Report on the Analysis of Macroplant Remains from the James Fort Period Second Well, Historic Jamestowne, Virginia

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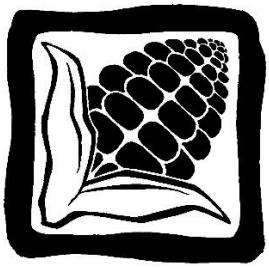

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Four waterlogged samples collected from the ca. 1611-1617 James Fort second well have been archived under refrigeration since their excavation in 2006 (Kelso et al. 2008). A subsample of material from three stratigraphic contexts within JR2158 ST177 were selected for macrobotanical analysis in order to better understand the type and quantity of preserved remains and to assess degrees of organic degradation resulting from long term storage.

Deposits within the well contained extremely well preserved organic materials including unburned plant artifacts and tissues that normally do not survive most archaeological conditions. Archeobotanical analysis of related contexts was accomplished by Steven N. Archer in 2006, and by the author in 2011. Archer's work focused on three contexts (JR2158AA, JR2158AB, and JR2158Z) and provided the first systematic study of macrobotanical remains from the well. Archer's work documented the earliest presence of tobacco *(Nicotiana sp.)* from the Chesapeake colonial period, along with a suite of New World cultigens, fruits, seeds, wood, and nutshells. The 2011 study of additional material from JR2158 Layer Z confirmed the presence of tobacco and identified native woods, nutshells, the seeds of weedy taxa and wild fruits, along with fungi, stem, bud, arboreal flower, and other vegetal miscellany.

The current study focuses on material from four contexts: Additional material from Stratum AA and AB, and two samples from Stratum AC. See Table 01.

Table 01: Material included in the current study. James Fort Second Well ca. 1611-1617.

Sample Number	Context	Sample weight (kilograms)	Subsample Weight (grams)	Subsample Volume (milliliters)
JR2158AA (43)	ST177	5.534	601.5	975
JR2158AB (46)	ST177	4	248.8	275
JR2158AC (45)	ST177	5	289.3	280
JR2158AC (44)	ST177	4	1123	1000

Methods

Flotation is the most common method for macrobotanical recovery and has been used with success elsewhere at Jamestown (McKnight 2012; 2018). However, flotation is not effective for waterlogged samples as saturated floral artifacts resist suspension in the flotation tank. Appropriate recovery of waterlogged materials is best accomplished using smaller volume samples and a sieving strategy through nested geologic sieves and filter paper. This approach has proved effectual in the recovery of a full range of plant macroremains (Pearsall 2000: 82-85; White and Shelton 2014: 107).

The well samples were completely waterlogged at the time of excavation and have been maintained in a saturated state during refrigerated storage. Samples contained visible vegetable material in a matrix of wet soil. Archeobotanical materials were separated from sample sediment using gentle water-screening through nested geological sieves following standard procedures (Pearsall 2001: 83-84; Kenward et al. 1980: 8-11). This approach has been used with success in previous well studies at Jamestown (Archer 2006; McKnight 2011). Sieve apertures measured 4mm, 2mm, 1mm, 500µ, and 250µ. Material measuring less than 250µ in diameter was discarded. The sample was processed in small batches, approximately 25ml at a time, in order to minimize abrasion of delicate plant artifacts. The 500µ and 250µ fractions were predominantly composed of coarse sand. To facilitate the recovery of small seeds, these fractions were subjected to additional processing: Each was placed in a conical sedimentation flask and gently swirled to produce a mild centrifuge action. Organic material separated from the sandy matrix was poured onto a series of filter papers for review under magnification. The residual sandy matrices were also scanned beneath a dissecting microscope (10X to 40X) for the remains of seeds and cultivated plant parts. All sample components were kept moist during analysis, and all materials (both archeobotanical and residual) were packaged in laboratory grade deionized water for storage. All archeobotanical remains encountered within the >4mm size fraction were isolated for identification. Nutshells, seeds, cultivated plant remains and miscellaneous plant materials were removed from the >2mm/<4mm size fraction. Seeds, cultivated plant remains, and identifiable botanical miscellany were isolated from the >1mm/<2mm, >500µ/<1mm, and >250µ/<500µ fractions.

