MARYLAND ARCHEOLOGY

Journal of the Archeological Society of Maryland, Inc.

MARCH-SEPTEMBER 2009
VOLUME 45 NUMBERS 1 & 2

ANALYSIS OF FLOTATION- AND WATERSCREEN-RECOVERED ARCHEOBOTANICAL REMAINS FROM THE HUGHES SITE (18MO1), MONTGOMERY COUNTY, MARYLAND

Justine W. McKnight

Introduction

The Hughes site (18MO1) is a palisaded Late Woodland village site located on a broad floodplain of the Potomac River in what is now the McKee-Beshers Wildlife Management Area in Montgomery County, Maryland. Diagnostic ceramic styles and the pattern of pit features at the Hughes site place it culturally within the Keyser Complex—a unique cultural manifestation confined to the northern Shenandoah and the upper and middle Potomac River valleys.

Richard Stearns, of the Maryland Natural History Society, was fortunately allowed to concurrently map the Yinger excavations, take notes, and collect some materials. It was he who published a short report in 1940 on the Yinger activities at the site. Some subsequent excavation took place at the site in 1969. That was undertaken by the Southwestern Chapter of the Archeological Society of Maryland. In 1990 the Potomac River Archaeology Survey (PRAS) of American University began three years of excavations at the site (1990, 1991, and 1994). Christine Jirikowic (1995) made the 1990s excavations the subject of her doctoral dissertation. In 2006 American University returned to the Hughes site for the Archeological Society of Maryland's Annual Tyler Bastian Field Session in Archaeology. This was undertaken in partnership with the Maryland Historical Trust's Office of Archeology. Richard Dent, of American University, served as principal investigator for all four years of the most recent excavations at the Hughes site.

Hughes has long been recognized as an important site with the potential to make a significant contribution to better understanding Native American subsistence practices and environmental conditions in the Potomac River Valley during the Late Woodland period. Remarkably good organic preservation, the preservation variety of features, and the recovery of both wild and cultivated plant artifacts (corn and nuts were visible during excavation [Jirikowic and Dent 1999:51]) suggest that floral remains from the Hughes site will provide important data regarding Keyser Complex subsistence practices. With this in mind, the PRAS rigorously collected soil samples for flotation processing from each of their four field sessions. Of the total of 42 features excavated at the Hughes site, 26 were sampled for archeobotanical remains. Soil samples were processed at the PRAS laboratory at American University using the methods described below, and the recovered material was placed in storage at American University and then at the Maryland Archaeological Conservation Laboratory awaiting analysis. In the spring of 2009, the Archeological Society of Maryland committed funds to support the study the Hughes site archeobotanical collection. The following report details the results of that analysis.

Research Methods

Flotation Samples

Twenty-six archeological soil samples of unknown volume were individually processed using a modified SMAP (Shell Mound Archaeological Project; see Watson 1976) type flotation system. Processing was conducted by PRAS staff, students, and volunteers. The flotation machine was equipped with two submerged shower heads to aid agitation. Processing resulted in two (light and heavy) fractions of material. The light fraction was collected in nylon hose and the heavy fraction was captured in standard window screen. Floated portions were air dried. The samples were packaged in vinyl bags and curated pending analysis.

Waterscreen Sample

A single sample of archeobotanical material (from Feature 34) was obtained through manual waterscreening of feature fill though window-screen mesh. This large sample was subjected to secondary processing using water flotation to liberate carbonized plant macro-remains from the matrix of natural and cultural debris composing the

waterscreen residuum. Flotation procedures differed from those described above—the waterscreened sample was manually floated using a bucket and strainer system (Pearsall 2000:35-36).

In the spring of 2009, 27 archeobotanical samples were transferred to archeobotanical consultant Justine McKnight at her laboratory in Severna Park, Maryland. All aspects of sample handling and analysis were conducted by McKnight. A summary of archeobotanical samples analyzed from the Hughes site is presented in Table 1.

The processed samples were generally composed of carbonized plant material (mostly wood charcoal), with small quantities of non-carbonized root fibers, clayey soil peds, modern grass stems, modern oat straw fragments, small rocks and gravel, terrestrial gastropods, insect egg cases, and insect larva and body parts. The samples also contained abundant cultural artifacts, including bone (both burned and unburned) fragments, fish scale, teeth, ceramics, lithic debitage, and bone and shell beads. The samples also contained carbonized spherical silicaceous material, which is formed when plant parts high in silica (such as grass, leaves and stems) are burned and the silica melts and forms droplets which persist in the archeological record. This material is often mistaken for small seeds.

Each sample was passed through geologic sieves ranging from 0.5 to 4 mm in size. Material 2 mm or greater was examined with a binocular microscope under low magnification (10X to 40X). Non-botanical and non-carbonized plant remains were separated and not further categorized. Carbonized plant remains were sorted into broad taxonomic categories (wood, nut, seed, cultigen, etc.). The less than 2 mm fraction was examined under low magnification for the remains of carbonized seeds and cultivated plants. Carbonized seeds were isolated for identification and quantification. Maize remains were so abundant as to prevent expedient analysis, so procedures were modified. Less than or equal to 2mm maize remains were identified and their number estimated but they were not isolated from the remainder matrix. Material less than 0.5 mm was also scanned for the remains of seeds and cultivated plants.

Identifications were attempted on all seeds, nuts, crop plant remains, and miscellaneous plant parts, and on a sub-sample of twenty randomly selected wood fragments from each sample, in accordance with standard practice (Pearsall 2000). All identifications were made under magnification (10X to 40X) with the aid of standard texts (Edlin 1969; Kozlowski 1972; Martin and Barkely 1961; Panshin and deZeeuw 1980) and checked against plant specimens from a modern reference collection representative of the flora of Montgomery County, Maryland. Identifications of all classes of botanical remains were made to the genus level when possible, to the family level when limited diagnostic morphology is available, and to the species level only when the assignment could be made with absolute certainty. The general wood categories *'ring porous'*, *'deciduous'* and *'unidentifiable'* were employed when wood fibers could not be more accurately classified based on minute features. The term *'amorphous carbon'* was used to classify carbonized remains which lacked any diagnostic morphology whatsoever.

