Archeobotanical Analysis of Feature Fill from Three James Fort Period Features. A Pilot Study.

Report Prepared for the Jamestown Rediscovery Project, Historic Jamestown

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INTRODUCTION

The Jamestown Rediscovery project curates extensive soil samples from within the James Fort site. The collections represent decades of cumulative sampling, and have the potential to significantly extend our understanding of plant utilization and the archaeological history of the fort and its inhabitants. This pilot study of nine flotation samples from three important features (see Table 01) attributed to the James Fort Period (1607-1624) allows for the assessment of plant macro-remains preserved within archived soils and will assist in planning for collections management, processing and analysis.

Table 01: Samples selected for pilot study.

Master Context	Context	Number of Samples	Soil Volume (liters)	Weight of Carbonized Plant Material Recovered (grams)
East Bulwark	JR105D	1	7.5	0.58
Pit 8	JR1795A-G	7	49.5	140.3
Structure 185	JR2718N	1	7.5	20.455
Total	8 contexts	9	64.5	161.34

Sample JR105D was secured from the Fort's East Bulwark. Excavation in 1996 revealed the Bulwark ditch or dry moat containing James Fort period artifacts.

Seven flotation samples were studied from Pit 8, a stratified, oval pit measuring 8'x5' and located along the interior of the west palisade wall of the Fort. Pit 8 produced a rich concentration of artifacts, including military items, trade goods, high-status household items and objects of personal adornment. This feature may have functioned as a storage pit below an impermanent structure (tent) that served as a dwelling for the Fort's first colonists. Development of Layers B-G of Pit 8 is estimated during the period 1607-1610.

Sample JR2718N hails from James Fort's first well which was dug late in 1608 or early in 1609. Located near the center of the fort, this well was dug beneath the cellar of Structure 185, an extension of the storehouse. The well was lined with a wooden barrel, and extended to a total depth of 14 feet below ground surface. Based on recovered animal remains, the Well fill probably dates to the "starving time" winter of 1609-1610. Documentary evidence strongly suggests that the well was abandoned and filled-in during June of 1610.

METHODS

Soil samples were air-dried and the dry soil volume of each was recorded. Samples were

individually processed using a Flote-Tech flotation system equipped with 0.325 mm fine fraction and 1.0 mm coarse fraction screens. The Flote-Tech system is a multi-modal flotation system which facilitates the separation and recovery of plant macro-remains from the soil matrix using water agitation and forced air delivery. Processing resulted in two (light and heavy) fractions of material. Floted portions were air dried. See Figures 01-06.

Each flotation fraction was passed through graduated geological sieves to provide divisions for analysis. Sample descriptions of the resulting fractions were recorded. The greater-than or equal-to 2mm botanical specimens were examined under low magnification (10X to 40X) and carbonized plant remains were removed and sorted into general categories of material (i.e. wood, nutshell, cultigen, seeds, etc.). The less-than 2mm size fractions were also examined under low magnification. The carbonized remains of seeds and cultivated plants were isolated for further study. Uncarbonized seeds were considered to be modern constituents and were generally described but were not removed from sample matrices or quantified.

In addition to carbonized plant macro-remains, the flotation samples also contained a great quantity and variety of other cultural artifacts and natural ecofacts (see Table 02).

Table 02: Sample descriptions.

master context	n of samples	sample numbers	sample descriptions
East Bulwark	1	105D	brick, glass, rock, quartz debitage, insect eggs (abundant)
Pit 8	7	1795A-G	insect eggs, insect bodies, beads (blue glass, white glass, shell, copper disk, large bone), Anglo and Native ceramics, brass pin, fishscale, glass, pipe (stem, bowl), bone, coal/clinker, lead (?) ball, oystershell, brick matrix, uncarbonized roots, iron hardware, lithics, eggshells, deciduous leaf fragments, cobbles, rodent teeth, tacks, coarse sand, daub/chinking, lead (scrap ?), marble?, copper/brass, crab claw, nail, turtle shell, snails
Structure 185	1	2718N	snails, eggshells, fishscale, brass pins, lead balls, coal fragments, iron, brick, glass, lithic debitage, bone, oystershell, copper, Native ceramics, insect bodies

Identifications were routinely attempted on all seed, nut, cultigen and miscellaneous plant remains, and on a sub-sample of 20 randomly selected wood fragments from each sample containing *more* than 20 specimens, in accordance with standard practice (Pearsall 2000). Identifications of all classes of botanical remains were made to the genus level when possible, to the family level when limited diagnostic information was available, and to the species level only when the assignment could be made with absolute certainty. When botanical specimens were

Figure 01: Measurement of dry soil samples a prior to flotation processing.

