Analysis of Plant Remains
from 44RN219

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INTRODUCTION

Archaeological plant and animal assemblages represent only a small fraction of what was originally used and deposited by humans in open-air settings. Natural and cultural factors can significantly modify organic remains, resulting in recovered assemblages that differ dramatically from the original deposits. As archaeologists, we examine collections that have undergone a series of processes—from the original selection of plants and animals by humans, to food preparation, cooking, discard, animal and insect scavenging, burial, decay, and weathering, to the recovery of food residues by archaeologists. Using standard methodological procedures for sampling, quantification, and analysis allows us to make sense of our assemblages in spite of the deleterious effects of these processes.

Here I report on the identification and analysis of the archaeobotanical assemblage from 44RN219. I treat the plant data first, followed by the animal data. In so doing, I present a basic discussion of recovery/ preservation issues, quantitative methods, and laboratory procedures. This is followed by the results and analysis of the data. I then discuss the patterns identified in each assemblage as a means to reconstruct more general plant subsistence practices at the site.

THE ARCHAEOBOTANICAL ASSEMBLAGE

Recovery and Preservation Bias

The circumstances under which plants preserve best archaeologically involve extreme conditions (e.g., exceptionally wet, dry, or cold environments) that prohibit decomposition of organic matter (Miksicek 1987). Plants can also preserve through exposure to fire, which can transform plant material from organic matter into carbon (Miksicek 1987). The likelihood that a plant will become carbonized varies according to the type of plant, how it is prepared and used, and whether it has a dense or fragile structure (Scarry 1986). Plants that are eaten whole are less likely to produce discarded portions that may find their way into a fire. Plants that require the removal of inedible portions (e.g., hickory nutshell, corn cobs) are more likely to find their way into a fire, and thus into the archaeological record. Inedible plant parts represent intentional discard that is often burned as fuel. Moreover, because inedible portions tend to be dense and fibrous, they are more likely to survive the process of carbonization than the edible parts (e.g., hickory nutshell vs. nutmeats). Physical characteristics are also important for determining whether or not a plant will survive a fire. Thick, dense nutshells are more likely to survive a fire than smaller, more fragile grass seeds. Food preparation activities also affect potential plant carbonization. The simple process of cooking provides the opportunity for carbonization through cooking accidents. Foods that are conventionally eaten raw, however, are less likely to be deposited in fires than cooked foods.

Some plants that find their way into the archaeological record in carbonized form were not eaten at all. Wood fuel is the most obvious example. Burned house structures can also yield carbonized plant deposits, and these deposits often differ dramatically from refuse deposits (Scarry 1986). Other non-food plants that become carbonized are incidental inclusions, such as seeds blown by wind dispersal (Miksicek 1987; Minnis

1981; Scarry 1986). Indeed, most secondary invaders are weedy species with lots of seeds (e.g., cheno/am plants) (Minnis 1981).

While we cannot ever hope to know the absolute quantities or importance of different plants in any past subsistence economy, the preservation and recovery biases discussed above do not prohibit quantitative analyses of archaeobotanical assemblages. The most commonly used plant resources in any subsistence economy are more likely to be subject to activities that result in carbonization (e.g., through fuel use and accidental burning) and ultimately, deposition (Scarry 1986; Yarnell 1982). Thus, we can quantitatively examine the relative importance of commonly-used plant resources through time and across space.

Methods of Quantification

Quantitative methods in archaeobotany have developed significantly over the past several decades, and as a result, have been a subject of much critical discussion (Hastorf and Popper 1988). The most common methods for recording and quantifying plant remains are counts and weights. Because of problems with comparability between different types of plant taxa, however, raw (or absolute) counts and weights are not appropriate comparative measures (Scarry 1986). For example, denser taxa yield higher weights than more fragile taxa, and some taxa yield higher seed counts than others (e.g., grasses versus fruits) (Scarry 1986). Thus, using absolute counts or weights to summarize plant data is highly problematic. Most archaeobotanists agree that absolute counts are inadequate for assessing past people-plant interactions in that they do not control for biases related to preservation and sampling error (Kandane 1988; Miller 1988; Popper 1988; Scarry 1986). Absolute counts and weights are simply raw, unstandardized data.

One way to avoid the problems of absolute counts/weights is through the use of ubiquity measures (Godwin 1956; Hubbard 1975, 1976, 1980; Popper 1988, Willcox 1974). This type of analysis is essentially a presence/absence analysis that sidesteps the problems of counts and weights by measuring the frequency of occurrence instead of abundance. In other words, ubiquity analysis measures the number of samples in which a taxon was identified, as opposed to the number of specimens represented by that taxon. The researcher first records the presence of a specific taxon in each sample, and then computes the percentage of all samples in which the taxon is present (Popper 1988). For example, if hickory shell is present in four out of ten samples, then its ubiquity value is 40%. Thus, each taxon is evaluated independently (Hubbard 1980). Because different types of plants are disposed of differently, direct comparisons of ubiquity values between taxa are problematic (Hubbard 1980:53). For example, a 70% ubiquity value for hickory nutshell would not be equivalent to a 70% ubiquity value for beans as these categories have different preservation opportunities—hickory nutshell represents a processing by-product often used as fuel, while beans represent edible portions.

