Vol. 2 Ch. 9 Ohio Hopewell as Food Producers, Regional Intensification of the Domestication Process

DeeAnne Wymer

Chapter 9

Ohio Hopewell as Food Producers, Regional Intensification of the Domestication Process

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FROM THERE TO HERE

In 1993, at the Ohio Archaeological Council *A View from the Core* symposium, I presented a summation of my research on Ohio Hopewell paleoethnobotany, as well as my interpretation of the meaning, and importance, of the data. This original synopsis was subsequently published in the 1996 proceedings from this seminal conference and largely focused on materials from several key Licking County, Ohio sites that had formed the core of my earlier dissertation as well as a number of analyses of samples from projects that took place early in my scholarly career (Wymer 1992, 1993, 1996, 1997). Several of the sites, such as the Murphy and Campus sites, were some of the best studied Ohio Hopewell habitation sites at the time of publication, and these data, along with material from other Licking County sites (Murphy III, Nu-Way, see also Pacheco 1996), and a few samples from the Jennison Guard site, allowed the first comprehensive glimpse into Ohio Hopewell paleoethnobotany. In addition, I was also privileged to have analyzed the flotation samples from Greber's Capitolium Mound excavations in Marietta, Ohio (Pickard 1996). Although the total amount of processed sediment (278.7 liters) that formed the basis for the 1996 publication is relatively modest, the number of features (43) and samples (82) is of a significant size—and, most importantly, I was able to

implement and oversee directly in the field for the Murphy, Campus, and Nu-Way sites, the flotation sample collection as well as the processing of those samples, and the subsequent laboratory analyses.

The purpose of the research, and the 1996 publication, was "... to summarize the available [paleoethnobotanical] data since 1978" (Wymer 1996:38) and validate the Ohio Hopewell utilization of the Eastern Agricultural Complex (EAC) pre-maize indigenous crop system. My work at that time especially focused on bringing the Ohio Hopewell (as well as other time periods—such as the Late Woodland) in line with the quality and depth of the paleoethnobotanical investigations that had taken place in Illinois, reflecting the prominent work of David and Nancy Asch, as well as the theoretical underpinnings by Bruce Smith (see discussions below). The 1996 publication allowed me to formalize for a larger academic audience two key implications of the material—that the data reflected a larger Hopewell land management system and that the pre-maize Complex cultigens were an important part of the Hopewell diet. For example, I noted that "... I believe current research indicates that the Ohio Hopewell had been sophisticated farmers and managers of their environment ... I would suggest that the cultigens from those gardens, were a major, if not the major, portion of their diet ..." (Wymer 1996:41–42). In addition, my results also had profound implications for elucidating the very nature of their settlements in terms of the degree of sedentariness. As any gardener knows quite well, especially those of us tucked within a forest, a garden cannot simply be created and then abandoned to return to collect any type of harvest in the fall (the wild denizens of the woods would ensure this); "The extensive use of crops at the Ohio sites minimally implies that some members of these small communities were present during the spring garden preparation and planting, most likely conducted summer maintenance of those plots, and certainly participated in fall harvesting activities" (Wymer 1996:48). I was very deliberate in the use of the term "farmers" to encourage archaeologists to confront the implications that having been consistent food producers would have for understanding these ancient populations—as well as getting us to go beyond the rather simple theoretical "driver" of a major shift in subsistence systems as underpinning the cultural change from the Middle Woodland to Late Woodland periods (see also Wymer 2003).

However, in a series of more recent publications, Yerkes (2002, 2005, 2006) raised a number of criticisms centered on the implications and conclusions I have drawn from the paleoethnobotanical data as well as the settlement system model

outlined by Dancey, Pacheco, and myself (Dancey 1991; Dancey and Pacheco 1997; Pacheco 1996, 1997, 2010; Pacheco and Dancey 2006). Yerkes's disagreement apparently hinges on a circuitous misunderstanding of the basic principles about the domestication process and the nature of the horticultural system represented by the Eastern Agricultural Complex,[1] as well as how we view Hopewell sedentism. In addition, he also apparently misattributes concepts to our writings and model not espoused nor advocated in our work—such as inexplicably segueing, in the midst of discussing his summation of some of our research, strongly worded statements that the Ohio Hopewell had not been chiefdoms (as if somehow this assertion had ever been made in our publications). He notes that, for example, "There were no Hopewell merchant princes sustained by agricultural surpluses" (Yerkes 2002:227) and "Consumption of domesticated plants does not transform the Ohio Hopewell into farmers, and the construction of elaborate ceremonial and mortuary features does not make them a chiefdom" (2002:227). A later publication comments that "The Ohio Hopewell did not establish sedentary agricultural chiefdoms" (2005:259)—apparently confusing our discussions about Hopewell settlements and sedentism with "sedentary agricultural chiefdoms."