Figure 02: A soil sample is introduced into the flotation tank.

Figure 03: Capture of light fraction remains during flotation processing.

Figure 04: Light fraction recovery in 0.325 mm fine mesh.

Figure 05: In addition to archeobotanical remains, the heavy fractions contained concentrations of non-botanical cultural debris.

Figure 06: Heavy and light fractions ready for drying.

found to be in such eroded or fragmentary condition as to prevent their complete examination or recognition, a variety of general categories were used to reflect the degree of identification possible: General wood categories within the analyzed assemblage include *'ring porous', 'deciduous'* and *'unidentifiable'* where specimens were so fragmentary or minute that no clear section could be obtained upon which to base identification. The category *'amorphous carbon'* was used in this report to classify burned plant remains which lacked any identifiable characteristics whatsoever.

All identifications were made under low magnification (10X to 40X) with the aid of standard texts (Edlin 1969; Kozlowski 1972; Martin and Barkely 1961; Panshin and deZeeuw 1980; Schopmeyer 1974), and checked against plant specimens from a modern reference collection representative of the Chesapeake Coastal Plain.

The processed samples yielded both carbonized and uncarbonized plant remains. Uncarbonized plant remains observed in the flotation-derived botanical assemblage included root fibers, deciduous leaf fragments and an array of uncarbonized seeds. These seeds occurred in flotation samples processed from the East Bulwark and Pit 8. Uncarbonized seeds were identified, but were not picked from the sample matrices or quantified. Although the persistence of uncarbonized plant remains from rare contexts such as consistently xeric or water-saturated environments does occur (Hastorf and Popper 1988; Minnis 1981; Pearsall 2000), such soil conditions do not characterize *these* contexts sampled within the James Fort. Uncarbonized plant remains occurring within archaeological soil samples from similar open-site environments are usually considered to be intrusive modern specimens (Minnis 1981; Keepax 1977). The recovery of uncarbonized plant remains may reveal specific contamination episodes associated with animal (i.e. rodent, insect, gastropod) burrowing, the action of root growth and decay, aeolian processes, or by the combined effects of these factors. While delicate, uncarbonized plant materials have been recovered from water-saturated contexts within James Fort (ER 2158) (Archer 2006; McKnight 2011), it is highly probable that the uncarbonized plant material recovered from the East Bulwark, Pit 8, and the Structure 185 Well is modern in origin.

RESULTS OF ANALYSIS

Soil samples from nine discrete proveniences within three separate early seventeenth century features were analyzed. Flotation processing of 64.5 liters of Fort feature fill produced a total of 161.34 grams of carbonized plant macro-remains (an average of 2.5014 grams per liter). A variety of economically important wild and cultivated plants were represented in the analyzed assemblage: These include a predominance of wood (oak and hickory species were best represented); Nuts (hickory, black walnut and walnut family were identified); Maize, beans, wheat or oats; carbonized seeds (wild fleshy fruits are especially well-represented); And miscellaneous plant materials (including fungi and amorphous carbon). An inventory of archeobotanical remains from the floted soil samples is presented in Table 3. A discussion of each class of plant material encountered within the assemblage is provided below.

Wood Charcoal

Wood charcoal was present within 100 percent of the flotation-processed soil samples analyzed. A total of 6,522 fragments of carbonized wood (>2mm in diameter) weighing 157.52 grams was recovered (accounting for over 97 percent of the analyzed flotation-recovered plant carbon, by

Table 03: Inventory of flotation-recovered plant macro-remains.