The processed samples yielded both carbonized and non-carbonized plant remains. Non-carbonized remains observed in the flotation-derived botanical assemblage included root fibers (noted and not further categorized) and non-carbonized seeds (copperleaf, pigweed, giant ragweed, beech, strawberry [tentative identification], bedstraw, carpetweed, sheep sorrel, panic or foxtail grass, poke, purselane, raspberry or blackberry, chickweed, and nightshade were identified). It is highly unlikely that these seed specimens were interred concurrent with period artifacts and the carbonized macro-botanical remains. Although the persistence of non-carbonized plant remains from rare contexts such as consistently xeric or water-saturated environments does occur (Hastorf and Popper 1988; Minnis

TABLE 1. Summary of archeobotanical samples from the Hughes site.

FEATURE TYPES	FEATURE NUMBERS	NUMBER OF FLOTATION SAMPLES	NUMBER OF WATER-SCREENED SAMPLES	WEIGHT OF RECOVERED PLANT MATERIAL (GRAMS)
Burial	34	1	0	1.77
Hearth	13	1	0	6
Indeterminate	33	1	0	3.84
Irregular depression	77	1	0	19.9
Lens	6, 18, 23, 26, 30	5	0	7.435
Large basin	45, 55	2	1	198.805
Small basin	1, 5, 16, 17, 20, 28, 29, 31, 40, 43, 78	3	0	66.39
Pit	7, 22, 79	11	0	161.19
Disturbance	8	1	0	0.81
9 FEATURE TYPES	**26 FEATURES**	**26 SAMPLES**	**1 SAMPLE**	**466.14**

1981; Pearsall 2000), such soil conditions do not characterize the Hughes site project area. Non-carbonized plant remains occurring within archeological soil samples from similar open-site environments are usually considered to be intrusive modern specimens (Minnis 1981; Keepax 1977; Smith 1985). The recovery of non-carbonized seed remains may reveal specific contamination episodes associated with animal (i.e., rodent, insect, gastropod) burrowing, the action of root growth and decay, flooding, aeolian processes, or by the combined effects of these factors. The Hughes site archeological features which yielded non-carbonized seeds were likely intruded upon by biological processes which introduced modern minute botanicals into archeological strata.

Results of Analysis

Flotation processing of the 26 soil samples and reprocessing of the single waterscreen-recovered floral sample resulted in the recovery of 466.14 grams of carbonized plant macro-remains from four seasons of archeological investigation at the site. The recovered archeobotanical remains were both abundant and diverse, and the condition of recovered organic remains was excellent. A wide variety of economically important plants were represented in the analyzed assemblage. These include a predominance of wood charcoal (dominated by hickory and white oak species); maize and beans; three genera of native mast; wild fruit, grain and ruderal seed; and miscellaneous plant materials including fungi, rind, monocotelydenous stem, and amorphous carbon. In addition, non-carbonized seeds were present in 52 percent of the analyzed samples (identified taxa described above). A full inventory of flotation-recovered plant remains is presented in Table 2. A summary of results is offered in Table 3. A discussion of each class of plant material encountered within the assemblage is provided below.

Wood Charcoal

Wood charcoal was the most abundant class of plant remains encountered within the Hughes site flotation samples, occurring in each of the 27 samples analyzed (see Figure 1). A total of 46,901 fragments of wood charcoal (>2 mm in diameter) weighing 368.84 grams was recovered. Of this total, a sub-sample of 540 fragments (a maximum of 20 fragments per sample) was randomly selected for identification. This sub-sample revealed a predominance of hickory *(Carya spp;* 44% of the selected subsample, by fragment count), with white oak *(Quercus spp. LEUCOBALANUS group;* 22%), red oak *(Quercus spp. ERYTHROBALANUS group;* 8%), and maple *(Acer spp.;* 3%). Elm *(Ulmus spp.)*, black locust *(Robinia pseudoacacia)*, pine *(Pinus spp.)*, beech *(Fagus grandifolia)*, American chestnut *(Castanea dentata)* and unspecified oak *(Quercus spp.)* were present in small amounts (accounting for 1% or less of the selected subsample). Wood specimens which were minute or which exhibited incomplete morphology were assigned to the categories *'ring porous'* (1%), *'deciduous'* (16%) and *'unidentifiable'* (2%).

Carbonized Seeds

Carbonized seed remains were present in 26% of the samples analyzed. A site total of 17 fragments weighing 0.12 grams was recovered. Identified species include bedstraw *(Galium sp.;* one seed), knotweed or dock (*Polygonum* or *Rumex* species; one seed), grass (POACEAE; one seed), grape *(Vitis spp.;* five entire seeds and eight seed fragments; see Figure 2). A single unidentifiable seed was also encountered.

Nut Remains

Nutshells were abundant within the Hughes site features studied. Occurring in 74% of the analyzed samples, nutshell remains totaled 2,000 fragments weighing 51.76 grams. Three native mast species were represented within the assemblage. Thick-walled hickory *(Carya spp.)* dominated the nut assemblage, with 1,952 shell fragments and four husk fragments. Lesser quantities of black walnut *(Juglans nigra;* 11 shell fragments) and oak acorn *(Quercus spp.;* three shell fragments) were also identified.

Cultigen Remains

The remains of cultivated plants—especially maize (corn)—were well-represented within the Hughes site features. A site total of 6,412 specimens classified as Mesoamerican cultigens were recovered. These included common bean *(Phaseolus vulgaris;* five cotyledon fragments from three features [Feature numbers 22, 45 and 79]) and maize *(Zea mays;* 6,407 specimens occurring in 78% of the samples analyzed). A variety of morphological elements characterized the maize assemblage from the site, including both cob and kernel artifacts (see Figures 3 and 4, Table 4).

While maize was introduced to some areas of North America by A.D. 200 (Ford 1987; Chapman and Crites 1987) it appears to have been a minor cultigen (perhaps serving a ceremonial role) until after A.D. 800. Evidence for a shift to maize-centered agriculture in the interior of the Eastern Woodlands comes from a marked increase in archeological maize remains from A.D. 800-900 and changing human bone isotope values which indicate a substantial increase in maize consumption from this period through about A.D. 1100. This shift to maize-centered agriculture (with the tropical cultigens beans and squash) is associated with increased sedentism and the development of more complex sociopolitical formations. Recent in-depth studies focused on the diffusion and adoption of maize in Virginia (McKnight and Gallivan 2007) have documented sig-

TABLE 2. Inventory of flotation- and waterscreen-recovered plant remains from the Hughes site.