As with any quantitative measure, ubiquity analysis has its disadvantages. A sufficient number of samples is necessary to provide meaningful results as using too few samples creates a high likelihood of sampling error. Hubbard (1976:60) suggests a minimum of 10 samples. Moreover, although ubiquity analysis may mitigate for preservation biases, it is not immune to them (Hubbard 1980:53; Scarry 1986:193). Most importantly, because ubiquity deals with occurrence frequency and not abundance, it can potentially obscure patterns where occurrence frequency does not change but abundance does (Scarry 1986). As Scarry (1986:193) notes: “the frequency with which a resource is used may remain constant, while the quantity used varies.” For example, a family may consistently eat corn on a daily basis, but the quantity they consume may vary from day to day. Despite these weaknesses, ubiquity analysis is a good starting point and can provide meaningful results when used alongside other measures.

While ubiquity measures may sidestep the problems inherent in absolute counts, it does not provide a means for calculating relative abundances of different plant taxa. Using comparative ratios is one way of determining the relative abundances of different plants. Essentially, calculating a ratio is a means of standardizing raw measures. In other words, we can deal with the problems of absolute counts and weights by standardizing them in terms of some constant variable (Miller 1988; Scarry 1986). The density measure standardizes data in terms of soil volume—the absolute count or weight of carbonized plant material (for individual taxa or for larger collapsed categories, e.g., corn kernels or corn) is divided by total soil volume for each sample or context. Density measures calculate the abundance of plants per liter of soil, and it is generally assumed that larger volumes of soil will yield more plant remains. However, differences in the context and manner of deposition between soil samples structure the relationship between soil volume and the size of the plant assemblage. For example, a 10 L soil sample from an intact house floor would probably yield a smaller sample of carbonized plant remains than a 10 L soil sample from a refuse midden, because people tend to keep their houses cleaner than their trash dumps. Moreover, standardizing by soil volume does not control for the range of non-plant related activities that contribute to the deposit from which the soil sample derives. In other words, the density measure does not consider plant remains in terms of plant-related activities, but rather in terms of all of the activities that are represented in the deposit.

Thus, if the analyst is interested in determining the importance of a specific plant relative to the other plants in a sample or context, then density measures may be inadequate. Rather, standardizing by plant weight might be more appropriate (Scarry 1986). Unlike the density measure, standardizing by plant weight considers the contribution of a specific plant or category of plants solely in terms of plant-related activities. As a result, a plant weight ratio more accurately reflects spatial and temporal differences in plant use. As a quantitative category, plant weight is a sum of weights recorded for all carbonized plant specimens per sample or context. Thus, for each sample, there is a total weight of plant material—this figure is the denominator used to standardize the variable of interest.

Overall, ratios are useful quantitative tools that overcome some of the problems of absolute counts. It is important to understand, however, that ratios reveal only the relative importance of plants within varied depositional contexts, not the absolute dietary contribution of actual resources used in the past (Scarry 1986).

Laboratory Procedures

Both the light and heavy fractions of the 44RN219 flotation samples were analyzed. Although the materials from the light and heavy fractions were processed and sorted separately, data from the two fractions were combined for analysis. According to standard practice, the light fractions were weighed and then sifted through 2.0 mm, 1.4

mm, and 0.7 mm standard geological sieves. Carbonized plant remains from both fractions were sorted in entirety down to the 2.0 mm sieve size with the aid of a stereoscopic microscope (10–40 X). Residue less than 2.0 mm in size was scanned for seeds, which were removed and counted; in addition, taxa encountered in the 1.4 mm sieve that were not identified from the 2.0 mm sieve were also removed, counted, and weighed.

Botanical materials were identified with reference to a seed identification manual (Martin and Barkley 1961) and the author's archaeobotanical comparative collection. All plant specimens were identified to the lowest possible taxonomic level. Taxonomic identification was not always possible—some plant specimens lacked diagnostic features altogether or were too highly fragmented. As a result, these specimens were classified as "unidentified" or "unidentified seed." In other cases, probable identifications were made—for example, if a specimen closely resembled a corn kernel, but a clear taxonomic distinction was not possible (e.g., the specimen was highly fragmented), then the specimen was identified as a probable corn cupule and recorded as "corn kernel cf.".

Once the plant specimens were sorted and identified, I recorded counts, weights (in grams), portion of plant (e.g., corn kernels versus cupules), and provenience information. Wood was weighed but not counted, and no wood identification was conducted. Generally, most of the seeds identified in the samples were too small to weigh, and thus only counts were recorded. Hickory nutshell and corn remains were identified only as fragments, and were both counted and weighed. Other than counts and weights, no other measurements were taken on any specimens.

Basic Results

This section presents the results of the identification of the carbonized plant remains from 44RN219, which forms the basis for the quantitative analysis that follows. Plant data from the flotation samples are summarized by site in Table 1 (data summary by feature are listed in separate MSexcel file). Raw counts and weights are provided for each taxon; plant weight, wood weight, and soil volume are also provided. Seasonality data are provided in Table 2.