Yerkes's distress focuses on the degree of the importance of the Complex cultigens in the Hopewell diet as well as, at the same time, questioning the very "domesticated" nature of the cultigens—as if the first argument is not successful (how much of the Hopewell diet is based upon the Eastern Agricultural Complex?) then apparently the 'back-up" argument that these plants do not represent "true" agricultural domesticates can be utilized. For example, Yerkes frequently asserts that "... There is no evidence that domesticated plants were staples in the diets of the Ohio Hopewell societies or that the Ohio Hopewell invested substantial amounts of labor in food production activities" (Yerkes 2006:61) rather claiming that "... [t]he weedy cultigens were supplements to the wild nuts, plants, fish, and game that supported the Hopewell ..." (Yerkes 2006:57).[2] Interwoven within such assertions is a continuing misunderstanding of the concept of "cultigens" and plant domestication. Yerkes consistently utilizes the term "weedy" as an adjective preceding the term "cultigen" or "domesticates"—in simple text as well as publication headings, subheadings, and table/chart/figure descriptors (see, for example, Yerkes 2002, 2005, 2006).

His comments give the impression that we should be suspicious that these taxa actually represent a [weedy] wolf in [domesticated] sheep's clothing (actually the technical definition of a "weed" is simply a plant growing where it is not wanted—although ruderal annuals do tend to have a similar suite of life history characteris-

tics). He has stated, in fact, that "… [n]o one has demonstrated that these native weedy plants depended upon humans for their propagation" (Yerkes 2006:57) and that "… it is misleading to view these starchy, oily weeds as agricultural plants that depended upon humans for their reproduction" (2006:57)—apparently ignoring the varied data from numerous technical and archaeological sources leaving no doubt about the domesticated nature of the majority of the Eastern Agricultural Complex taxa. Yet, however, if indeed the taxa were not dependent upon human propagation, then why do some of the various EAC cultigens disappear from our biome once they were no longer grown by Native American populations (see discussions below)?

Why do these arguments seem to take such a twisted turn of logic and misconstruing of concepts? Perhaps because the idea of food production has such intimate ties to understanding the domestic sphere of the Hopewell world—and to the level of sedentism—in these societies (as well, of course, to illuminating the remarkable ceremonial and ritual lifeways of these ancient populations). It is clear that Yerkes so desperately wants the Hopewell to have been "small mobile … populations that used wild foods to meet most of their subsistence needs" (Yerkes 2005:246) since this forms the theoretical core to understanding the built environment of the Hopewell. He comments, for example, that "… elaborate mound or earthwork-based ceremonial complexes may have been necessary to integrate" these small wandering populations (Yerkes 2005:246). He views earthwork construction and the concomitant rituals as a "… way of integrating the dispersed members of these mobile tribal societies" (Yerkes 2005:259). Thus, scattered Hopewell populations, because they by necessity maintained a mobile lifeway (since they had to travel to various places to procure seasonally abundant food sources), needed a mechanism (building earthworks and participating in larger social rituals) to prevent social isolation (Yerkes 2005:259). However, this would have been an issue for earlier pre-Hopewell foraging societies who seemed to have managed their social isolation without utilizing the "trappings" (ritual centers; trade networks) found for Hopewell populations. Ironically, during the time Yerkes was publishing his series of critiques, Paul Pacheco and I, joining forces with Jarrod Burks, had moved on to a series of excavations in Ross County, Ohio focusing on Hopewell archaeology.

EXPLORING THE CORE

> *"… many Hopewell scholars simply cannot accept, nor perhaps recognize, the signatures of the domestic sphere of Hopewell life. It seems that these ancient peoples are doomed forever to wander as lost primordial waifs within the ghostly forests of the past, only becoming 'real' in the moment of sacred activities. …"* [*Wymer 2016:534*]

In the intervening years since the 1996 publication, I have continued paleoethnobotanical analyses of organic materials from a large number of North American sites from Paleoindian to Historic time periods, although focusing largely on Ohio Hopewell assemblages. Thus, I have analyzed organic materials from the surface of a large number of Hopewell copper artifacts from noteworthy ceremonial contexts (Wymer 2001, 2002, 2004, 2006a), to flotation samples from Lynott's recent excavations at Hopeton (Wymer 2006b) as well as Greber's reassessment and summary of several excavations conducted at the Seip earthwork (Wymer 2009). All of these Hopewell analyses and evaluations have been conducted against a backdrop of ongoing fieldwork and organic analysis in Egypt, from 2004 to 2012, at the Mendes site in the Delta and a number of tombs adjacent to the Valley of the Kings. This research, analyzing materials from the early Dynastic to the Roman era has introduced me to the incredible complexity of large-scale household studies and ceremonial lifeways from a very different part of the globe.

