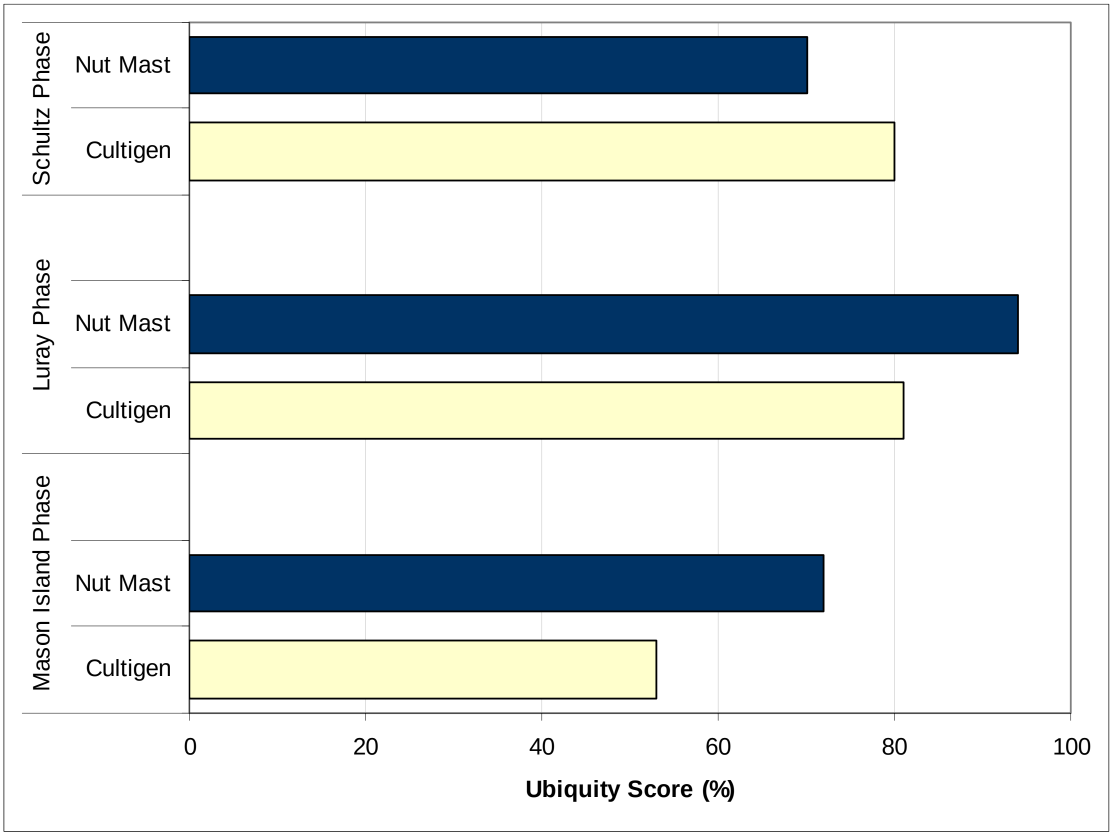

Figure 15. Cultigen and Nut Mast Ubiquity Scores by Culture Period

Nut mast ubiquity is highest for the Luray Phase and the Mason Island and Schultz Phases are virtually identical. While researchers have noted an overall decrease in hickory and increase in maize over time, this does not appear to be the case at the Barton site. Unfortunately, the inherent biases in the dataset make interpretations tenuous; however, the increase in nut mast could be related to environmental factors (i.e., the beginning of the Little Ice Age) or could be related to the feature types that are represented in the assemblage or changes in food storage practices. The majority of the nutshell comes from midden and storage pit contexts for the Luray Phase and storage pit contexts for the Schultz Phase, though is present in most of the feature types. There are no storage pits for the Mason Island Phase and the nutshell is more evenly distributed among feature types, with slightly higher counts for midden contexts, but not to the degree that is seen in the Luray Phase midden contexts.

Scores for the wild plant group were excluded due to the very small sample size from which to make comparisons; specifically, the Schultz Phase is represented by two flotation samples, only one of which contained wild plant remains, so comparisons across culture periods are meaningless. The Mason Island and Luray Phase samples contained 10 wild plant taxa each (Table 15). While the specific taxa vary between the two phases, there is some overlap in identified taxa, suggesting there were no significant differences in the subsistence economy between the two periods. The Mason Island Phase assemblage shows a wider diversity of fleshy fruits than the Luray Phase, which may be an indicator of increasing reliance on maize agriculture, or may reflect other factors, such as recovery bias or environmental influences. Due to the paucity of wild plant remains from the Schultz Phase, it is not possible to make comparisons or interpretations about the importance of these taxa.