master context		East Bulwark	Pit 8	Pit 8	Pit 8	Pit 8	Pit 8	Pit 8	Pit 8	Structure 185	total
sample number		105D	1795A	1795B	1795C	1795D	1795E	1795F	1795G	2718N	9 samples
soil volume (liters)		7.5	10	9.5	6	10.5	4	5.5	4	7.5	64.5
weight analyzed carbonized plant remains (grams)		0.58	3.725	5.105	3.575	5.245	1.275	110.75	10.63	20.455	161.34
WOOD CHARCOAL (carbonized) (no of fragments)		93	422	688	410	542	142	949	1086	2190	6522
	total weight (grams)	0.53	3.67	4.85	3.06	4.1	1.11	109.3	10.55	20.35	157.52
Acer spp. (maple)		3	4								7
Carya spp. (hickory)		4		2	1	6	1	5	3	4	26
Juglans nigra (black walnut)					3						3
Pinus sp. (pine)								6		3	9
Quercus spp. (white oak)		8	12	16		10	3	9	4	8	70
Quercus spp. (red oak)				2	15		9		12	5	43
Robinia pseudoacacia (black locust)									1		1
ring porous					1						1
deciduous		5	1			4	6				16
unidentifiable			3				1				4
total identified fragments		20	20	20	20	20	20	20	20	20	180
NUTS (carbonized) (n of fragments)		6	3	6	17	43	7	11	6	1	100
	weight (grams)	0.04	0.02	0.24	0.5	1.12	0.15	0.86	0.07	0.01	3.01
Carya spp. (hickory) shell		6	3	6	17	43	7		2		84
Juglans nigra (black walnut) shell								11	4		15
JUGLANDACEAE (walnut family) shell										1	1
SEEDS (carbonized) (n of specimens)		0	1	2	0	1	1	2	0	0	7
	total weight (grams)	0	0.005	0.005	0	0.005	0.005	0.01	0	0	0.03
cf. Ilex opaca (holly) seed fragment							1				1
Prunus sp. (cherry) pit fragment (tentative id)			1								1
Rhus sp. (sumac) seed				1							1
Vitis sp. (grape) seed								2			2
striated seed coat fragment						1					1
unidentifiable seed coat fragment				1							1
CULTIGENS (carbonized) (n of specimens)		0	1	1	1	0	2	0	0	22	27
	total weight (grams)	0	0.01	0.01	0.005	0	0.01	0	0	0.09	0.125
Triticum/Avena (wheat or oats)	kernel			1						13	14
	kernel fragment									5	5
Phaseolus vulgaris (common bean)	cotyledon									2	2
	cotyledon fragment (tentative id)				1						1
Zea mays (maize) total specimens			1				2			2	5
	kernel fragment									1	1
	kernel fragment (tentative id)						2				2
	cupule fragment		1							1	2
MISC PLANT REMAINS (carbonized) (n of fragments)		6	3	0	2	2	0	21	2	2	38
	total weight (grams)	0.01	0.02	0	0.01	0.02	0	0.58	0.01	0.005	0.655
fungal fructification								1	2	2	5
amorphous carbon		6	3		2	2		20			33
UNCARBONIZED SEEDS (presence)		x		x	x	x	x	x			67%
Eleusine indica (goose grass)					x	x	x				33%
Fragaria/Potentilla (strawberry/cinquefoil)					x						11%
Mollugo verticillata (carpetweed)		x						x			22%
Phytolacca americana (poke)					x	x	x				33%
Viola sp. (violet)				x		x					22%
Vitis sp. (grape)						x					11%

weight). Of the total wood charcoal, a sub-sample of 180 fragments (a maximum of 20 fragments per sample) was randomly selected for identification. This sub-sample revealed a predominance of white oak species (*Quercus spp. LEUCOBALANUS group)* (70 fragments or 39 percent of the selected sub-sample, by fragment count), red oak (*Quercus spp. ERYTHROBALANUS group)* (43 fragments or 24 percent), hickory *(Carya spp.)* (26 fragments or 14 percent), pine *(Pinus sp.)* (nine fragments or five percent), maple *(Acer spp.)* (seven fragments or four percent), black walnut *(Juglans nigra)* (three fragments or two percent) and black locust *(Robinia pseudoacacia)* (one fragment or one percent). Wood specimens which were too minute or which exhibited incomplete morphology were assigned to the categories *'ring porous'* (less than one percent), *'deciduous'* (ten percent), and *'unidentifiable'* (three percent). The percent composition of wood types is illustrated in Figure 07.