Identifications were attempted on all seed, nut, and miscellaneous plant remains, and on a sub-sample of a maximum of 10 randomly selected non-carbonized wood fragments (>4mm in size) from each sample 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. All identifications were made under low magnification (10X to 40X) with the aid of standard texts (Edlin 1969; Kozlowski 1972; Hoadley 1990; Martin and Barkely 1961; Panshin and deZeeuw 1980; Schopmeyer 1974) and checked against plant specimens from a modern reference collection representative of the flora of James City County, Virginia (Weakley 2012; USDA 2023; Mrozowski 2001).

Results

Organic preservation within the sampled strata remains good, with a variety of uncarbonized plant remains recovered through the wet screening process. Each sample was positive for macrobotanical artifacts. The residual fraction matrices contained a range of artifacts and ecofacts that are generally described at the bottom of Table 02. The samples contained a constellation of plant taxa reflecting fuel, foodstuff, building debris, seed stock, and weedy

Table 02: Results from four well samples, James Fort Second Well ca. 1611-1617.

Sample Number	JR2158AB	JR2158AC	JR2158AA (43)	JR2158AC (44)	total
Context	ST177	ST177	ST177	ST177	4 samples
Sample weight (grams)	248.8	289.3	601.5	1123	2262.6
volume (ml)	275	280	975	1000	2530
Wood (not carbonized) no of specimens selected for identification	5	x	10	3	18
Acer sp. (maple)			1		1
Quercus sp. (white oak group)			1		1
Quercus sp. (red oak group)	5		6		11
Pinus sp. (pine)			1	3	4
diffuse porous			1		1
minute wood fibers present		x			
NUTSHELL (not carbonized) (no of fragments > 2mm)	2	3	4	1	10
Carya sp. (hickory) thick walled hickory shell		3	4	1	8
Quercus sp. (oak acorn) shell fragments	2				2
SEEDS (not carbonized) (no of specimens)	8	1	2	2	13
Amaranthus sp. (pigweed)	1		1	1	3
Fragaria sp. (strawberry)	1			1	2
Gaylussacia sp. (huckleberry)		1			1
Nicotiana sp. (tobacco)	5				5
Scirpus sp. (rush)	1				1
Vaccinium sp. (blueberry)			1		1
MISCELLANEOUS (not carbonized) (no of fragments/presence)	1	0	3	0	4
Cucurbita sp. (squash) rind fragments	1		2		3
monocot stem fragment			1		1
deciduous leaf fragments	x			x	
Description	gravel, clay peds, brick fragments, insect egg cases, insect body parts, root fibers,	sand, mica, insect puparium fragments, hair, insect body parts, sclerotia	large wood sample, gravel, insect remains, brick fragments, shell fragments	brick, mica, filamentous material, insect egg cases, sclerotia	

vegetation that reference a culturally modified landscape within the fort. An inventory of the archeobotanical materials identified within the sample is presented in Table 02. The macro-botanical remains are discussed below by material type and by well strata.

Wood remains were all uncharred and were present within each of the analyzed samples. Analyzed wood remains were limited to fragments measuring >4mm in diameter. Ten fragments from each sample were randomly selected for identification. Identification of the random sub-sample of fragments documented the presence of red oak (*Quercus* ERYTHROBALANUS group) (61 percent of the subsample selected for identification), pine (*Pinus*) (six percent), white oak *(Quercus* LEUCOBALNUS group) (six percent), maple (*Acer*) (six percent), and diffuse porous type (the remaining 21 percent).

Nutshells were identified within each of the samples and included two types. Eight fragments of thick-walled hickory (*Carya*) shell and two fragments of oak acorn (*Quercus*) were recovered. All nutshells were uncarbonized.

Uncarbonized seeds totaled 13 specimens and occurred within each of the analyzed samples. An array of culturally important taxa were represented, including five tobacco (*Nicotiana*) seeds, strawberry (*Fragaria*) (two seeds), huckleberry (*Gaylussacia*) (one seed), blueberry (*Vaccinium*) (one seed), along with pigweed (*Amaranthus*) (three seeds) and rush (*Scirpus*) (one seed).

A variety of miscellaneous floral elements were recovered from the well samples, including squash rind (*Cucurbita*) (three fragments), a piece of monocot stem, and fragments of indeterminate deciduous leaf.