A total of 319 flotation samples from 64 features were collected and processed; given time constraints, subsampling was necessary, resulting in the analysis of 127 samples from a total of 33 features, representing a total of 1,247 liters of soil with a total plant weight of 1,063 grams. Combined, these samples yielded 34 plant taxa, including corn, a variety of nuts and fruits, and several miscellaneous seeds (Table 1). Corn (*Zea mays*), bean (*Phaseolus* sp.), and sumpweed (*Iva annua*) were the only definitive field cultigens present in the samples. Additionally, a single seed was classified as a sumpweed/sunflower, as it was not possible to distinguish species.

Corn and beans are often discussed together as they commonly represent partner crops. Whether or not they co-evolved as part and parcel of the same domestication process, corn and beans have a long tradition of inter-cropping and successional cropping in the New World (Lentz 2000). Inter-cropping corn and beans is often beneficial in that corn stalks support the bean vines throughout plant growth (Smartt 1988:149). Moreover, inter-cropping also reduces the risk of pest and disease outbreaks than in pure stands (Smartt 1988:149). Corn and beans are also complementary in terms of nutritional value; corn is deficient in essential amino acids lysine and isoleucine, which beans have in abundance (Bodwell 1987:264; Giller 2001:140). Thus, in addition to the benefits of cropping corn and beans together, there are also benefits to eating corn and beans together.

Nutshell recovered from the Buzzard Rock flotation samples includes acorn (*Quercus* sp.), hazelnut (*Corylus* sp.), hickory (*Carya* sp.), and walnut (*Juglans* sp.). Acorn processing depends upon whether the nuts derive from white or red oak trees. Nuts from the red oak are high in tannin and are extremely bitter as a result. White oaks, however, yield sweeter nuts; the nutmeats from these acorns can be used for cooking immediately after extraction from the shell (Scarry 2003). The tannin present in the bitter acorns, however, requires an additional processing step. Leaching the tannin from acorns can be accomplished either by soaking them in water, or parching and then boiling them with an alkaline substance such as wood ash. Once processed, acorns were generally ground into a fine meal, which could then be used to make gruel, bake bread, or thicken stews. Less often, acorns were boiled and the oil extracted (Swanton 1946:260, 277).

The hazelnut identified in the assemblage probably represents the American hazelnut (*Corylus americana*). Unlike the other nuts which come from trees, hazels are shrubs; they prefer open and anthropogenic habitats, and form dense thickets (Scarry 2003). While the nuts begin to ripen in the late summer, they don't fall to the ground until October/November, at which time they are quickly comsumed by animals (Scarry 2003). These factors would have resulted in low collection rates for this type of nut (Scarry 2003; Talalay et al. 1984). Hazelnuts are high in fat and were probably processed for the nutmeats themselves, as opposed to the oil they produce (Scarry 2003).

While the nutmeats of walnuts can be easily extracted from the shell, hickory nuts and some acorns require extensive processing before they are rendered palatable (Petruso and Wickens 1984). The hickory kernels are so tightly enmeshed in the interior shell that picking the nutshells from the cracked shell casing is a time-consuming task. Instead, hickory nuts were generally pounded into pieces and boiled to extract the oil (Ulmer and Beck 1951). The process of boiling the pounded hickory nuts separates the pieces of shell, which sink to the bottom of the pot, from the oil, which rises to the top as the nutmeats dissolve and can be skimmed off or decanted. This oil or milk would then be used as an added ingredient in soups and stews, as a condiment for vegetables, or as a general sauce or beverage (Scarry 2003; Talalay et al. 1984).

Fruit taxa recovered from the samples are represented by several wild species, including 3 blackberry/raspberry seeds (*Rubus* sp.), a blueberry seed (*Vaccinium* sp.), several wild grape (*Vitis* sp.) and hawthorn (*Crataegus* sp.) seeds, a possible mulberry seed (*Morus* sp.), persimmon ((*Diospyros virginiana*), a plum seed (*Prunus* sp.), and 4 seeds that represent either plum (*Rubus* sp.) or cherry (*Rubus* sp.). The most abundant fruit recovered was persimmon, represented by 26 seeds, and 9 fragments of carbonized fleshy fruit; the inclusion of the latter part of the plant is quite rare. Because fruits are often eaten uncooked, their seeds (and flesh) have fewer opportunities for carbonization than corn cobs or nutshell, whose secondary uses often include fuel. Thus, the relative rarity of fruits in the assemblage does not indicate their unimportance in the diet.