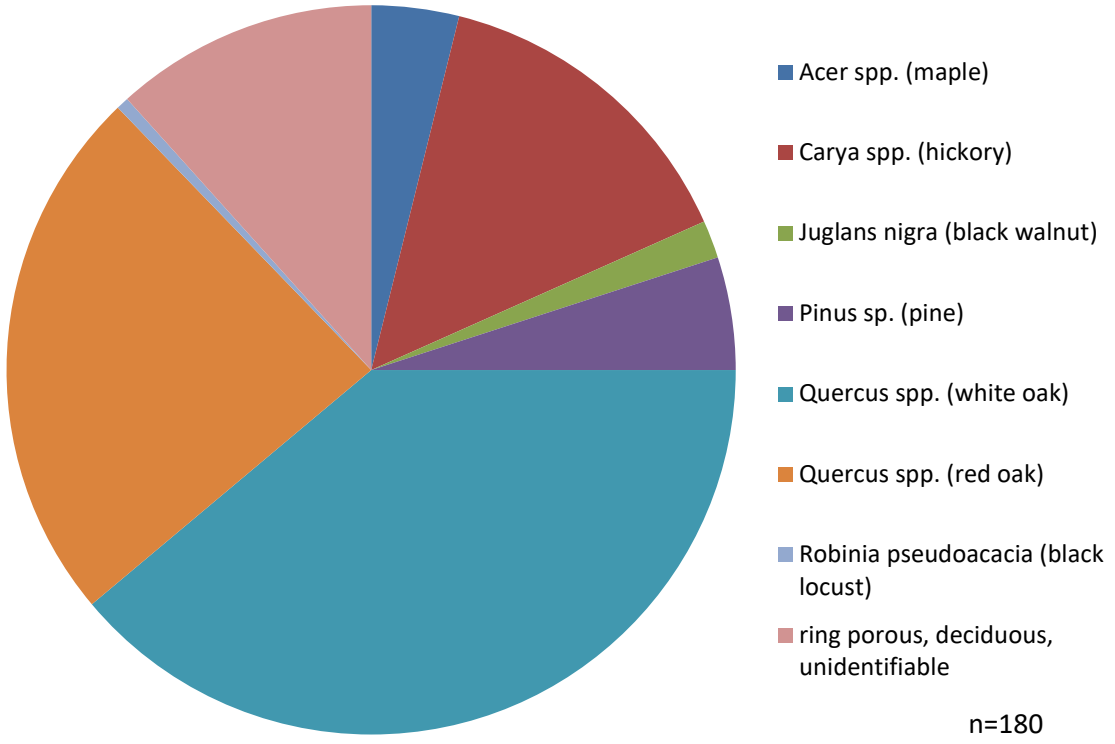

Figure 07: Percent composition of identified wood taxa.

Nuts

Native tree nuts, or mast, were represented in each of the nine flotation samples analyzed. One hundred specimens of carbonized nutshells weighing 3.01 grams were recovered. Taxa identified include thick-walled hickory nutshell *(Carya spp.)* (84 fragments or 84 percent of the recovered nutshell, based on fragment count), black walnut shell *(Juglans nigra)* (15 fragments) and walnut *(JUGLANDACEAE)* (one fragment).

Cultivated Plant Remains

The remains of cultivated plants are well-represented, occurring in flotation samples from Structure 185 (the well) and from Pit 8. Cultivated plant remains total 27 specimens weighing

0.125 grams. Both Native crops and grain introduced from England were represented within the assemblage. Maize *(Zea mays)* (five specimens) (Figure 08), beans *(Phaseolus vulgaris)* (three specimens) (Figure 09) and wheat or oats *(Triticum/Avena)* (19 specimens) (Figures 10, 11) were identified.