Table 15. Wild Plant Taxa Presence, Mason Island and Luray Phases

Group	Taxa	Phase	
		Mason Island	Luray
Starchy Weed	Goosefoot	X	X
	Knotweed		X
Fleshy Fruit	Blackberry	X	X
	Blueberry	X	X
	Elderberry	X	X
	Grape		X
	Groundcherry	X	
	Maypop	X	
	Strawberry	X	
	Sumac	X	X
Miscellaneous	Bean family	X	X
	Grass family	X	X
	Mallow family		X

CONCLUSION

Twenty plant taxa were identified from over 15,000 macroplant remains recovered from 59 features. Macroplant remains include nut mast, cultigens, and wild plants, indicating the Mason Island through Schultz Phases practiced maize horticulture but also relied on wild plants, such as nuts, berries, and starchy, herbaceous plants for their subsistence needs. Quantitative analysis indicates a trend towards the increasing importance of maize, and possibly hickory, as ubiquity scores for each taxa increase from the Mason Island Phase to the Schultz Phase. Recovery and sampling biases unfortunately have influenced the results of the quantitative analysis, thereby limiting interpretations of the macroplant assemblage.

CHAPTER 5. DISCUSSION AND CONCLUSIONS

This chapter includes a discussion of the research questions and provides suggestions for future research.

RESEARCH QUESTIONS

1. **What can be understood about dietary changes, if any, throughout the Late Woodland and into the Contact Period?**

An assessment of dietary changes from the Late Woodland into the Contact Period was not possible; however, a few observations were noted. The Barton site inhabitants practiced a subsistence strategy that included collecting of wild plant resources and exploitation of local and tropical domesticated plants. The recovery of wild plant remains in both Mason Island and Luray contexts indicates the continued importance of these food resources in the diet. In addition, the diversity of taxa reflects a broad-based subsistence strategy that likely continued into the Contact Period. The lower quantity of maize recovered from Mason Island contexts suggests tropical domesticates were less important in the diet than in the succeeding Luray and Schultz Phases. This could, however, reflect changes in, or adoption of, food storage practices, as discussed below. The plant data do not suggest any differences in subsistence, although additional research and sampling is necessary to effectively assess this issue.

2. **What information can the archaeobotanical data yield about food processing and storage, and what does this tell us about site seasonality?**

It is not clear if the Mason Island inhabitants had food storage technology; if so, then it was in above-ground structures or containers that left no archaeological traces. The prevailing theory seems to be that food storage was adopted during the Luray Phase with the nucleation of settlements into villages. The reasons for this are complex and are beyond the scope of this study; it is obvious from regional data, however, that food storage was adopted beginning around AD 1400. Changes in food storage technology are evident from the Luray to the Schultz Phase, where large subterranean pits were replaced by deep, bell-shaped pits (see Figure 5).

Little can be said about wild plant food processing based on the archaeological data. The presence of maize cupules and cob fragments throughout the three phases suggests ears of maize were transported to the village for processing. Ethnographic data indicates maize was dried and stored on the cob, then removed as needed. The large amount of hickory shell indicates entire nuts also were brought back to the village for processing. No husk fragments were identified during analysis, so it is possible these were removed at the source before transport.

The plant taxa identified at the site would have been available at various times from the spring through early winter. In theory, the site was occupied during this time; however, seasonality is difficult to assess with groups who possessed food storage technology and therefore year-round occupation was possible. The location of the site on an active river floodplain may have precluded year-round occupation, especially during the early spring when floods from the winter's snow melt occurred. Prevailing theories suggest that Mason Island Phase occupations were less sedentary and were moved according to the season to exploit seasonally available resources. This may be manifested in the lower quantities of cultigens recovered from this phase at the site. While flooding may have been a potential hazard during certain times of the year, it is possible the Luray and Schultz Phase components represent year-round habitation, especially given the presence of palisades and subterranean storage.