A variety of miscellaneous seeds was also identified in the Buzzard Rock assemblage. These include amaranth (*Amaranthus* sp.), bearsfoot (*Polymnia uvedalia*), bedstraw (*Galium* sp.), bulrush (*Scirpus* sp.), carpetweed (*Mollugo* sp.), checkermallow (Sidalcea sp.), chenopod (*Chenopodium* sp.), copperleaf (*Acalypha ostryaefolia*), dock

(*Rumex* sp.), possible knotgrass (*Paspalum* sp. cf.), knotweed (*Polygonum* sp.), morninglory (*Convolvulus*/*Ipomoea* sp.), purslane (*Portulaca* sp.), sedge (*Carex* sp.), smartweed (*Polygonum* sp.), tickclover (*Desmodium* sp.), possible wax myrtle (*Myrica* sp. cf.), and possible wildbean (*Strophostyles* sp. cf.). Also seeds from grass family (Poaceae), knotweed family (Polygonaceae), nightshade family (Solanaceae), spurge family (Euphorbiaceae) were also identified. People probably collected and consumed the seeds of amaranth, bearsfoot, chenopod, knotweed, and smartweed. Amaranth, chenopod, knotweed, purslane, and smartweed, in addition to wildbean, may also have been eaten green or as potherbs (Hedrick 1972; Medsger 1966, Ulmer and Beck 1951). Weedy seeds that probably represent incidental inclusions in the assemblage include bedstraw, bulrush, copperleaf, sedge, and tickclover. Bedstraw may also have been consumed as a tea and the weedy legume may have been used as food (Hedrick 1972; Peterson 1977). Some species of morninglory produce edible tubers, although the seeds identified in the samples might simply be field weeds (Medsger 1966).

While most of these seed species may have been eaten as food or may represent weedy inclusions, some of them have documented medicinal uses as well. Bearsfoot was used by native Indians in poultices and salves, and as a laxative and stimulant (Chevallier 1970; Grieve 1984; Usher 1974). The root can be rendered and taken orally for the treatment of indigestion and liver malfunction (Chevallier 1970). Bearsfoot root can also be made into a salve for treating burns, cuts, and skin inflammations (Moerman 1998). Although bedstraw is widely known for its use as bedding (e.g., stuffing in pillows and mattresses), it also boasts several medicinal purposes, including use as a diuretic, astringent, and antispasmodic, in addition to treatment of kidney problems (Coffey 1993). Bedstraw may also have been consumed as a tea and the weedy legume may have been used as food (Coffey 1993; Hedrick 1972; Peterson 1977). In addition to its use as food, chenopod is also known as a treatment for worms in children (Coffey 1993) and as an antispasmodic (Coon 1979), and can therefore also be considered a medicinal plant. The root of the knotweed has astringent properties and is also a natural emetic/purgative; it can be used to treat diarrhea, constipation, dysentery, and uterine bleeding (Porcher 1970). The leaves of the knotweed can be made into an infusion to stop bleeding in the mouth (Coffey 1993). Finally, wax myrtle represents one of the most widely documented medicinal plants discussed thus far (Coon 1979; Porcher 1970). Also known by the common name bayberry, wax myrtle has astringent properties useful in the treatment of ulcers, diarrhea, dysentery, jaundice, and uterine bleeding; in large doses it can also be used as an emetic (Coon 1979; Porcher 1970). When dried and ground, wax myrtle can be inhaled as snuff for nasal congestion (Coon 1979; Porcher 1970).

Table 1. Plant Taxa identified at 44RN219.

Total Samples	127		
Total Features	33		
Total soil floated (liters)	1247		
Wood Weight (grams)	863.96		
Plant Weight (grams)	1062.84		

		Count	Weight
CULTIGENS			
Bean	*Phaseolus* sp.	45	0.67
Bean cf.	*Phaseolus* sp. cf.	29	0.09
bean family	Fabaceae	2	0.00
Corn cob cf.	*Zea mays* cf.	1	0.02
Corn cob frag w kernel	*Zea mays*	1	0.07
Corn cupule	*Zea mays*	3067	15.95
Corn kernel	*Zea mays*	1446	9.46
Sumpweed	*Iva annua*	2	0.00
Sumpweed cf.	*Iva annua* cf.	5	0.00
Sumpweed/sunflower	*Iva/Helianthus*	1	0.01
NUTS			
Acorn	*Quercus* sp.	53	0.13
Acorn cf.	*Quercus* sp. cf.	2	0.00
Acorn meat	*Quercus* sp.	1	0.05
Acorn meat cf.	*Quercus* sp. cf.	1	0.00
Hazelnut	*Corylus* sp.	4	0.05
Hickory	*Carya* sp.	8209	130.78
Hickory cf.	*Carya* sp. cf.	2	0.00
Hickory meat	*Carya* sp.	1	0.00
Walnut	*Juglans* sp.	944	30.00
FRUITS			
Blackberry/raspberry	*Rubus* sp.	3	0.00
Blueberry	*Vaccinium* sp.	1	0.00
Grape	*Vitis* sp.	12	0.08
Grape cf.	*Vitis* sp. cf.	1	0.00
Hawthorn	*Crataegus* sp.	3	0.00
Mulberry cf.	*Morus* sp.	1	0.00
Persimmon	*Diospyros virginiana*	26	0.45
Persimmon fruit	*Diospyros virginiana*	9	0.72
Plum	*Prunus* sp.	1	0.19
Plum/cherry	*Prunus* sp.	4	0.00
SEEDS			