Figure 08: Maize *(Zea mays)* cupule (approximately 75 % complete) recovered from JR 2718N (the Well beneath Structure 185). Scale = 1mm grid

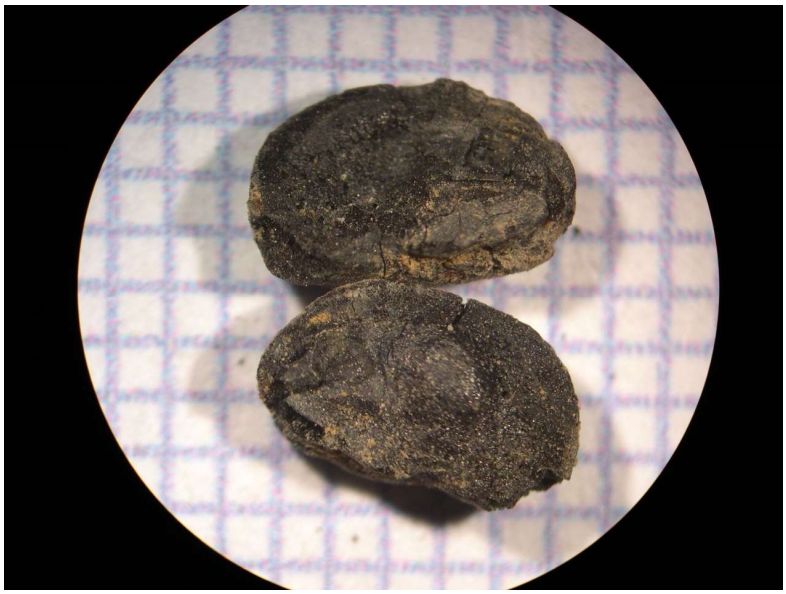

Figure 09: Common bean *(Phaseolus vulgaris)* cotyledons recovered from JR 2718N (Structure 185). Scale = 1mm grid

Figure 10: Oats or wheat *(Avena/Triticum)* kernels were recovered in concentration within sample JR 2718N (Structure 185). Scale = 1mm grid

Figure 11: Oats or wheat *(Avena/Triticum)* kernel recovered from Pit 8 (Sample JR1795B). Scale = 1mm grid

Carbonized Seeds
Carbonized seed remains were confined to samples secured from Pit 8, with a total of seven specimens (0.03 grams) recovered. A minimum of five taxa are represented, and the seed assemblage reveals a predominance of fleshy fruits. Identified taxa include (in order of abundance): grape (*Vitis sp.*) (two seeds) (Figure 12), sumac *(Rhus sp.)* (one seed), cherry *(Prunus sp.)* (one seed fragment was tentatively identified) , possible holly (cf. *Ilex opaca*) (one seed fragment), a striated seed coat fragment, and an unidentifiable seed coat fragment.

Miscellaneous
Miscellaneous archeobotanical materials recovered through soil flotation total 38 specimens weighing 0.655 grams. Five fragments of fungal fruiting bodies and 33 pieces of amorphous carbon were documented.

Uncarbonized Seeds
Unburned seeds were present within 67 percent of the flotation samples analyzed. These specimens occurred within samples from the East Bulwark and from Pit 8 (from all but the deepest level sampled). Taxa observed include goosegrass *(Eleusine indica)*, strawberry/cinquefoil *(Fragaria/Potentilla),* carpetweed *(Mollugo verticillata),* poke *(Phytolacca americana)*, violet *(Viola sp.)* and grape (*Vitis sp.).* It is the opinion of the analyst that these seeds are modern in origin, and are unrelated to historic activities at the Fort during the James Fort Period.

Figure 12: Grape *(Vitis sp.)* seeds were identified from deep contexts (JR1795F) within Pit 8. Scale = 1mm grid

DISCUSSION

Feature Comparison

Examination of the archeobotanical assemblage by individual feature reveals some interesting patterns. While all of the Features produced carbonized plant macro-remains, a limited quantity and diversity were present within the East Bulwark sample. Samples analyzed from Pit 8 and the

Well beneath Structure 185 contained richer concentrations of carbonized plant materials (2.83 and 2.73 grams of carbonized material per liter of feature fill, respectively). See Figure 13. Differences in the kinds of plant products preserved within sampled features are also apparent, and provide important information about history of these contexts. A summary of recovered remains by Feature is presented in Table 04.