DIRECTIONS FOR FUTURE RESEARCH

Several recommendations are made with regard to feature and soil sampling during future investigations of the site. Systematic flotation recovery could not only provide subsistence data (both macroplant and faunal), but provide other small classes of data not normally recovered during excavation, such as lithic debitage. While additional subsistence studies are crucial to the site's interpretation, recovery of a sample of all data classes is as important. Ideally, a blanket sampling approach should be used, whereby non-cultural contexts are sampled to provide a baseline from which the cultural data can be compared and analyzed. In addition, controlled sampling of features, including recordation of sample sizes and volumes would allow for more detailed and sophisticated analyses that could help answer subsistence questions.

Analysis of the archaeobotanical assemblage resulted in identification of several avenues for future research:

- Conduct a comprehensive comparative study of contemporaneous archaeological sites in the region with subsistence data;
- Undertake identification and analysis of the charred wood remains from the site;
- Reconstruct the local paleoenvironment based on the site's macroplant remains, as well as locally available proxy climate records; and
- Conduct further study of the role of climate on the Late Woodland and Contact Periods.

CONCLUSIONS

Archaeobotanical analysis of features from the Barton site provided a wealth of information concerning the dietary patterns practiced by the Late Woodland and Contact Period inhabitants of the site. While interpretations of the data were limited by sampling issues, the assemblage indicates the site's inhabitants practiced a diverse subsistence economy based on gathering of wild plants and cultivation of domesticated plants. Beginning approximately AD1400, the site's inhabitants adopted food storage technology that allowed them to endure periods of food shortage caused by cultural, political, and climate factors. Future studies of the Barton site's archaeobotanical remains are expected to contribute further to understanding subsistence, settlement, and the paleoenvironment.

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APPENDIX A

Appendix A- 1. Barton Site Raw Data – Cultigens

Feature	Zone/ Layer	Feature Type	CP*	Cultigens													
				Maize kernel		Maize cupule		Maize cob		Bean		Squash		Sunflower		Total	
				CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
1		Pit, large	M	49	0.91	2	0.01									51	0.92
5		Burial	M														
6		Unknown	M	2	0.05											2	0.05
9		Midden	M	7	0.26											7	0.26
16		Midden	M	35	0.71											35	0.71
19		Basin	M	9	0.06											9	0.06
20		Pit, shallow	M	46	0.45	7	0.05			1	0.04					54	0.54
22		Pit, shallow	M	31	0.40	2	0.01	1	0.23							34	0.64
23		Midden	M	264	3.07					4	0.31					268	3.38
24		Pit, shallow	M														
25		Pit, small	M														
26		Basin	M														
35		Unknown	M	3	0.06	1	0.01									4	0.07
44		Basin	M														
48		Pit, small	M														
53		Hearth	M														
53	Ash layer	Hearth	M														
53	Ash layer, layer 2	Hearth	M														
53	Red burned soil	Hearth	M	2	0.04											2	0.04
62		Midden	M	11	0.20	1125	6.27	18	0.90	6	0.22					1160	7.59
63		Burial	M											1	0.01	1	0.01
67		Midden	M														
67A		Hearth	M			1	0.01									1	0.01
67B		Hearth	M														
68A		Midden	M														
73		Midden	M														
78A		Unknown	M														
86		Basin	M	8	0.06											8	0.06
89		Hearth	M														
94		Hearth	M														
97		Hearth	M	2	0.08											2	0.08
98		Hearth	M														
99		Midden	M														
113		Midden	M	2	0.03	1	0.01									3	0.04
119		Unknown	M	3	0.02											3	0.02
Subtotal Mason Island Phase				**474**	**6.40**	**1139**	**6.37**	**19**	**1.13**	**11**	**0.57**	**0**	**0.00**	**1**	**0.01**	**1644**	**14.48**

Appendix A-1. Barton Site Raw Data – Cultigens (continued)