SAMPLE NUMBER	3001	3005	3006	3007	3008	3013	3016	3017	3018	3020	3022	3023	3026	3028	3029	3030	3031	3033	3034	3040	3043	3045	3045 ws*	3055	yr 2006	yr 2006	yr 2006	TOTAL
FEATURE	1	5	6	7	8	13	16	17	18	20	22	23	26	28	29	30	31	33	34	40	43	45	45	55	77	78	79	
volume (liters)	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	unk	
weight analyzed carbonized plant remains (grams)	6.22	3.72	1.435	14.13	0.83	8	1.045	14.81	0.46	19	54.48	0.75	4.35	6.005	1.93	0.44	4.74	3.84	1.77	1.03	1.31	60.335	139.37	9.3	19.9	6.58	92.6	466.54
WOOD CHARCOAL (carbonized) (# of fragments)	439	395	174	713	74	336	102	123	38	392	6120	136	227	281	240	69	295	135	212	154	188	4565	12565	520	11710	629	7069	46901
total weight (grams)	3.87	3.61	1.35	12.52	0.54	2.77	0.75	1.52	0.45	6.5	52.97	0.74	4.33	5.69	1.8	0.44	4.7	1.19	1.74	0.99	1.3	57.13	107.41	8.33	10.46	5.89	69.85	368.84
Acer spp. (maple)	11																					2	6					19
Carya spp. (hickory)	9	6	11		4	18	16	15	9	19	9	4	20	5	1	3	17		10	4	2	9	4	16	7	13	6	237
Castanea dentata (American chestnut)								2																1				3
Fagus grandifolia (beech)														2														2
Quercus spp. (white oak)		11	8		10		4	3	5		11	10		13	1	3	2				3	5	10	3		5	11	118
Quercus spp. (red oak)				17	4					1									1	1		3			13		3	43
Quercus spp. (oak)				3		2																						5
Pinus spp. (pine)					1																	1						2
Robinia pseudoacacia (black locust)									1												4							5
Ulmus spp. (elm)		3																										3
ring porous taxa			1									3														2		6
deciduous					1			5							18	14	1	29	9	15	6							89
unidentifiable												3									5							8
total identified fragments	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	540
NUTS (carbonized) (# of fragments)	2	3	4	18	2	1	8	0	0	0	40	0	1	13	2	0	2	0	2	1	0	67	894	3	97	23	817	2000
weight (grams)	0.04	0.11	0.06	0.48	0.02	0.02	0.28	0	0	0	0.82	0	0.02	0.18	0.12	0	0.03	0	0.02	0.04	0	2.48	18.63	0.91	3.98	0.4	22.12	51.76
Carya spp. (hickory) shell	2	3	3	17	2	1	8						1	13	12		2		2	1		62	892	2	91	23	815	1952
Carya spp. (hickory) husk																						4						4
Juglans nigra (black walnut)																						1	2	1	5		2	11
Quercus spp. (acorn) shell			1	1																					1			3
SEEDS (carbonized) (# of specimens)	0	0	1	1	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	10	0	0	0	1	17
total weight (grams)	0	0	0.005	0.005	0	0	0.01	0	0	0	0	0	0	0.005	0	0	0	0	0	0	0	0.005	0.06	0	0	0	0.03	0.12
Galium sp. (bedstraw)			1																									1
Polygonum/Rumex (knotweed/dock)																						1						1
POACEAE (grass)							1																					1
Vitis spp. (grape) seed																							4				1	5
seed fragment				1			1																6					8
unidentifiable (seed coat absent)														1														1
CULTIGENS (carbonized) (# of specimens)	653	0	3	435	31	983	1	2037	1	1064	112	14	0	12	0	0	0	50	1	0	1	44	654	3	176	42	95	6412
total weight (grams)	2.31	0	0.02	1.1	0.25	3.21	0.005	13.29	0.01	9.71	0.66	0.01	0	0.09	0	0	0	0.04	0.005	0	0.01	0.45	2.13	0.02	0.94	0.29	0.51	35.06
Phaseolus vulgaris (bean) cotelydon fragment											1												2				2	5
Zea mays (maize) total specimens	653	0	3	435	31	983	1	2037	1	1064	111	14	0	12	0	0	0	50	1	0	1	44	652	3	176	42	99	6407
kernel						1																1	4				2	8
kernel fragment	2			2		3	1			1				1								10	33			4	2	59
embryo								3											1			1	2					7
cupule segment	2			2	1			2															1				1	9
cupule	146		1	24	12	175		587		225	13	2						5				8	43		35	7	5	1298
*cupule fragment**	508		2	407	43	785		1435	1	835	98	12		11				45			1	42	569	3	141	11	83	5027
glume						19				3																		22
MISC PLANT REMAINS (carbonized) (# of fragments)	0	0	0	2	0	0	0	0	0	171	4	0	0	1	3	0	1	483	1	0	0	11	40	3	410	0	14	1144
total weight (grams)	0	0	0	0.005	0	0	0	0	0	2.79	0.03	0	0	0.04	0.01	0	0.01	2.61	0.005	0	0	0.07	0.14	0.04	4.52	0	0.09	10.36
fungal fructification				2							3				3		1	2	1			11	40	3			13	79
rind-like material																		452										452
monocot stem											1																1	2
amorphous carbon										171				1				29							401			602
																												percent present
NON-CARBONIZED SEEDS (presence)		x	x		x	x		x	x			x				x			x	x	x	x	x	x				52%
Acalypha sp. (copperleaf)			x						x							x			x		x		x	x				36%
Amaranthus sp. (pigweed)		x							x										x				x	x				15%
Ambrosia trifida (giant ragweed) achene																							x					4%
Fagus americana (beech)																							x					4%
cf. Fragaria sp. (strawberry)																x												4%
Galium sp. (bedstraw)					x																		x					7%
Mollugo verticillata (carpetweed)																								x				4%
Oxalis stricta (yellow sorrel)		x			x											x				x				x				19%
Panicum/Setaria (panic or foxtail grass)		x																					x					11%
Phytolacca americana (poke)																			x									4%
Portulaca oleracaea (purslane)																					x		x					7%
Rubus sp. (raspberry or blackberry)						x																						4%
Stellaria media (chickweed)		x	x		x			x	x			x							x	x								22%
SOLANACEAE (nightshade)																												7%
unidentifiable												x																4%

* waterscreen-recovered sample

TABLE 3. Summary of archeobotanical samples from the Hughes site.