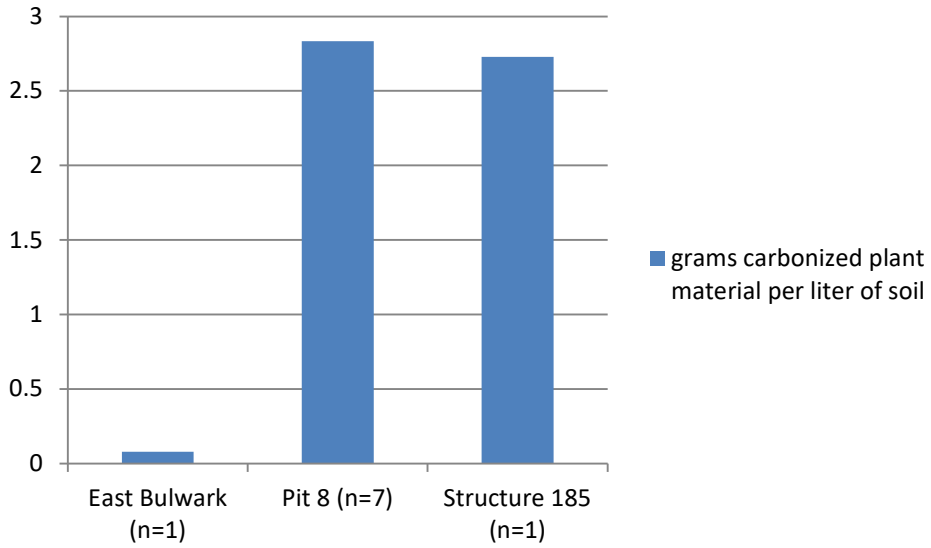

Figure 13: Comparison of the density of carbonized remains from the three features studied.

The single sample analyzed from the Fort's East Bulwark contained predominantly wood charcoal (white oak, hickory, maple and deciduous). Food remains within were limited to six hickory nutshells, and six fragments of amorphous carbon were recovered. Archaeology of the East Bulwark suggests that the feature was an architectural fortification, and was not primarily associated with domestic activities such as food preparation. Recovered plant remains from the East Bulwark were scant in comparison to other feature contexts within the Fort (see Figure 13).

Seven flotation samples were studied from Pit 8, which is interpreted as a storage pit beneath a tent-like dwelling. Recovered artifacts suggest that the structure functioned as the living quarters of an affluent resident. The archeobotanical assemblage from Pit 8 reveals a high diversity of plant food types, including hickory nuts and black walnuts, the seeds of fleshy fruits, and wheat, maize and beans. A diverse array of wood types was documented from the Pit 8 samples, suggesting the remains of local woods used as fuel.

One flotation sample was analyzed from the Fort's first Well, located beneath Structure 185 and associated with the storehouse. Recovered plant remains include oak, hickory and pine wood charcoal, a single walnut shell fragment, and a concentration of cultivated plant remains (22 specimens). Wheat or oats were best represented (18 kernels or kernel fragments), beans (two cotyledons), and maize cupule and kernel fragments (two). Historical records suggest that the well was abandoned and filled during June 1610, as part of a concerted clean-up effort within the Fort. The material filling the Well may represent debris collected from the storehouse and its dependencies.

Examining the wood charcoal types identified from each of the three sampled features, some interesting patterns emerge (Figure 14). White oak species dominate the identified wood sample from each of the features, accounting for around 40 percent of the total identified wood. The greatest diversity in wood types is evident within Pit 8, where a minimum of seven species are represented. The East Bulwark features exhibits the least diversity in wood types, which is perhaps a product of the architectural nature of this context. The Well feature produced the most identifiable wood charcoal – with red oaks, hickory and pine identified in addition to the white oak species.