Feature	Zone/ Layer	Feature Type	CP*	Maize kernel CT	Maize kernel WT	Maize cupule CT	Maize cupule WT	Maize cob CT	Maize cob WT	Bean CT	Bean WT	Squash CT	Squash WT	Sunflower CT	Sunflower WT	Total CT	Total WT
17		Midden	L	10	0.17	17	0.14									27	0.31
17A		House trench?	L	2	0.01											2	0.01
33		Storage pit	L	3	0.01											3	0.01
34		Palisade trench	L	7	1.15	2	0.01			1	0.01					10	1.17
128		Pit, large	L	1	0.01											1	0.01
130		Midden	L	2	0.10	1	0.01									3	0.11
131B		Midden	L			3	0.04									3	0.04
143		Midden	L			2	0.01									2	0.01
143A		Midden	L														
143A	Burned soil	Midden	L														
143A	Red burned soil	Midden	L														
143B		Midden	L	2	0.06											2	0.06
144		Pottery concentration	L	2	0.03											2	0.03
145		Storage pit	L														
145A	Zone A	Storage pit	L	7	0.06	4	0.03							3	0.01	14	0.10
145B	Zone B	Storage pit	L	26	0.29	37	0.24									63	0.53
145C	Zone C	Storage pit	L	58	0.63	45	0.56			1	0.04					104	1.23
145D	Zone D	Storage pit	L	21	0.21	5	0.03									26	0.24
146		Hearth	L			1	0.01									1	0.01
146	Burned soil	Hearth	L														
150		Basin	L														
153		Basin	L	5	0.01	4	0.01									9	0.02
LHF*		House floor	L														
Subtotal Luray Phase				**146**	**2.74**	**121**	**1.09**	**0**	**0.00**	**2**	**0.05**	**0**	**0.00**	**3**	**0.01**	**272**	**3.89**
28		Pit, medium	S	33	1.23	72	0.73							56	0.13	161	2.09
43		Hearth	S														
43	subsoil context	Hearth	S			3	0.03									3	0.03
57E		Storage pit	S	4	0.26					2	0.04					6	0.30
57F		Storage pit, bell-shaped	S	1295	29.09			1	0.08	440	10.08					1736	39.25
57F	Zone A	Storage pit, bell-shaped	S	428	11.54	51	1.60			65	5.43					544	18.57
57F	Zone D	Storage pit, bell-shaped	S	61	1.08	31	0.14			2	0.07	1	0.02			95	1.31
57F	Zone E	Storage pit, bell-shaped	S	30	0.30	14	0.06			4	0.09					48	0.45
57F	Zone F	Storage pit, bell-shaped	S	15	0.14	1	0.01			3	0.04	1	0.01			20	0.20
59		Storage pit	S	1145	33.80	276	1.88			45	1.66					1466	37.34
93		Storage pit	S	13	0.50	3	0.01									16	0.51
95		Hearth	S														
96		Storage pit, bell-shaped	S	445	7.86	25	0.23			12	0.26			1	0.01	483	8.36
110B		Palisade trench	S														
147		Pit, medium	S	1	0.01											1	0.01
Subtotal Schultz Phase				**3470**	**85.81**	**476**	**4.69**	**1**	**0.08**	**573**	**17.67**	**2**	**0.03**	**57**	**0.14**	**4579**	**108.42**
TOTAL				**4090**	**94.95**	**1736**	**12.15**	**20**	**1.21**	**586**	**18.29**	**2**	**0.03**	**61**	**0.16**	**6495**	**126.79**

*CP = Culture Period: M = Mason Island Phase, L = Luray Phase, S = Schultz Phase
CT = Count, WT = Weight (g)
LHF = Luray House Floor (no feature number assigned)

Appendix A- 2. Barton Site Raw Data – Fleshy Fruits

Feature	Zone/Layer	Feature Type	CP*	Fleshy Fruits																	
				Blackberry		Blueberry		Elderberry		Grape		Groundcherry		Maypop		Strawberry		Sumac		Total	
				CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
1		Pit, large	M															13	0.03	13	0.03
5		Burial	M																		
6		Unknown	M																		
9		Midden	M																		
16		Midden	M															3	0.01	3	0.01
19		Basin	M																		
20		Pit, shallow	M																		
22		Pit, shallow	M																		
23		Midden	M					1	0.01			3	0.01					2	0.01	6	0.03
24		Pit, shallow	M																		
25		Pit, small	M																		
26		Basin	M																		
35		Unknown	M	1	0.01	1	0.01							2	0.01	1	0.01			5	0.04
44		Basin	M																		
48		Pit, small	M																		
53		Hearth	M																		
53	Ash layer	Hearth	M																		
53	Ash layer, layer 2	Hearth	M																		
53	Red burned soil	Hearth	M																		
62		Midden	M																		
63		Burial	M																		
67		Midden	M																		
67A		Hearth	M																		
67B		Hearth	M																		
68A		Midden	M																		
73		Midden	M																		
78A		Unknown	M																		
86		Basin	M																		
89		Hearth	M																		
94		Hearth	M																		
97		Hearth	M																		
98		Hearth	M																		
99		Midden	M																		
113		Midden	M															1	0.01	1	0.01
119		Unknown	M																		
Subtotal Mason Island Phase				**1**	**0.01**	**1**	**0.01**	**1**	**0.01**	**0**	**0.00**	**3**	**0.01**	**2**	**0.01**	**1**	**0.01**	**19**	**0.06**	**28**	**0.12**