However, it has been the partnership of Paul Pacheco, Jarrod Burks, and myself—three individuals with different skill sets and specializations yet similar backgrounds in studying Ohio Hopewell settlement systems—that has proven extremely fruitful for amassing a large dataset of paleoethnobotanical samples from Hopewell habitation localities (as well as our more recent excavations of ceremonial sites). Thus, this chapter will largely focus on the materials from the Harness Farm Project sites (Brown's Bottom #1 and Lady's Run) as well as our ongoing excavations at the Balthaser Home site, located in adjacent Pickaway County—with insights also noted from our 2012 excavations at the Hopewell Mound Group—Datum H ceremonial encampment (Pacheco et al. 2013; Wymer 2013; see also Pacheco et al., this volume). Please note that the paleoethnobotanical analyses are still ongoing for the Lady's Run and Balthaser Home sites, and that this particular chapter will focus upon key elements of the results that directly impact the central core of the arguments about the Hopewell as food producers—future publications will focus on a detailed description and assessment of the paleoethnobotanical database for each individual site. In addition, other researchers (see, for example, Patton, this volume as well as Weaver et al. 2011) are starting to generate a rich and insightful database for Hopewell (and earlier periods) paleoethnobotany outside the "core" region for these remarkable ancient peoples.

As previous publications have summarized, the Brown's Bottom #1 and Lady's Run sites undoubtedly represent adjacent household units that may have been part of the same settlement that included three structures, interior and exterior work

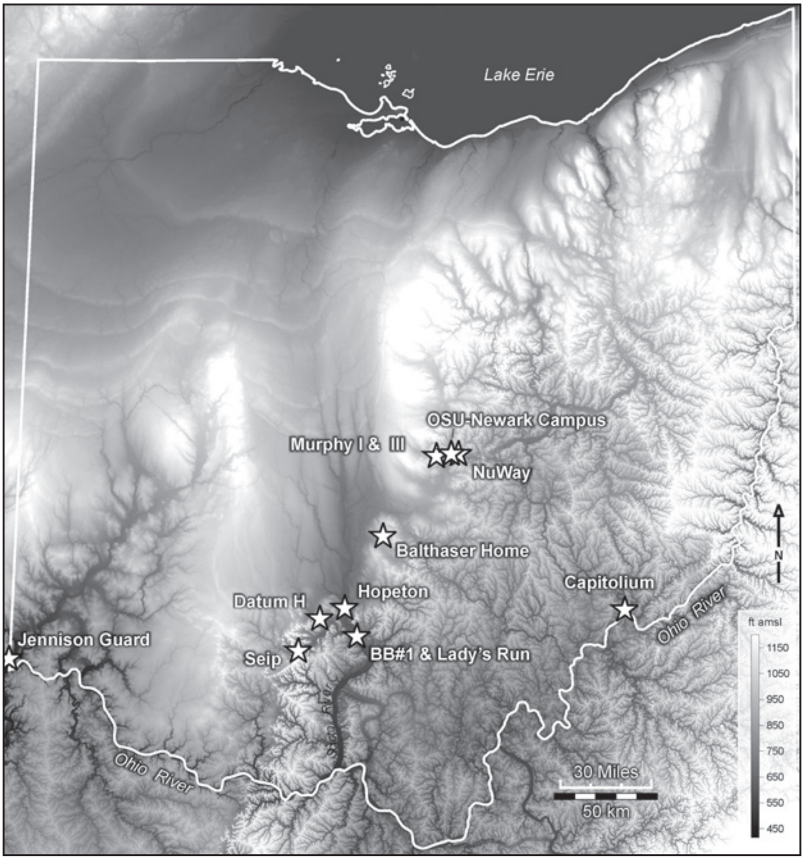


Figure 1. Site locations mentioned in text (map created by Jarrod Burks).

spaces, and secondary refuse (*midden*) filling parts of a drainage channel sweeping behind the structures (Kanter et al. 2015; Pacheco et al. 2005, 2006, 2009a, 2009b; Steinhilper and Wymer 2006; Wymer 2011; and Pacheco et al., this volume). Excavations are currently ongoing for the Balthaser Home site, but initial work suggests a largely single-component Hopewell habitation site, overlooking a tributary of Walnut Creek, with radiocarbon dates ranging from circa AD 230 to 400, and at least one structure (Snyder and Johnson 2016; Figure 1).

As of the writing of this chapter, several AMS dates have been returned directly dating several samples of domesticated *Chenopodium* specimens from several Balthaser site features (see below). All sites have produced a dense and diverse suite of characteristic Hopewell artifacts, from ceramics to lithics, as well as a rich paleo-

ethnobotanical database. The sites share the same range of features, from large pits (some of which match the characteristics of features assumed to represent "earth ovens") to post molds, although, not surprisingly, the larger and apparently more intensely occupied sites of Brown's Bottom #1 and Lady's Run have the greatest diversity of feature types (see Table 1).