Amaranth	*Amaranthus* sp.	3	--
Bearsfoot	*Polymnia uvedalia*	7	--
Bedstraw	*Galium* sp.	2	--
Bulrush	*Scirpus* sp.	4	--
Carpetweed	*Mollugo* sp.	23	--
Checkermallow	*Sidalcea* sp.	3	--
Chenopod	*Chenopodium* sp.	10	--
Copperleaf	*Acalypha virginica*	4	--
Dock	*Rumex* sp.	1	--
Grass family	Poaceae	4	--
Knotgrass cf.	*Paspalum* sp. cf.	1	--
Knotweed	*Polygonum* sp.	4	--
Knotweed family	Polygonaceae	1	--
Knotweed/Smartweed	*Polygonum* sp.	3	--
Morninglory	*Ipomoea*/*Convolvulus*	1	--
Nightshade family	Solanaceae	1	--
Purslane	*Portulaca* sp.	5	--
Sedge	*Carex* sp.	1	--
Smartweed	*Polygonum* sp.	3	--
Spurge family	Euphorbiaceae	3	--
Tick Clover	*Desmodium* sp.	21	--
Wax myrtle cf.	*Myrica* sp. cf.	1	--
Wild bean cf.	*Strophostyles* sp. cf.	1	--
Unidentified		527	1.94
Unidentified seed		32	--

An assessment of seasonality for these plants indicates the harvesting and collection of resources from May through December (Table 2). Most fruits are available from mid to late summer. Corn and beans begin to ripen in the mid-summer and continue to be harvested throughout the early fall. The ripening of the fall nut mast begins in September with acorns; hickories and walnuts begin to ripen in October. Collectively, the seasonality information gleaned from the plant remains points to a year-round occupation at the site. Nuts and corn could have been dried and stored for consumption during the lean winter months.

Table 2. Seasonality of Plants at 44RN219 in order of bloom.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Blackberry/Raspberry					X	X						
Bedstraw					X	X	X	X				
Blueberry					X	X	X	X				
Purslane					X	X	X	X	X			
Plum						X	X	X				
Carpetweed						X	X	X				
Copperleaf						X	X	X	X	X		
Plum/Cherry						X	X	X	X			
Checkermallow							X	X				
Dock							X	X	X			
Hazelnut							X	X	X			
Maize							X	X	X			
Amaranth							X	X	X			
Bearsfoot							X	X	X			
Bulrush							X	X	X			
Bean							X	X	X	X		
Chenopod							X	X	X	X	X	
Knotweed							X	X	X	X	X	
Morninglory							X	X	X	X	X	
Smartweed							X	X	X	X	X	
Grape								X	X	X		
Tick clover								X	X	X		
Hawthorn									X	X		
Persimmon									X	X		
Acorn									X	X	X	
Sumpweed									X	X	X	
Hickory										X		
Walnut										X		
Sedge										X	X	X

Data Analysis

To assess the importance of different plants in the site assemblage, I use ubiquity analysis. Table 3 presents ubiquity values calculated by feature (not by sample) for all identified plant taxa in descending order. The results are not surprising, and are comparable to other sites in the surrounding region (e.g., Buzzard Rock, 44RN348, Graham-White). After wood, hickory and corn are the most ubiquitous plants at the site, with ubiquity values of 97% and 94%, respectively, followed closely by walnut. After a considerable drop in representation, acorn and bean are the 4th and 5th ranked taxa, both with ubiquity values of 27%. In terms of presence and frequency of occurrence, it appears that the most important plant food resources at the site are cultigens and nuts. A variety of fruits and weedy seed plants are less ubiquitous, ranging between 3-21% in terms of ubiquity values. While grape is the most ubiquitous fruit seed, it is interesting persimmon is actually more abundant in the assemblage. Both fruits are common in southeastern assemblages, however, and tend to be the most well represented fruits.

Table 3. Ubiquity Values calculated by features in descending order.

	Features Present	Total Features	Ubiquity Value
Wood	33	33	100.0%
Hickory shell	32	33	97.0%
Corn (all parts)	31	33	93.9%
Corn kernel	31	33	93.9%
Corn cupule	27	33	81.8%
Walnut	22	33	66.7%
Acorn shell	9	33	27.3%
Bean	9	33	27.3%
Bean cf.	9	33	27.3%
Carpetweed	7	33	21.2%
Chenopod	7	33	21.2%
Grape	7	33	21.2%
Persimmon	5	33	15.2%
Tick Clover	5	33	15.2%
Copperleaf	4	33	12.1%
Hazelnut	4	33	12.1%
Amaranth	3	33	9.1%
Bearsfoot	3	33	9.1%
Blackberry/raspberry	3	33	9.1%
Checkermallow	3	33	9.1%
Grass family	3	33	9.1%
Knotweed	3	33	9.1%
Spurge family	3	33	9.1%
Sumpweed cf.	3	33	9.1%
Acorn cf.	2	33	6.1%
bean family	2	33	6.1%
Bulrush	2	33	6.1%
Hawthorn	2	33	6.1%
Hickory cf.	2	33	6.1%
Knotweed/Smartweed	2	33	6.1%
Purslane	2	33	6.1%
Smartweed	2	33	6.1%
Sumpweed	2	33	6.1%
Acorn meat	1	33	3.0%
Acorn meat cf.	1	33	3.0%