Appendix A-2. Barton Site Raw Data – Fleshy Fruits (continued)

				Fleshy Fruits																	
				Blackberry		Blueberry		Elderberry		Grape		Groundcherry		Maypop		Strawberry		Sumac		Total	
Feature	Zone/Layer	Feature Type	CP*	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
17		Midden	L															3	0.01	3	0.01
17A		House trench?	L																		
33		Storage pit	L																		
34		Palisade trench	L																		
128		Pit, large	L																		
130		Midden	L																		
131B		Midden	L																		
143		Midden	L																		
143A		Midden	L																		
143A	Burned soil	Midden	L																		
143A	Red burned soil	Midden	L																		
143B		Midden	L																		
144		Pottery concentration	L																		
145		Storage pit	L																		
145A	Zone A	Storage pit	L															1	0.01	1	0.01
145B	Zone B	Storage pit	L					1	0.01											1	0.01
145C	Zone C	Storage pit	L																		
145D	Zone D	Storage pit	L			1	0.01			1	0.01									2	0.02
146		Hearth	L																		
146	Burned soil	Hearth	L																		
150		Basin	L																		
153		Basin	L	1	0.01															1	0.01
LHF*		House floor	L																		
Subtotal Luray Phase				**1**	**0.01**	**1**	**0.01**	**1**	**0.01**	**1**	**0.01**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**4**	**0.02**	**8**	**0.06**
28		Pit, medium	S																		
43		Hearth	S																		
43	subsoil context	Hearth	S																		
57E		Storage pit	S																		
57F		Storage pit, bell-shaped	S																		
57F	Zone A	Storage pit, bell-shaped	S							1	0.04									1	0.04
57F	Zone D	Storage pit, bell-shaped	S																		
57F	Zone E	Storage pit, bell-shaped	S																		
57F	Zone F	Storage pit, bell-shaped	S																		
59		Storage pit	S																		
93		Storage pit	S																		
95		Hearth	S																		
96		Storage pit, bell-shaped	S																		
110B		Palisade trench	S																		
147		Pit, medium	S																		
Subtotal Schultz Phase				**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**1**	**0.04**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**1**	**0.04**
TOTAL				**2**	**0.02**	**2**	**0.02**	**2**	**0.02**	**2**	**0.05**	**3**	**0.01**	**2**	**0.01**	**1**	**0.01**	**23**	**0.08**	**37**	**0.22**

*CP = Culture Period: M = Mason Island Phase, L = Luray Phase, S = Schultz Phase

CT = Count, WT = Weight (g)

LHF = Luray House Floor (no feature number assigned)

Appendix A- 3. Barton Site Raw Data – Other Seeds

Feature	Zone/Layer	Feature Type	CP*	Starchy Weeds				Grass		Miscellaneous							
				Goosefoot		Knotweed		Grass Family		Bean Family		Mallow Family		Unidentifiable		Total	
				CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
1		Pit, large	M											4	0.03	4	0.03
5		Burial	M														
6		Unknown	M														
9		Midden	M											2	0.01	2	0.01
16		Midden	M							1	0.01			3	0.01	4	0.02
19		Basin	M														
20		Pit, shallow	M														
22		Pit, shallow	M														
23		Midden	M	1	0.01			1	0.01					4	0.01	6	0.03
24		Pit, shallow	M														
25		Pit, small	M	1	0.01									1	0.01	2	0.02
26		Basin	M														
35		Unknown	M					1	0.01							1	0.01
44		Basin	M														
48		Pit, small	M														
53		Hearth	M														
53	Ash layer	Hearth	M														
53	Ash layer, layer 2	Hearth	M														
53	Red burned soil	Hearth	M														
62		Midden	M														
63		Burial	M														
67		Midden	M														
67A		Hearth	M														
67B		Hearth	M														
68A		Midden	M														
73		Midden	M														
78A		Unknown	M														
86		Basin	M														
89		Hearth	M														
94		Hearth	M														
97		Hearth	M														
98		Hearth	M														
99		Midden	M														
113		Midden	M														
119		Unknown	M														
Subtotal Mason Island Phase				**2**	**0.02**	**0**	**0.00**	**2**	**0.02**	**1**	**0.01**	**0**	**0.00**	**14**	**0.07**	**19**	**0.12**