Number of Samples Analyzed		27	
Total Volume Soil Samples		unknown	
Total Weight Analyzed Carbonized Material		466.14 grams	
WOOD CHARCOAL	(total weight)	368.84 grams	
	total number of >2 mm fragments	46,901	
	number of fragments identified	540	
		% of identified fragments (n=540)	% presence in samples (n=27)
Maple (Acer spp.)		3	11
Hickory (Carya spp.)		44	93
American chestnut (Castanea dentata)		1	7
Beech (Fagus grandifolia)		<1	4
Pine (Pinus spp.)		<1	7
White oak (Quercus spp.)		22	67
Red oak (Quercus spp.)		8	30
Oak (Quercus spp.)		1	7
Black locust (Robinia pseudoacacia)		1	7
Elm (Ulmus spp.)		1	4
Other (ring, deciduous or unidentifiable)		19	44
NUTSHELL	(total weight)	51.76 g	
	total number of >2 mm fragments	2,000	
		% of fragments (n=2000)	% presence in samples (n=27)
Hickory (Carya spp.) shell thick-walled type		98	70
Hickory (Carya spp.) husk		<1	4
cf. acorn (Quercus spp.)		<1	11
Walnut family (JUGLANDACEAE)		<1	19
CULTIGENS	(total weight)	35.06 g	
	total number of fragments	6,412	
		% of specimens (n=6,412)	% presence in samples (n=27)
Beans *(Phaseolus vulgaris)*		<1	11
Maize *(Zea mays)*		99.9	78
SEEDS (carbonized)	(total weight)	0.12 g	
	total number of specimens	17	
		% of specimens (n=17)	% presence in samples (n=27)
Bedstraw (Galium sp.)		6	4
Knotweed/dock (Polygonum/Rumex)		6	4
Grass (POACEAE)		6	4
Grape *(Vitis spp.)*		76	15
MISCELLANEOUS	(total weight)	10.36 g	
	total number of fragments	1,144	
		% of specimens (n=1,144)	% presence in samples (n=27)
Fungal fruit		7	37
Rind-like material		40	4
Monocot stem		<1	7
Amorphous carbon		53	15

nificantly different patterns in maize use—direct dates record corn's presence in the Chesapeake region only after A.D. 1100, with beans present after A.D. 1300.

A portion of a maize cob fragment was hand-recovered from Feature 13 during the 2006 excavation, and it was submitted for radiocarbon dating using the Accelerator Mass Spectrometry (AMS) technique. The C-13 adjusted age of the Feature 13 maize was 490±40 B.P. (see Table 5 and Figure 5).

This direct date on maize from the Hughes site complements the growing dataset on maize histories in the region. With a calibrated median probability of A.D. 1427, the Hughes maize falls comfortably within the range of other directly dated maize remains from Keyser Complex and the closely related Montgomery Complex sites in the Potomac region (see Figure 6).

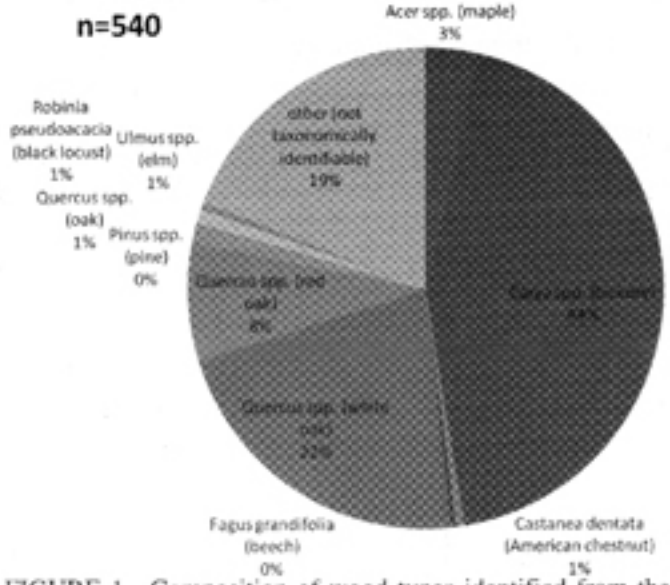

FIGURE 1. Composition of wood types identified from the Hughes site features.

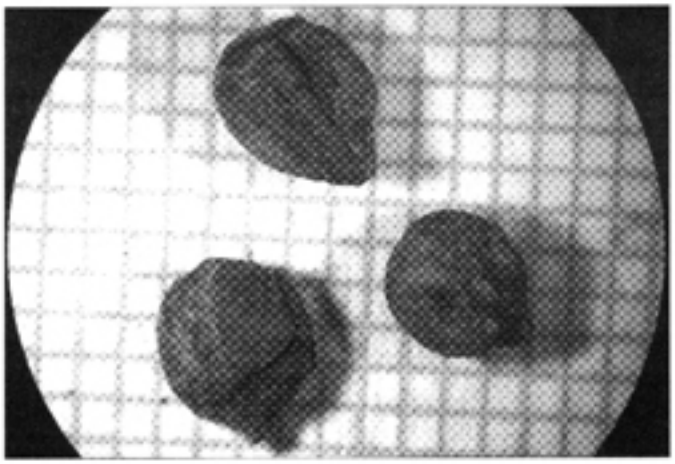

FIGURE 2. Grape *(Vitis spp.)* seed recovered from Feature 45, sample number 3045 (1 mm grid).