Bedstraw	1	33	3.0%
Blueberry	1	33	3.0%
Corn cob cf.	1	33	3.0%
Corn cob fragment	1	33	3.0%
Dock	1	33	3.0%
Grape cf.	1	33	3.0%
Hickory meat	1	33	3.0%
Knotgrass cf.	1	33	3.0%
Knotweed family	1	33	3.0%
Morninglory	1	33	3.0%
Mulberry cf.	1	33	3.0%
Nightshade family	1	33	3.0%
Persimmon fruit	1	33	3.0%
Plum	1	33	3.0%
Plum/cherry	1	33	3.0%
Sedge	1	33	3.0%
Sumpweed/sunflower	1	33	3.0%
Wax myrtle cf.	1	33	3.0%
Wild bean cf.	1	33	3.0%

In addition to ubiquity, relative percentages were also calculated according to broad classifications of cultigens, nuts, fruits, and seeds. Collectively, nuts were the single most abundant category at the site, representing a full 66% of carbonized plants in the assemblage, followed by cultigens at 33%. Fruits and seeds, however, only represent about 1%. There is no doubt that the site represents a permanent, year-round occupation in which residents farmed cultigens and gathered nuts, supplementing their stores with fruits and greens when available.

Table 4. Relative Percentages of Major Plant Groups

	Count	Percent
NUTS	9217	65.9%
CULTIGENS	4599	32.9%
FRUITS	61	0.4%
SEEDS	107	0.8%
Total	13984	

Because nuts and cultigens represent the bulk of the assemblage, this analysis considers them more closely. To do so I use box plots (see also Cleveland 1994; McGill et al. 1978; Scarry and Steponaitis 1997; Wilkinson et al. 1992). Box plots summarize distributions of data using several key features. The median value of the distribution is marked by the line at the center of the box. The edges of the box, or hinges, represent the 25th and 75th percentiles of the distribution—the approximate middle 50% of the data fall between the hinges (Cleveland 1994:139). Vertical lines, or whiskers, extend outward from the box and represent the tails of the distribution. Box plots also designate outliers—these are unusually large or small data values that "portray behavior in the extreme tails of the distribution" (Cleveland 1994:140). Outliers are depicted as asterisks and far outliers as open circles. The outliers on the box plots are of particular interest because they represent those features that do not conform to the central tendency of features in terms of some variable, for example features that have significantly more or less of a certain taxon.

Figure 1 presents a comparison of the distribution of different nut species: acorn, hickory, and walnut. Counts of nutshell by sample were standardized to plant weight. This measure differs from ubiquity in that it considers abundance instead of frequency of occurrence. Further, standardizing by plant weight allows us to consider the importance of these taxa relative to the *other plants* in the assemblage. As the box plot reveals, there are significant differences between the three different nut types in terms of their abundance in the assemblage. Hickory is significantly more abundant than both walnut and acorn (at the 0.05 level). Walnut, while significantly less abundant than hickory, is nevertheless significantly more abundant than acorn. While walnut is common at southeastern sites, and especially at comparable sites in North Carolina and Virginia, its sheer abundance at 44RN219 is notable.

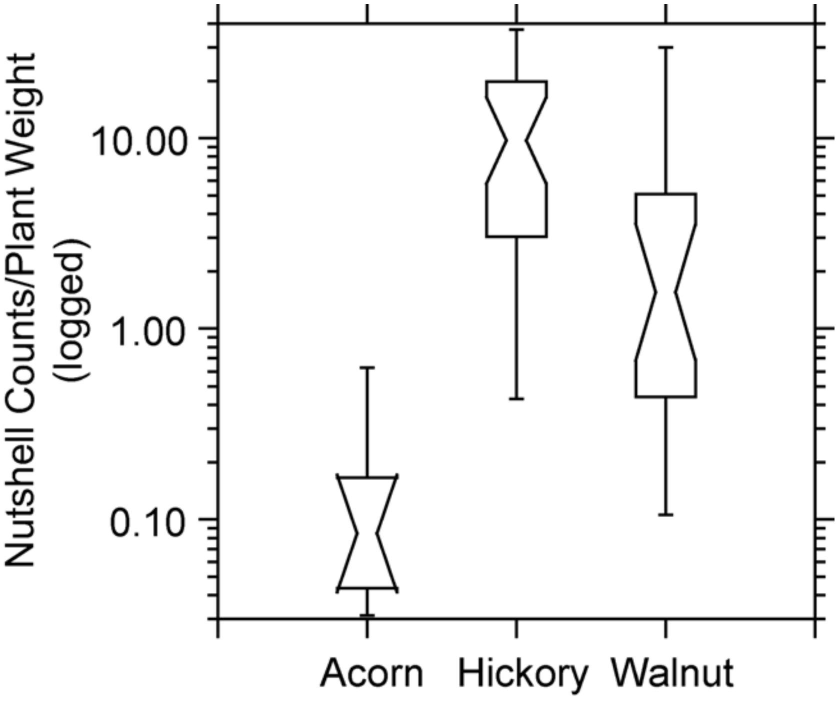

Figure 1. Box plot of nut distributions at 44RN219 (values are log-transformed).