Appendix A-3. Barton Site Raw Data – Other Seeds (continued)

				Starchy Weeds				Grass		Miscellaneous							
				Goosefoot		Knotweed		Grass Family		Bean Family		Mallow Family		Unidentifiable		Total	
Feature	Zone/Layer	Feature Type	CP*	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
17		Midden	L														
17A		House trench?	L														
33		Storage pit	L														
34		Palisade trench	L							1	0.01					1	0.01
128		Pit, large	L														
130		Midden	L														
131B		Midden	L														
143		Midden	L											1	0.01	1	0.01
143A		Midden	L														
143A	Burned soil	Midden	L														
143A	Red burned soil	Midden	L														
143B		Midden	L														
144		Pottery concentration	L														
145		Storage pit	L														
145A	Zone A	Storage pit	L			3	0.01							1	0.01	4	0.02
145B	Zone B	Storage pit	L	3	0.01			1	0.01							4	0.02
145C	Zone C	Storage pit	L	1	0.01									4	0.01	5	0.02
145D	Zone D	Storage pit	L	3	0.01							1	0.01	1	0.01	5	0.03
146		Hearth	L											1	0.01	1	0.01
146	Burned soil	Hearth	L														
150		Basin	L											1	0.01	1	0.01
153		Basin	L														
LHF*		House floor	L					1	0.01					2	0.01	3	0.02
Subtotal Luray Phase				**7**	**0.03**	**3**	**0.01**	**2**	**0.02**	**1**	**0.01**	**1**	**0.01**	**11**	**0.07**	**25**	**0.15**
28		Pit, medium	S											9	0.1	9	0.10
43		Hearth	S														
43	subsoil context	Hearth	S			1	0.01	1	0.01							2	0.02
57E		Storage pit	S														
57F		Storage pit, bell-shaped	S											2	0.05	2	0.05
57F	Zone A	Storage pit, bell-shaped	S														
57F	Zone D	Storage pit, bell-shaped	S														
57F	Zone E	Storage pit, bell-shaped	S														
57F	Zone F	Storage pit, bell-shaped	S											2	0.01	2	0.01
59		Storage pit	S														
93		Storage pit	S														
95		Hearth	S														
96		Storage pit, bell-shaped	S														
110B		Palisade trench	S														
147		Pit, medium	S														
Subtotal Schultz Phase				**0**	**0.00**	**1**	**0.01**	**1**	**0.01**	**0**	**0.00**	**0**	**0.00**	**13**	**0.16**	**15**	**0.18**
TOTAL				**9**	**0.05**	**4**	**0.02**	**5**	**0.05**	**2**	**0.02**	**1**	**0.01**	**38**	**0.30**	**59**	**0.45**

*CP = Culture Period: M = Mason Island Phase, L = Luray Phase, S = Schultz Phase

CT = Count, WT = Weight (g)

LHF = Luray House Floor (no feature number assigned)

Appendix A- 4. Barton Site Raw Data – Nut Mast

Feature	Zone/Layer	Feature Type	CP*	Nut Mast									
				Acorn		Hickory		Walnut-Butternut		Unidentifable		Total	
				CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
1		Pit, large	M			36	0.48	2	0.04			38	0.52
5		Burial	M									0	0.00
6		Unknown	M			5	0.04					5	0.04
9		Midden	M			8	0.50	1	0.04			9	0.54
16		Midden	M			32	0.60	3	0.07			35	0.67
19		Basin	M	5	0.03	18	0.13					23	0.16
20		Pit, shallow	M			32	0.52	1	0.05			33	0.57
22		Pit, shallow	M			21	0.40					21	0.40
23		Midden	M			83	1.39					83	1.39
24		Pit, shallow	M									0	0.00
25		Pit, small	M							7	0.07	7	0.07
26		Basin	M							4	0.01	4	0.01
35		Unknown	M									0	0.00
44		Basin	M									0	0.00
48		Pit, small	M									0	0.00
53		Hearth	M			5	0.06					5	0.06
53	Ash layer	Hearth	M			3	0.09					3	0.09
53	Ash layer, layer 2	Hearth	M			3	0.05					3	0.05
53	Red burned soil	Hearth	M			1	0.05					1	0.05
62		Midden	M			9	0.26	5	0.20	1	0.01	15	0.47
63		Burial	M			60	1.51					60	1.51
67		Midden	M			25	1.96					25	1.96
67A		Hearth	M			37	0.67	5	0.16			42	0.83
67B		Hearth	M									0	0.00
68A		Midden	M									0	0.00
73		Midden	M									0	0.00
78A		Unknown	M			7	0.34					7	0.34
86		Basin	M			6	0.10					6	0.10
89		Hearth	M									0	0.00
94		Hearth	M			25	0.82					25	0.82
97		Hearth	M			11	0.30			2	0.02	13	0.32
98		Hearth	M			3	0.06					3	0.06
99		Midden	M			4	0.04					4	0.04
113		Midden	M			1	0.11			1	0.01	2	0.12
119		Unknown	M			10	0.06	1	0.01	4	0.02	15	0.09
Subtotal Mason Island Phase				**5**	**0.03**	**445**	**10.54**	**18**	**0.57**	**19**	**0.14**	**487**	**11.28**