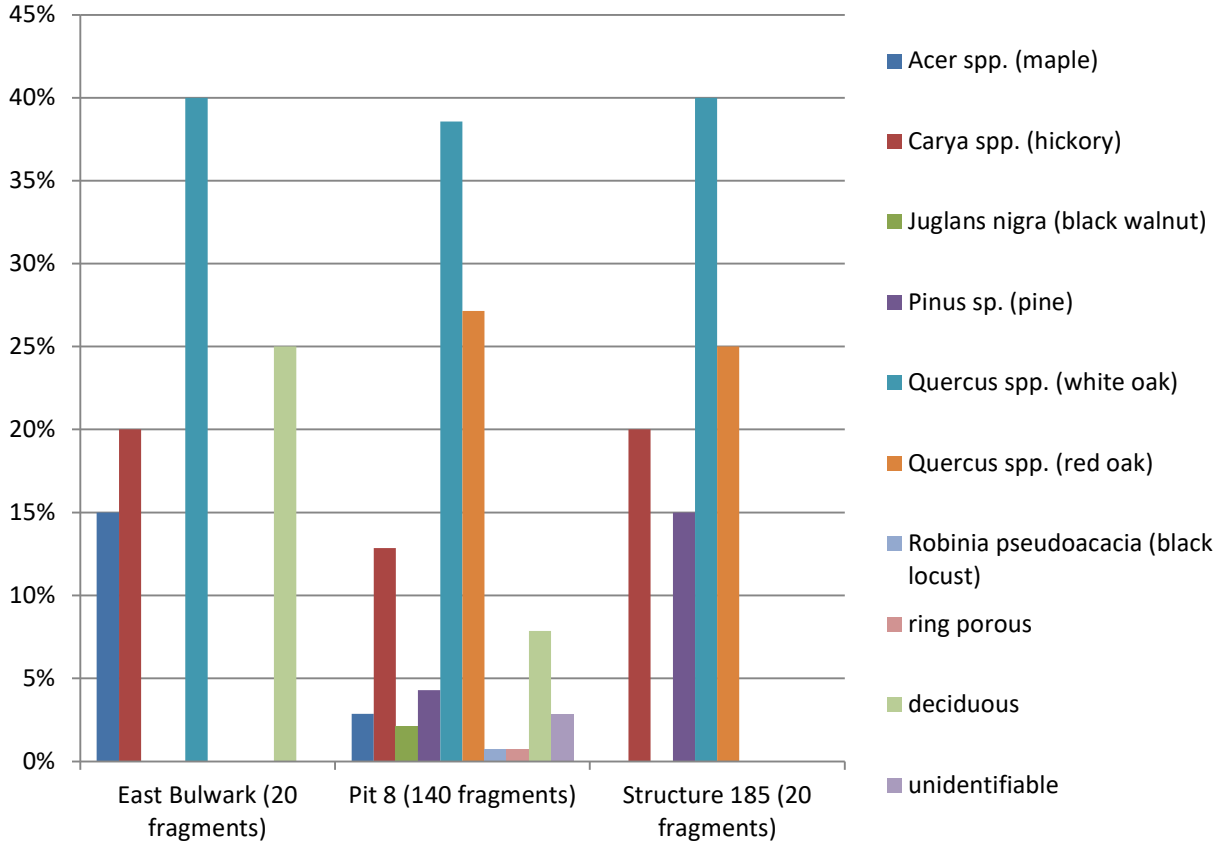

Figure 14: Comparison of identified wood types by cultural feature.

Site Environment

These archeobotanical data contribute to a better understanding of landscape conditions during the early years of the James Fort occupation. The fort is located on the north bank of the James River approximately 60 miles from its confluence with the Chesapeake Bay. The site lies within the Atlantic Slope Section of the Oak-Pine Forest Region as defined by Braun (1950:268-269). Native forest development within the Coastal Plain or Embayed district of this region has been largely influenced by topography and permanence of abundant water. Native forest cover over the project area was probably characterized by a medium tall to tall forest of broadleaf deciduous and needleleaf evergreen trees. The forest overstory would have been dominated by loblolly and Virginia pines and a variety of hickory and oak species. The wood assemblage from sampled contexts within James Fort is composed of taxa characteristic of this native forest association.

Table 04: Summary of recovered archeobotanical remains by feature.