Figure 2 considers the distribution of different parts of the maize plant by feature, calculated as a maize kernel/cupule ratio. Before maize can be ground into flour, the kernels must first be removed from the cob, leaving the cobs and cupules as byproducts of the removal process. Thus, kernels represent the part of the maize plant meant for consumption and cupules represent processing discard. Therefore, features that have significantly higher ratios of maize kernels-to-cupules (represented in Figure 2 as outliers and far outliers) are features characterized by maize originally intended for consumption; this may represent leftovers from a meal(s) or the intentional burning of spoiled stores. In ascending order of significance, the outlying features are features 69, 26, 82, and 27. Calling attention to these features can help to understand their function in coordination with other sets of artifactual data.

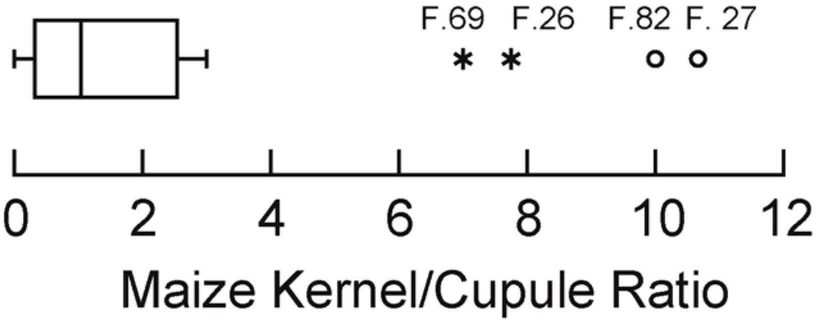

Figure 2. Maize kernel/cupule ratios calculated by feature.

Whereas Figure 2 considers the distribution of elevated levels of maize meant for consumption, the box plot in Figure 3 considers elevated levels of maize processing debris through a consideration of the density of maize cupules per liter of soil. Since maize cupules represents the part of the plant left behind when shelling corn, especially high densities of cupules can direct us to loci which represent the remains of processing/preparation activities. Significant outliers in ascending order are features 52, 86, 51, and 47. While it is difficult to understand their importance in the context of this report on a single dataset, archaeologists analyzing other sets of data from these features should consider this pattern when making broader, synthetic interpretations of feature function at the site.

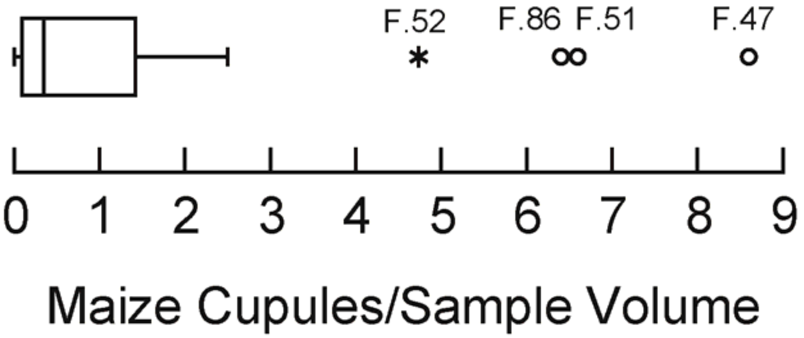

Figure 3. Density of maize cupules per liter of soil floated, aggregated by feature.

Summary of Plant Data at 44RN219

In sum, the analysis of plant remains from flotation samples points to a year-round site occupation by people committing to farming, supplemented heavily by nut collection, and the gathering of greens, herbs, and wild fruits. Hickory and walnut represent the key nut resources, and maize and beans the primary cultigens. The amount of grape and persimmon seeds are also notable; since seeds of fruits are not often recovered in great quantities as they are eaten ripe and uncooked, their presence and abundance in the samples speak to their significance in the diet of the site. In addition, analyses of maize point to several features that represent areas of consumption and processing discard, respectively. These features should be considered more closely by analysts addressing other datasets from the site.

References cited

Bodwell, C. E.
1987 Nutritional Implications of Cereals, Legumes, and Their Products. In *Cereals and Legumes in the Food Supply*, ed. by J. Dupont and E. M. Osman, pp. 259–276. Iowa State University Press, Ames.

Chevallier, A.
1970 *The Encyclopedia of Medicinal Plants*. Dorling Kinderlsey Press, London.

Cleveland, William S.
1994 *The Elements of Graphing Data*. AT&T Bell Laboratories, Murray Hill, New Jersey.

Coffey, Timothy
1993 *The History and Folklore of North American Wildflowers*. Self-published, New York.

Coon, Nelson
1979 *An American Herbal: Using Plants for Healing*. Rodale Press, Emmaus, PA.

Giller, Ken E.
2001 *Nitrogen Fixation in Tropical Cropping Systems*. CABI Publishing, New York.

Godwin, H.
1956 *The History of British Flora*. Cambridge University Press, Cambridge.

Grieve
1984 *A Modern Herbal*. Penguin Press, New York.

Hastorf, Christine A., and Virginia S. Popper (editors)
1988 *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*. The University of Chicago Press, Chicago and London.

Hedrick, U.P.
1972 *Sturtevant's Edible Plants of the World.* Dover Publications, New York.