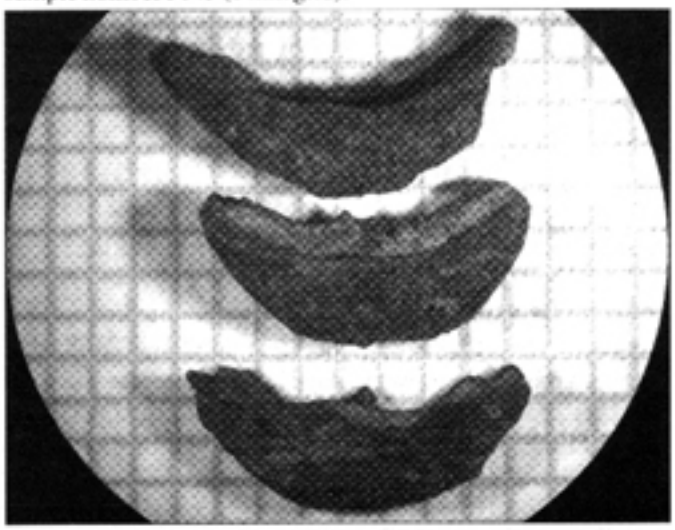

FIGURE 3. Maize cupules recovered from Feature 45 (1 mm grid).

TABLE 4. Summary of maize remains.

***Zea mays* (maize)**	
Total specimens recovered	6,407
Weight (grams)	34.07
Kernel	8
Kernel fragment	59
Embryo	7
Cupule segment	9
Cupule	1,298
Cupule fragment*	5,027
Glume	22

** includes estimate of number of ≤ 2mm fragments*

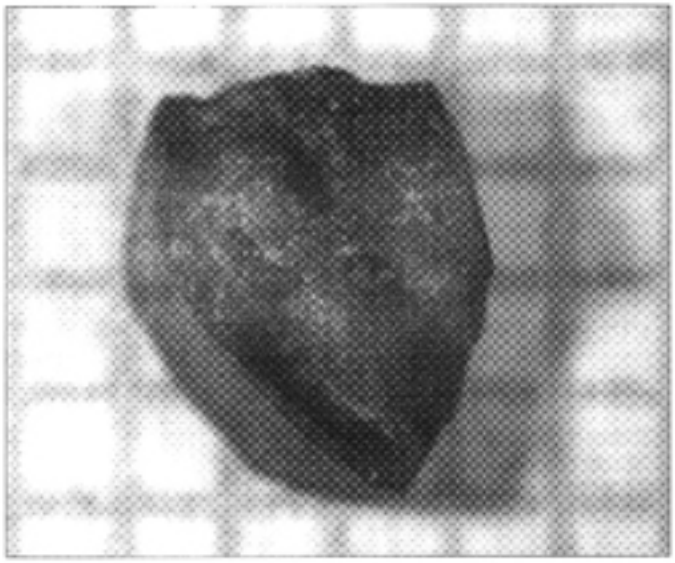

FIGURE 4. A maize embryo (germ) recovered from Feature 17 (1 mm grid).

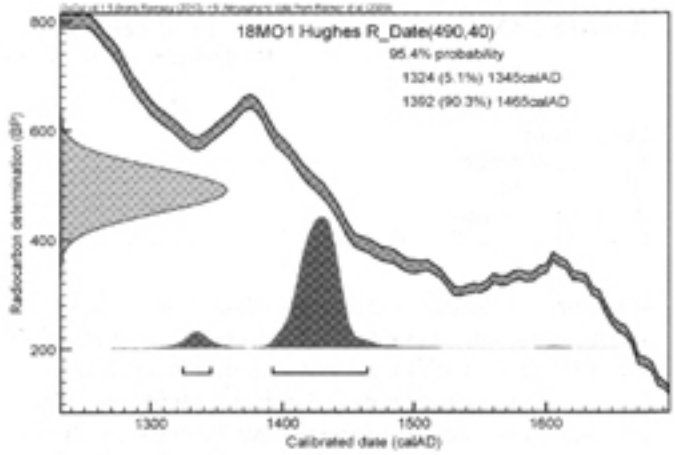

FIGURE 5. Graphical display of Beta 242479 AMS date, obtained from maize cob fragments from Feature 13 (Dent, personal communications, 2009).

TABLE 5. AMS dating results on a maize cob fragment from Feature 13.

BETA ANALYTIC SAMPLE ID #	C-13 ADJUSTED AGE	CALIBRATED 2 SIGMA LOW	CALIBRATED MEDIAN PROBABILITY	CALIBRATED 2 SIGMA HIGH
242478	490+/-40 bp	1324	1427	1465

Calibration with Calib 5.0.1 (Stuiver and Reimer 1993)