JR2158AA

A sample of 975 ml (601.5 grams) of material isolated from Stratum AA (43) was largely composed of uncarbonized wood fibers. Ten fragments of wood selected for identification revealed the presence of red oak (*Quercus*), maple (*Acer*), white oak (*Quercus*), pine (*Pinus*), and a diffuse porous type. Four fragments of thick-walled hickory nutshell (*Carya*), a pigweed (*Amaranthus*) seed, and a blueberry (*Vaccinium*) seed were identified. Two fragments of squash rind (*Cucurbita*) and a fragment of monocot stem were also recovered. Other materials observed within Stratum AA include gravel, insect body parts and egg cases, brick fragments, and pieces of marine shell.

JR2158AB

A 275ml (248.8 gram) sample secured from Stratum AB produced red oak (*Quercus*) wood (five fragments for identification), oak acorn (*Quercus*) shell fragments (two), eight seeds (five tobacco [*Nicotiana*], one pigweed [*Amaranthus*], one strawberry [*Fragaria*], and one rush [*Scirpus*]), a fragment of squash (*Cucurbita*) rind, and indeterminate pieces of deciduous leaf. The sample from Stratum AB also contained gravel, clay peds, brick fragments, insect egg cases and body parts, and root fibers.

JR2158AC
Two samples totaling 1,280 ml (1,412.3 grams) were selected from Stratum AC. One sample was comprised of sand, mica, insect puparium fragments, hair, insect body parts, and sclerotia. Sclerotia are small, spherical fungal bodies (to 4mm in diameter). These dormant fungal growths persist in the ground and are often found in close association with tree roots. To the unaided eye, they can resemble small, burned seeds. Wood remains within this sample were limited to minute fragments of unburned wood fibers (indeterminate). Three fragments of thick-walled hickory (*Carya*) nutshell and a huckleberry (*Gaylussacia*) seed were identified. The second sample from Stratum AC included brick, mica, filamentous material (a product of decomposition?), insect egg cases, and sclerotia. Macrobotanical remains included pine (*Pinus*) wood fibers (three), a fragment of thick-walled hickory (*Carya*) nutshell, a pigweed (*Amaranthus*) seed, a strawberry (*Fragaria*) seed, and fragments of leaf litter of indeterminate taxa.

Discussion

This study supports previous macrobotanical analyses of James Fort's second well, providing corroborating evidence of previously documented plant taxa and a novel record of huckleberry (*Gaylussacia*) within Stratum AC. There is consistency between taxa identified across the various macrobotanical research efforts, Table 03 presents an overview of seed, nut, and cultivated plant taxa identified from the three investigations. Table 03 also highlights a decline in taxonomic diversity through time, a result that indicates deterioration of organic remains.

Comprehensive results to date document a rich array of culturally significant plants. As observed during previous investigations, the well assemblages are predominantly New World in origin. There is a notable absence of European crop plants, and results confirm a reliance on native cultigens (squash, maize, common bean, and perhaps bottle gourd) and endemic plant foods (mast, fleshy fruits) common in the vicinity of James Fort. Importantly, results from the second well document the adoption of a suite of indigenous crop plants by the colonists. The assemblages reveal information about local forest cover, with the seeds and leaves of arboreal taxa revealing their proximity to the Fort.

One of the most meaningful outcomes of the macrobotanical analysis of the James Fort well fill has been the identification of tobacco seeds from an early colonial context. Despite the known importance of tobacco to regional history, very few archaeological tobacco seeds have been recovered from historic sites. This is due in large part to the myriad challenges to the preservation and recovery of archaeological tobacco seeds: In addition to being extremely small, the manner of tobacco cultivation includes topping the flowers of the growing plant to enhance leaf growth, necessarily preventing the formation of seed: The result being that possession of tobacco seeds would be limited to activities surrounding propagation – the breeding, storage and distribution of seed stock. Tobacco plants are germinated in small seed beds and the young

Table 03: Comparison of seed, nut, and cultivated plant remains remains from three studies. James Fort Second Well ca. 1611-1617.