master context	East Bulwark	Pit 8	Str 185
number of samples	1	6	1
sample number	105D	1795 A-F	27188N
soil volume (liters)	7.5	49.5	7.5
weight analyzed carbonized plant remains (grams)	0.58	140.305	20.455
WOOD CHARCOAL (carbonized) (no of fragments)	93	4239	2190
total weight (grams)	0.53	136.64	20.35
Acer spp. (maple)	3	4	
Carya spp. (hickory)	4	18	4
Juglans nigra (black walnut)		3	
Pinus sp. (pine)		6	3
Quercus spp. (white oak)	8	54	8
Quercus spp. (red oak)		38	5
Robinia pseudoacacia (black locust)		1	
ring porous		1	
deciduous	5	11	
unidentifiable		4	
total identified fragments	20	140	20
NUTS (carbonized) (n of fragments)	6	93	1
weight (grams)	0.04	2.96	0.01
Carya spp. (hickory) shell	6	78	
Juglans nigra (black walnut) shell		15	
JUGLANDACEAE (walnut family) shell			1
SEEDS (carbonized) (n of specimens)	0	7	0
total weight (grams)	0	0.03	0
cf. Ilex opaca (holly) seed fragment		1	
Prunus sp. (cherry) pit fragment (tentative id)		1	
Rhus sp. (sumac) seed		1	
Vitis sp. (grape) seed		2	
striated seed coat fragment		1	
unidentifiable seed coat fragment		1	
CULTIGENS (carbonized) (n of specimens)	0	5	22
total weight (grams)	0	0.035	0.09
Triticum/Avena (wheat or oats) kernel		1	18
Phaseolus vulgaris (common bean)		1	2
Zea mays (maize) total specimens		3	2
MISC PLANT REMAINS (carbonized) (n of fragments)	6	30	2
total weight (grams)	0.01	0.64	0.005
fungal fructification		3	2
amorphous carbon	6	27	
UNCARBONIZED SEEDS (presence)	100%	71%	0

(Kartesz 1999; Little 1971; Harvill et al. 1992).

James Fort is located in close proximity to a variety of micro-environmental zones which could have provided wild foods throughout much of the seasonal cycle. The archeobotanical data, narrative descriptions and the site setting suggest that the floodplain areas were likely characterized by cleared land surrounded by weedy growth and young successional forest. Margins of these areas would have given way to more stable bottomland hardwood and pine forests, and local uplands would have been characterized by the forest association described above.

Subsistence

The association of comestible plants recovered from three James Fort Period features document a reliance on cultivated plants, including the Native crops maize and beans, as well as wheat or oats imported or introduced from England. In addition, the assemblage evidences the consumption of wild-gathered nuts (hickory and walnut), and fleshy fruits (grape, cherry, sumac and holly).

The presence of both New World and Old World comestibles within this new data set provide documentation of the use and probable cultivation of European grains in addition to indigenous domesticates. Previous archeobotanical studies within James Fort include analysis of waterlogged contexts within JR2158Z, a James Fort Period well which offered superb organic preservation and intact uncarbonized plant remains from the period 1611-1617 (Archer 2006; McKnight 2011). Interestingly, the assemblage of plant macro-remains identified from JR2158Z was limited almost exclusively to New World taxa (the species status of two of the plants identified within the well is the subject of ongoing debate among botanists). European cultigens were conspicuously absent from the JR2158Z assemblage.

SUMMARY

A well-preserved and moderately abundant archeobotanical assemblage was recovered through soil flotation of over 150 liters of cultural fill from three features excavated within James Fort that date to the years spanning 1607-1624 (the James Fort Period). A variety of economically important wild and cultivated plant foods were documented from contexts directly linked to the domestic and military focus of the Fort during these early years of occupation. Analysis of this preliminary suite of flotation samples reveals a plant-derived subsistence base focused on the cultivation of crops (Native maize and beans as well as wheat or oats introduced by the colonists) and the collection of wild nuts and fleshy fruits. Wood charcoal identified from the sampled features reveals a predominance of oak and hickory species which were undoubtedly important as building material as well as fuel.

The recovered archeobotanical remains contribute baseline information about plant artifacts preserved within James Fort. In addition, the new data set bolsters a growing archeobotanical database from the site (Archer 2006; McKnight 2002, 2011). These data contribute to our understanding of how the early colonists used, coped with, and influenced the tidewater landscape. The archeobotanical record from James Fort also informs our understanding of interactions between the early colonists and the Powhatan.

These new data provide an opportunity to more thoroughly contrast the archeological record with the rich archival history from the Fort and the early Virginia colony. Food featured prominently in the inital years of James Fort, and collaboration with and coercion of Native peoples was closely tied to the Colony's survival during the early years. The presence of indigenous plant foods – both wild and cultivated – within features from the early years of Fort occupation attest to the importance of Native foods and Native farmers in providing food to the English. More specifically, this preliminary data set provides important information about the "Starving Time" winter of 1609-1610. Pit 8 and James Fort's first Well beneath Structure 185 are directly connected to this period of the Fort's history. It is notable that the archeobotanical record provides evidence of discarded comestibles during a time of acute food scarcity.

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