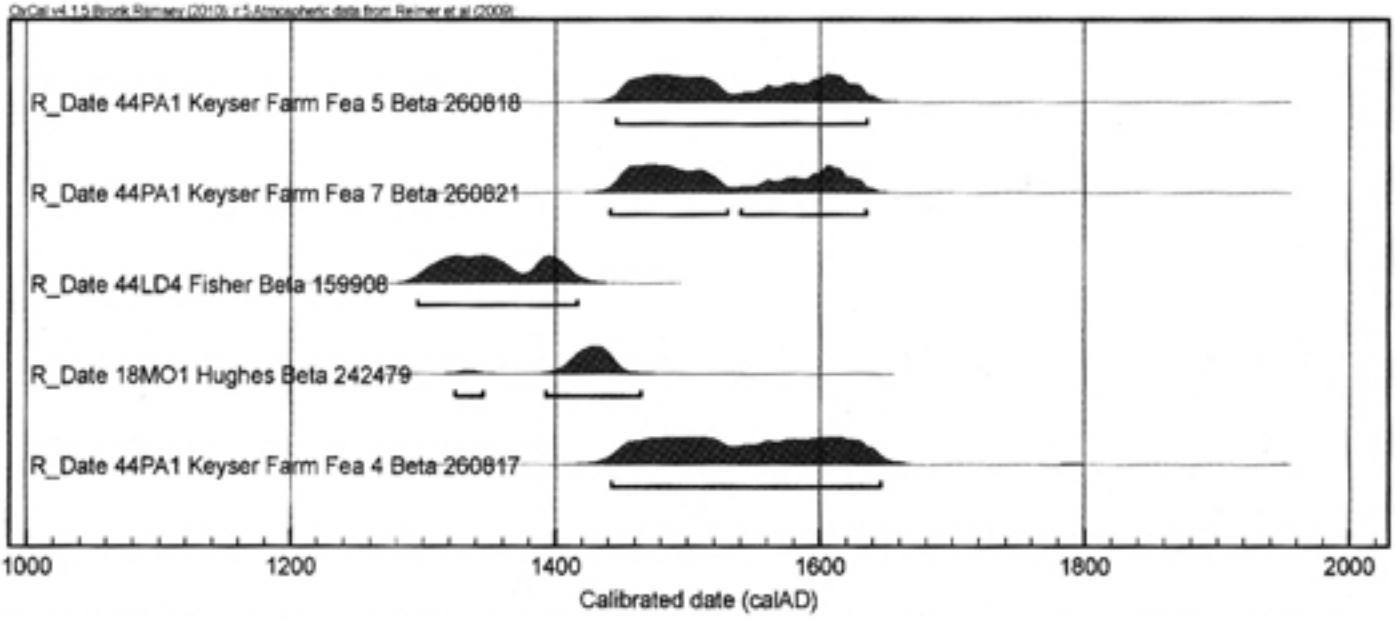

FIGURE 6: Radiocarbon assays for directly dated maize remains from Keyser Complex maize remains from the Potomac Piedmont and Ridge and Valley (Means and McKnight 2009; Pullins and Lewes 2002; Dent personal communications, 2009).

Miscellaneous Plant Remains

Miscellaneous archeobotanical materials occurred in 100 percent of the Hughes Site samples analyzed. A total of 1,144 elements weighing 10.36 grams were recovered. Miscellaneous materials included fungal fruiting bodies (79 fragments), rind-like material (not a squash; 452 fragments), monocot stem (2 fragments), and unidentifiable amorphous carbon (602 fragments).

Discussion

Features

The Hughes site features that were sampled for plant macro-remains can be grouped into 9 gross categories (Table 6). Examining the data, the pits emerges as the most productive feature class, bearing significantly greater quantities of carbonized plant macro-remains than other features types. Also, a variety of different kinds of plant remains are best-represented in the pit features. Nutshells were present in all feature types, underscoring the importance of mast resources in the diet and for fuel. Maize was recovered from all types of features sampled. Interestingly, maize is present in two of the least-meaningful feature classes (Indeterminate and Disturbance), emphasizing that maize remains were ubiquitous across the site, and not confined to special feature contexts. Carbonized seeds were recovered from the Lens, Large Basin, Small Basin and Pit feature types. Table 7 provides an inventory of flotation-recovered plant remains be feature type.

Environment

A broad interpretation of the prehistoric landscape of the Hughes site can be made based on the botanical remains recovered from archeological contexts, and our knowledge of native forest cover for the region (see Figure 7). The Hughes site occupies the Maryland bank of the Potomac River on the Piedmont Plateau in Montgomery County, Maryland. Floristically, the project area lies within the Piedmont section of the Oak-Chestnut Forest Region as defined by Braun (1950:192). According to Kuchler (1964), the project area lies within the interface

TABLE 6. Summary of flotation-derived plant materials by feature type.

FEATURE TYPE	FEATURE NUMBERS	TOTAL WEIGHT CARBONIZED REMAINS (GRAMS)	PRESENCE OF PLANT MATERIALS					
			WOOD	NUTS	CORN	BEAN	SEED	MISC.
Burial	34	1.77	x	x	x			x
Hearth	13	6.0	x	x	x			
Indeterminate	33	3.84	x		x			x
Irregular depression	77	19.9	x	x	x			x
Lens	6, 18, 23, 26, 30	7.435	x	x	x		x	
Large basin*	45, 55	69.435	x	x	x		x	x
Small basin	1, 5, 16, 17, 20, 28, 29, 31, 40, 43, 78	66.39	x	x	x		x	x
Pit	7, 22, 79	161.19	x	x	x	x	x	x
Disturbance**	8	0.81	x	x	x			

* waterscreen-recovered sample excluded ** pit attributed to Yinger excavation

FIGURE REDACTED
FIGURE REDACTED
FIGURE REDACTED
FIGURE REDACTED
FIGURE REDACTED

FIGURE 7. Forest associations documented over the project area.

area of the Oak-Pine-Hickory and the Appalachian Oak Forest regions. Native forest cover over the project area was a locally variable mosaic of tall broadleaf deciduous trees with some needleleaf evergreens. Dominant species would have included white oak and northern red oak with American chestnut and hickories. Sub-dominants would have included maples, birch, beech, yellow poplar, and pines. The wood charcoal identified from archeological features at the Hughes site reveals an overwhelming predominance of hickory and oak species, which is consistent with the precontact native forest cover of the region (Kartesz 1999; Little 1971; Harvill et al. 1992; Brown et al. 1987). The Late Woodland inhabitants of the Hughes site undoubtedly used a wide spectrum of plants from the rich flora of the area for food, fuel, construction, tool manufacturing, and medicine. The location of the project area

TABLE 7. Flotation-recovered plant remains by feature type.