Hubbard, R.N.L.B
1975 Assessing the botanical component of human paleoeconomies. Bulletin of the Institute of Archaeology 12:197–205.

1976 On the strength of the evidence for prehistoric crop processing activities. *Journal of Archaeological Science* 3:257–265.

1980 Development of Agriculture in Europe and the Near East: Evidence from Quantitative Studies. *Economic Botany* 34:51–67.

Kandane, Joseph B.
1988 Possible Statistical Contributions to Paleoethnobotany. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, ed. by C. H. Hastorf and V. S. Popper, pp. 206–214. The University of Chicago Press, Chicago and London.

Lentz, David L.
2000 Anthropocentric Food Webs in the Precolumbian Americas. In *Imperfect Balance: Landscape Transformations in the Precolumbian Americas*, ed. by D. L. Lentz, pp. 89–120. Columbia University Press, New York.

Martin, A. C., and W. D. Barkley
1961 *Seed Identification Manual*. University of California Press, Berkeley.

McGill, Robert, John W. Tukey, and Wayne A. Larsen
1978 Variations of box plots. *The American Statistician* 32:12–16.

Medsger, Oliver Perry
1966 *Edible Wild Plants*. Collier Books, New York.

Miksicek, Charles H.
1987 Formation Processes of the Archaeobotanical Record. In *Advances in Archaeological Method and Theory*, Vol. 10, ed. by M. Schiffer, pp. 211–247. Academic Press, New York.

Miller, Naomi F.
1988 Ratios in Paleoethnobotanical Analysis. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, ed. by C. H. Hastorf and V. S. Popper, pp. 72–85. The University of Chicago Press, Chicago and London.

Minnis, Paul E.

1981 Seeds in Archaeological Sites: Sources and Some Interpretive Problems. *American Antiquity* 46(1):143–152.

Moerman, D.
1998 *Native American Ethnobotany*. Timber Press, Oregon.

Peterson, Lee Allen
1977 *A Field Guide to edible wild plants of Eastern and Central North America*. Houghton Mifflin Company, Boston.

Petruso, Karl M., and Jere M. Wickens
1984 The Acorn in Aboriginal Subsistence in eastern North America: A Report on Miscellaneous Experiments. In *Experiments and Observations on Aboriginal Wild Plant Food Utilization in Eastern North America*, edited by P. Munson, 360-378. Indiana Historical Society, Indiana.

Popper, Virginia S.
1988 Selecting Quantitative Measures in Paleoethnobotany. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, ed. by C. H. Hastorf and V. S. Popper, pp. 53–71. The University of Chicago Press, Chicago and London.

Porcher, Francis P.
1970 *Resources of the southern field and forests*. Arno Press Inc., New York.

Scarry, C. Margaret
2003 Patterns of wild plant utilization in the prehistoric Eastern Woodlands. In *People and Plants in the ancient eastern North America*, ed. by P. J. Minnis, pp. 50-104. Smithsonian Institution Press, Washington D.C.

1986 Change in Plant Procurement and Production during the Emergence of the Moundville Chiefdom. Unpublished Ph.D. dissertation, Department of Anthropology, University of Michigan, Ann Arbor.

Scarry, C. Margaret, and Vincas P. Steponaitis
1997 Between Farmstead and Center: The Natural and Social Landscape of Moundville. In *People, Plants, and Landscapes: Studies in Paleoethnobotany*, ed. by K. J. Gremillion, pp. 107–122. The University of Alabama Press, Tuscaloosa.

Smartt, J.
1988 Morphological, Physiological, and Biochemical Changes in *Phaseolus* Beans under Domestication. In *Genetic Resources of Phaseolus Beans*, ed. by P. Gepts, pp. 143–162. Kluwer Academic Publishers, Boston.

Swanton, John R.

1944 The Indians of the Southeastern United States. Bureau of American Ethnology Bulletin 137. Government Printing Office, Washington.

Talalay, Laurie, Donald R. Keller, and Patrick J. Munson
1984 Hickory Nuts, Walnuts, Butternuts, and Hazelnuts: Observations and Experiments Relevant to Their Aboriginal Exploitation in Eastern North America. In *Experiments and Observations on Aboriginal Wild Plant Utilization in Eastern North America*, edited by P. J. Munson, pp. 338-359. Indiana Historical Society, Indianapolis.

Ulmer, Mary and Samuel E. Beck
1951 *Cherokee Cooklore*: *Preparing Cherokee Foods*. Museum of the Cherokee Indian, Cherokee.

Usher, G.
1974 *A Dictionary of Plants Used by Man*. Constable Press, New York.

Wilkinson, Leland, MaryAnn Jill, Stacey Miceli, Gregory Birkenbeuel, and Erin Vang
1992 *Systat Graphics*. SYSTAT, Inc., Evanston, Illinois.

Willcox, G. H.
1974 A history of deforestation as indicated by charcoal analysis of four sites in Eastern Anatolia. Anatolian Studies 24:117–133.

Yarnell, Richard A.
1982 Problems of interpretation of archaeological plant remains of the eastern woodlands. *Southeastern Archaeology* 1(1):1–7.