Taxon	current study JR2158AA, AB, AC	2011 study JR2158Z	2006 study JR2158AA, AB, Z
American beech (*Fagus grandifolia*)			x
American holly (*Ilex opaca*)			x
Aster (Asteraceae) cf. *Chicorium* or *Cirsium*			x
bean (*Phaseolus vulgaris*)			x
beggar's tick (*Bidens*)			x
black walnut (*Juglans nigra*)		x	x
blackberry/raspberry (*Rubus*)		x	x
blueberry (*Vaccinium*)	x	x	x
cf. bottle gourd (*Lagenaria siceraria*)			x
carpetweed (*Mollugo verticillata*)		x	
cf. catchfly (*Silene*)			x
cherry (*Prunus serotina* or *virginiana*)			x
cf. Chickasaw plum (*Prunus angustifolia*)			x
cocklebur (*Xanthium strumarium var. canadense*)			x
grape (*Vitis*)			x
grass (Poaceae)		x	
gum (*Nyssa*)			x
hickory (*Carya*)		x	x
huckleberry (*Gaylussacia*)	x		
knotweed (*Polygonum*)			x
cf. knotweed (Polygonaceae)		x	
maize (*Zea mays ssp. mays*)			x
maple (*Acer*)			x
maypop (*Passiflora incarnata*)			x
oak (*Quercus*) acorn	x		x
panic/foxtail grass (*Panicum/Setaria*)		x	
persimmon (*Diospyros virginiana*)			x
pigweed (*Amaranthus*)	x	x	
poke (*Phytolacca americana*)		x	
purslane (*Portulaca oleracea*)		x	x
rush (*Scripus*)	x		x
sedge (Cyperaceae)		x	x
squash (*Cucurbita pepo*)			x
squash (*Cucurbita*)	x		
squash (Cucurbitaceae)		x	x
strawberry (*Fragaria*), or cf.	x	x	
sweetgum (*Liquidambar styraciflua*)			x
sycamore (*Platanus occidentalis*)			x
tobacco (*Nicotiana*)	x	x	x
umbel (Apiaceae/Umbelliferae)		x	x
yelow poplar (*Liriodendron tulipifera*)		x	

plants are then transplanted to growing fields elsewhere once they are established. Considering these farming practices, it is unlikely that tobacco seeds would have many opportunities to enter the archaeological record. There are many species of tobacco (*Nicotiana*), indigenous to the Americas, Australia, Southwest Africa, and the South Pacific, and their seeds are difficult to discern based on size and morphology. Two species are germane to the discussion of tobacco history in eastern North America: The first - *Nicotiana rustica* - was an essential specialty plant to Native North Americans that was used in a variety of ways as a ceremonial and therapeutic plant. Early European visitors to the New World were fascinated by Native tobacco and its importance in indigenous culture, and they recorded its use in artistic and narrative descriptions. The Powhatans introduced this species to the English colonists, who found its smoke unpleasantly strong and harsh. The Second species - *Nicotiana tabacum* - is important to the colonial history in the Middle Atlantic, and is the species grown worldwide today for the production of tobacco leaf for smoking and chewing. *Tabacum* was the plant introduced from the West Indies to the Jamestowne colony in Virginia by John Rolfe in 1610 and which was the mainstay of Chesapeake culture and economy for hundreds of years. The plant was particularly well-suited to the temperate climate of the region and adaptable with its new landscape. Tobacco and the labor required for its production led to the importation of the first enslaved Africans to Virginia in 1619. The presence of tobacco seeds within well fill from the James Fort period (ca. 1611-1617) aligns with the historical narrative regarding tobacco cultivation at the settlement. The recovery of tobacco seeds from JR2158 AB (this study) and JR2158Z (Archer 2006; McKnight 2011) affirms the historical record of John Rolfe's introduction of *Nicotiana tabacum* and its subsequent importance at Jamestown.

Summary

A wealth of information has been generated through the analysis of archeobotanical materials from the James Fort well. Small batch wet-screening has proven to be effective in the recovery of a full complement of macroplant artifacts from waterlogged strata. This current effort adds to a growing archeobotanical dataset from the feature (Archer 2006; McKnight 2002, 2011), and provides the first record of huckleberry (*Gaylussacia*) from the feature.

Results document a reduction in taxonomic diversity and in the quantity of macrobotanical remains within samples over time. Excavated in 2006, the first macroplant analysis of well fill (accomplished in 2006) produced well-preserved, abundant, and diverse plant remains dating from the ca. 1611-1617 period (Archer 2006). The 2006 work observed delicate leaves that were identifiable to the species level as well as dung. The 2011 research effort (McKnight 2011) documented a comparatively moderate botanical assemblage with slightly reduced diversity and quantity. The current dataset is notably smaller, less diverse, and the preservation of very delicate element such as leaves is diminished. Filamentous material within the AC Stratum is a likely biproduct of decomposition and an indicator of ongoing decay. Despite the careful storage of samples under refrigeration at James Fort laboratory, delicate plant artifacts from the well feature cannot be maintained indefinitely.

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