FEATURE TYPE	burial	hearth?	indeterminate	irreg depres	lens	lg basin	pit	small basin	disturbance	total
								1, 5, 16, 17, 20, 28, 29, 31, 40, 43,		
FEATURE NUMBERS	34	13	33	77	6, 18, 23, 26, 30	45*, 55	7, 22, 79	78	8	9 feature types
number of samples	1	1	1	1	5	2	3	11	1	26 samples
volume (liters)	unk	unk	unk	unk	unk	unk	unk	unk	unk	
weight analyzed carbonized plant remains (grams)	1.77	6	3.84	19.9	7.435	69.435	161.19	66.39	0.81	336.77
WOOD CHARCOAL (carbonized) (no of fragments)	212	336	135	11710	644	5085	13902	3238	74	35336
total weight (grams)	1.74	2.77	1.19	10.46	7.31	65.46	135.34	36.62	0.54	261.43
Acer spp. (maple)						2		11		13
Carya spp. (hickory)	10	18		7	47	25	15	107	4	233
Castanea dentata (American chestnut)						1		2		3
Fagus grandifolia (beech)								2		2
Quercus spp. (white oak)					26	8	22	42	10	108
Quercus spp. (red oak)	1			13		3	20	2	4	43
Quercus spp. (oak)		2					3			5
Pinus spp. (pine)						1			1	2
Robinia pseudoacacia (black locust)					1			4		5
Ulmus spp. (elm)								3		3
ring porous taxa					4			2		6
deciduous	9		20		19			40	1	89
unidentifiable					3			5		8
total identified fragments	20	20	20	20	100	40	60	220	20	520
										0
NUTS (carbonized) (n of fragments)	2	1	0	97	5	70	875	54	2	1106
weight (grams)	0.02	0.02	0	3.98	0.08	3.39	23.42	1.2	0.02	32.13
Carya spp. (hickory) shell	2	1		91	4	64	832	64	2	1060
Carya spp. (hickory) husk						4				4
Juglans nigra (black walnut)				5	0	2	2			9
Quercus spp. (acorn) shell				1	1	0	1			3
										0
SEEDS (carbonized) (n of specimens)	0	0	0	0	1	1	2	3	0	7
total weight (grams)	0	0	0	0	0.005	0.005	0.035	0.015	0	0.06
Galium sp. (bedstraw)					1					1
Polygonum/Rumex (knotweed/dock)						1				1
POACEAE (grass)						0		1		1
Vitis spp. (grape) seed							1			1
seed fragment							1	1		2
unidentifiable (seed coat absent)								1		1
										0
CULTIGENS (carbonized) (n of specimens)	1	983	50	176	18	47	642	3810	31	5758
total weight (grams)	0.005	3.21	0.04	0.94	0.04	0.47	2.27	25.705	0.25	32.93
Phaseolus vulgaris (bean) cotelydon fragment							3			3
Zea mays (maize) total specimens	1	983	50	176	18	47	639	3810	31	5755
kernel		1				1	2			4
kernel fragment		3				10	4	9		26
embryo	1					1		3		5
cupule segment							3	4	1	8
cupule		175	5	35	3	8	42	975	12	1255
*cupule fragment**		785	45	141	15	45	588	2796	43	4458
glume		19						3		22
										0
MISC PLANT REMAINS (carbonized) (n of fragments)	1	0	483	410	0	14	20	176	0	1104
total weight (grams)	0.005	0	2.61	4.52	0	0.11	0.125	2.85	0	10.22
fungal fructification	1		2			14	18	4		39
rind-like material			452							452
monocot stem							2			2
amorphous carbon			29	401				172		602
NON-CARBONIZED SEEDS (presence)	100%	100%			80%	100%		36%	100%	
Acalypha sp. (copperleaf)	100%				60%	50%		9%		
Amaranthus sp. (pigweed)					20%	50%		9%		
Ambrosia trifida (giant ragweed) achene										
Fagus americana (beech)										
cf. Fragaria sp. (strawberry)					20%					
Galium sp. (bedstraw)									100%	
Mollugo verticillata (carpetweed)						50%				
Oxalis stricta (sheepsorrel)					20%	50%		18%	100%	
Panicum/Setaria (panic or foxtail grass)						50%		9%		
Phytolacca americana (poke)	100%									
Portulaca oleracea (purselane)						50%		9%		
Rubus sp. (raspberry or blackberry)		100%								
Stellaria media (chickweed)					60%			18%	100%	
SOLANACEAE (nightshade)	100%							9%		
unidentifiable					20%					

* excluding waterscreen-recovered material

would have permitted residents easy access to the productive potential of a variety of micro-environmental zones, including forested uplands, wooded bottom lands, and fertile floodplain areas. The cultivation of maize and beans at the site would have required the clearing of land for farming which would have resulted in the disruption of native forest cover and in increase in 'edge' environments. This interference with the natural vegetation of the project area would have had the result of increasing the diversity of wild plants and wild plant foods in the vicinity.

Plant food remains were very well represented within the Hughes site archeobotanical assemblage. Regrettably, original sediment volumes for the flotation samples were not recorded, and the absence of this information limits the types of statistical and comparative analyses possible with the dataset.

Both wild-gathered and cultivated comestible remains were abundant within the feature samples from Hughes. While the abundance and ubiquity of maize and beans from the site documents the importance of these crops to Keyser culture at Hughes, native mast resources are also well represented (see Table 8). Seed remains are not abundant within the Hughes site assemblage, but the presence of grape seeds attests to the use wild-gathered fruits in the diet. The evidence from the Hughes site for a continuing reliance on wild-gathered foods after the widespread adoption of maize between A.D. 1200 and 1300 is consistent with regional patterns in the Middle Atlantic based on stable isotope assays on human bone and on archeobotanical data (Trimble 1996; Farrow 1986; McKnight and Gallivan 2007).

Seasonality

Archeobotanical remains often provide strong markers for seasonality and the data from the Hughes site features suggest some seasonal patterns. Based on the botanical remains recovered, it is evident that wild nuts played an important role in site subsistence. These forest products would have been available for consumption or processing from September through November. Likewise, the maize remains that are so well-represented at Hughes are a fall-ripening resource. And the grape seeds recovered from Feature 45 are ready for harvest from late summer through the autumn months. However, determining seasonality of recovered nut, maize, and fleshy fruit remains is complicated, as these all constitute readily storable foods. The specimens recovered from archeological contexts may represent preserved foods used at any time of the year.

Summary

Study of 26 flotation samples and one waterscreen-recovered sample from four seasons of field excavation at the Hughes site (18MO1) provide documentation of site ethnobotany, and contribute to our understanding of Keyser Complex plant use. The site botanical assemblage offers a wealth of data regarding subsistence and land use during the Late Woodland period.