Appendix A-4. Barton Site Raw Data – Nut Mast (continued)

				Nut Mast									
				Acorn		Hickory		Walnut-Butternut		Unidentifable		Total	
Feature	Zone/Layer	Feature Type	CP*	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
17		Midden	L			49	0.63					49	0.63
17A		House trench?	L			12	0.24					12	0.24
33		Storage pit	L			23	0.39					23	0.39
34		Palisade trench	L	1	0.01	54	1.70					55	1.71
128		Pit, large	L			41	0.61					41	0.61
130		Midden	L			13	0.07					13	0.07
131B		Midden	L			7	0.08	4	0.18	7	0.04	18	0.30
143		Midden	L			126	2.36	6	0.37			132	2.73
143A		Midden	L			12	0.13					12	0.13
143A	Burned soil	Midden	L									0	0.00
143A	Red burned soil	Midden	L									0	0.00
143B		Midden	L			14	0.37					14	0.37
144		Pottery concentration	L			17	0.22					17	0.22
145		Storage pit	L									0	0.00
145A	Zone A	Storage pit	L			79	1.42					79	1.42
145B	Zone B	Storage pit	L			109	2.41					109	2.41
145C	Zone C	Storage pit	L			160	5.04	3	0.10			163	5.14
145D	Zone D	Storage pit	L			159	5.19					159	5.19
146		Hearth	L			24	0.42					24	0.42
146	Burned soil	Hearth	L			16	0.19					16	0.19
150		Basin	L			11	0.16					11	0.16
153		Basin	L			4	0.06					4	0.06
LHF*		House floor	L									0	0.00
Subtotal Luray Phase				**1**	**0.01**	**930**	**21.69**	**13**	**0.65**	**7**	**0.04**	**951**	**22.39**
28		Pit, medium	S	1	0.14	19	0.57					20	0.71
43		Hearth	S			18	0.44					18	0.44
43	subsoil context	Hearth	S							3	0.01	3	0.01
57E		Storage pit	S			6	0.75					6	0.75
57F		Storage pit, bell-shaped	S			964	24.50	17	1.50			981	26.00
57F	Zone A	Storage pit, bell-shaped	S			554	13.50	9	0.70			563	14.20
57F	Zone D	Storage pit, bell-shaped	S			26	0.63					26	0.63
57F	Zone E	Storage pit, bell-shaped	S			32	0.39	2	0.10	2	0.01	36	0.50
57F	Zone F	Storage pit, bell-shaped	S			10	0.14					10	0.14
59		Storage pit	S			460	8.43	1	0.11			461	8.54
93		Storage pit	S			65	2.42					65	2.42
95		Hearth	S									0	0.00
96		Storage pit, bell-shaped	S			5372	19.48	17	1.42			5389	20.90
110B		Palisade trench	S									0	0.00
147		Pit, medium	S							1	0.01	1	0.01
Subtotal Schultz Phase				**1**	**0.14**	**7526**	**71.25**	**46**	**3.83**	**6**	**0.03**	**7579**	**75.25**
TOTAL				**7**	**0.18**	**8901**	**103.48**	**77**	**5.05**	**32**	**0.21**	**9017**	**108.92**

*CP = Culture Period: M = Mason Island Phase, L = Luray Phase, S = Schultz Phase

CT = Count, WT = Weight (g)

LHF = Luray House Floor (no feature number assigned)