Within the archeobotanical assemblage from the Hughes features we see reflected the relationships between Keyser peoples and the natural world. The composition of local forests and the selection of wood types for fuel and building material is illuminated by the predominance of hickory and oak species in the wood charcoal assemblage. Dietary patterns are better understood through the food-plant remains recovered. Noteworthy is the balance of wild and cultivated comestibles from sampled features, with nuts and maize being the most abundant and ubiquitous plant foods recovered. Seed remains from the site are scant, with the use of grape being the only clear evidence provided by the data. There is no evidence that the cultivation of small grains was practiced at the site. It is significant that while the Keyser occupants of the Hughes site successfully farmed maize and beans on the fertile Potomac River floodplain, they also relied heavily on the seasonally-predictable wild fare available from a rich local forest environment.

References Cited

Braun, E. Lucy
1950 *Deciduous Forests of Eastern North America*. The Blakiston Company, Philadelphia.

Brown, Melvin L., James L. Reveal, C. Rose Broome and George F. Frick
1987 Comments on the Vegetation of Colonial Maryland. *Huntia* 7:247-283.

Brush, Grace S., Cecelia Lenk, and Joanne Smith
1980 The Natural Forests of Maryland: An Explanation of the Vegetation Map of Maryland. *Ecological Monographs* 50(1):77-92.

Chapman, J., and G. Crites
1987 Evidence for Early Maize (Zea mays) from the Icehouse Bottom Site, Tennessee. *American Antiquity* 52:352-354.

Dent, Richard J.
2009 Personal Communication, September 12, to Justine McKnight regarding Beta Analytic, Inc. radiocarbon dating analysis on plant remains from 2006 field season.

Edlin, Herbert L.
1969 *What Wood is That? A Manual of Wood Identification*. The Viking Press, New York.

Farrow, D.C.
1986 A Study of Monogahela Subsistence Patterns Based on Mass Spectometric Analysis. *Midcontinental Journal of Archaeology* 11:153-179.

Ford, Richard I.
1987 *Dating Early Maize in the Eastern United States.* Paper presented at the annual Conference of the Society of Ethnobiology, Gainsesville, Florida, March 5-8.

Harville, A.M., et al.
1992 Atlas of the Flora of Virginia. 3rd Edition. Privately published by the authors. Burkesville.

Hastorf, C.A., and V.S. Popper, editors.
1988 *Current Paleoethnobotany.* The University of Chicago Press, Chicago.

Jirikowic, Christine A.
1995 *The Hughes Village Site: A Late Woodland Community in the Potomac Piedmont.* Doctoral dissertation, The American University, Washington D.C.

Jirikowic, Christine A., and Richard J. Dent
1999 *Final Report on the 1990, 1991, and 1994 Excavations at the Hughes Site (18MO1).* Excavations Conducted by the American University Potomac River Archaeology Survey Department of Anthropology. Washington D.C.

Kartesz, J.T.
1999 A Synonymized Checklist and Atlas with Biological Attributes for the Vascular Flora of the United States, Canada, and Greenland. First Edition. In *Synthesis of the North American Flora*, Version 1.0, Kartesz, J.T., and C.A. Meacham, editors. North Carolina Botanical Garden, Chapel Hill, NC.

Keepax, Carole
1977 Contamination of Archaeological Deposits by seeds of Modern Origin with Particular Reference to the Use of Flotation Machines. *Journal of Archaeological Science* 4:221-229.

Kozlowski, T.T., Ed.
1972 *Seed Biology.* Academic Press, New York.

Kuchler, A.W.
1964 Manual to Accompany the map of Potential Natural Vegetation of the Coterminous United States. American Geographical Society, Special Publication 36.

Little, Elbert L.
1971 *Atlas of United States Trees. Volume 1. Conifers and Important Hardwoods.* United States Department of Agriculture Forest Service Miscellaneous Publication No. 1146.

McKnight, Justine, and Martin Gallivan
2007 *Towards a Synthesis of Chesapeake Ethnobotany: The Virginia Archeobotanical Data Base Project.* Paper presented at the Middle Atlantic Archeological Conference, Virginia Beach, Virginia. March 16-18, 2007.

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

Means, Bernard K., and Justine W. McKnight
2009 *Virginia Department of Historic Resources Threatened Sites Project Final Report: Constructing Chronologies from Curated Collections for Northern Virginia's Late Woodland Period.* Submitted to the Virginia Department of Historic Resources, Richmond.Minnis, Paul E.
1981 Seeds in Archaeological Sites: Sources and Some Interpretive Problems. *American Antiquity* 46:143-151.

Panshin, Alexis, and Carl deZeeuw
1980 *Textbook of Wood Technology.* Volume 1, 4th edition. McGraw Hill, New York.

Pearsall, D.
2000 *Paleoethnobotany: A Handbook of Procedures.* Second Edition Academic Press, San Diego.

Pullins, Stevan C., and David W. Lewes
2002 *The Fisher Site Revisited: Archaeology at a Montgomery Focus Village on the Potomac River. An Archaeological Assessment of a Portion of Site 44LD4, Loudon County, Virginia.* Virginia Department of Historic Resources, Richmond.

Smith, E.
1985 Recovery and Processing of Botanical Remains. In *The Analysis of Prehistoric Diets*, edited by Robert Gilbert and James Mielke, pp. 97-123. Academic Press, New York.

Stuiver, Minze, and Paula J. Reimer
1993 Extended ^{14}C Data Base and Revised CALIB 3.0 ^{14}C Age Calibration Program. *Radiocarbon* 35(1):215-230.

Trimble, Carmen Carreras
1996 *Paleodiet in Virginia and North Carolina as Determined by Stable Isotope Analysis of Skeletal Remains.* Master of Science Thesis. Department of Environmental Sciences, University of Virginia.

Watson, Patty Jo
1976 In Pursuit of Prehistoric Subsistence: A Comparative Account of Some Contemporary Flotation Techniques. *Midcontinental Journal of Archaeology* 1(1):77-100.

Justine W. McKnight is a consultant providing archeobotanical analysis and research services to cultural resource management firms and institutions. She holds a B.A. in Anthropology from the University of Illinois. Her research interests include food and culture, prehistoric ecosystems, and indigenous horticultural development. She can be reached by e-mail at jwmcknight@verizon.net, by phone at 410-507-3582, or through her website at www.archeobotany.com. Her mailing address is Archeobotany Consulting, 708 Faircastle Avenue, Severna Park, Maryland 21146.