Table 1. Flotation Samples Context, Number of Samples, and Liters from Project Sites.

Sites	No. of Features/ Contexts	No. of Samples	No. of Liters
Datum H	12	29	143
Pits/Earthovens	4	14	69
Posts	6	6	29
Refuse/Midden	1	7	35
North Trench	1	2	10
Balthaser	5	27	127.5
Pits/Earthovens	3	24	112
Refuse-filled posts	2	3	15.5
Brown's Bottom #1	54	105	515
Interior Posts	6	6	30
Structure main posts/porch	20	24	120
Interior pits	8	12	57
Exterior basins	9	18	86
Exterior earthovens	8	40	197
Burial contexts	3	5	25
Lady's Run	8	22	107
Structure 1 interior features	2	7	30
Structure 2 interior features	4	7	38
Exterior Features	1	3	14
Midden	1	5	25
Totals	***79***	***183***	***892.5***

At this stage of the analysis, a total of 79 features, 183 samples, and just over 892 liters have been analyzed—well over a two-fold increase in feature, sample, and sample volume sizes from the previous 1996 publication. Gratifyingly, a sig-

nificant number of the samples are from site contexts that would be expected to reflect disposal of food waste and food-processing debris—large pit features and midden deposits filled with secondary refuse sediments. In addition, several of what appear to be main structural support posts (internal) at the Balthaser Home site were filled with a high density of what appear to be secondary refuse material, such as ceramic sherds, mica fragments, lithic debris, and charred plant material, and thus were selected for prompt analysis and are included in this summation of the Balthaser samples (see Table 1).

FLOTATION SAMPLE ANALYSIS RESULTS

The paleoethnobotanical assemblage from the sites' flotation samples reveal an overarching similarity of identified materials, as well as distinctions in density and diversity—both of which are undoubtedly linked to differences in sample sizes, contexts, and occupation intensity (Table 2).

Table 2. Summary of Materials from Project Sites.

Material	Count	Weight (g)	Count/liter	Grams/liter
Wood Charcoal				
Datum H	—	21.93	—	0.153
Balthaser	—	33.93	—	0.266
B.B. #1*	—	64.61	—	0.19
Lady's Run	—	5.54	—	0.052
Nutshell				
Datum H	852	8.82	5.96	0.07
Balthaser	4181	60.22	32.79	0.472
B.B. #1*	1846	38.84	5.43	0.114
Lady's Run	3156	54.98	29.5	0.514
Seeds/Achenes				
Datum H	1173	—	8.2	—
Balthaser	1316	—	10.32	—
B.B. #1*	582	—	1.71	—
Lady's Run	417	—	3.9	—

Material	Count	Weight (g)	Count/liter	Grams/liter
Squash Rind				
Datum H	14	0.05	0.098	0.003
Balthaser	17	0.03	0.13	0.0002
B.B. #1*	38	0.03	0.11	0.00006
Lady's Run	23	0.04	0.215	0.0004
Unid. Organic				
Datum H	166	1.39	11.6	0.01
Balthaser	128	0.86	1	0.0067
B.B. #1*	231	1.74	0.68	0.005
Lady's Run	80	0.67	0.75	0.0063

*Density calculations for the Brown's Bottom #1 site excludes the post mold data.

A total of nearly 133 grams of wood charcoal and just over 163 grams of charred nutshell (representing over 10,000 fragments) were recovered from the flotation samples included in this analysis. In addition, the flotation samples also produced 3,550 carbonized seeds or achenes and 95 squash rind (*Cucurbita pepo* var. *ovifera*) fragments. These tabulations, of course, do not represent the entire range of interesting materials recovered from the sites since specimens collected during excavation ("macro" specimens) are excluded from these tables. Nor are the subtle nuances of the nature of some of the specimens encapsulated in the "dry" and sometimes overwhelming statistics/numbers represented in table or chart form (see discussions below).

Densities across the four sites do range significantly for nutshell weights and seed counts although squash rind and wood charcoal indices are more alike (see Figures 2 and 3).

Of perhaps greater importance, however, is the similar nature—especially among the domestic localities—in terms of a "typical" sample from refuse contexts, as well as the character of the taxa that compose the wood, nutshell, and seed assemblages. For example, samples from large pit features filled with secondary refuse and midden (refuse catchment) areas would typically contain moderate to high amounts of wood charcoal and processed (shattered) nutshell fragments (often from several different nut genera), small fragments (circa 1 mm in size) of charred squash rind, moderate numbers of a variety of carbonized seeds (with members of the Eastern Agricultural Complex dominant—see discussions below), minor traces of heavily burned and

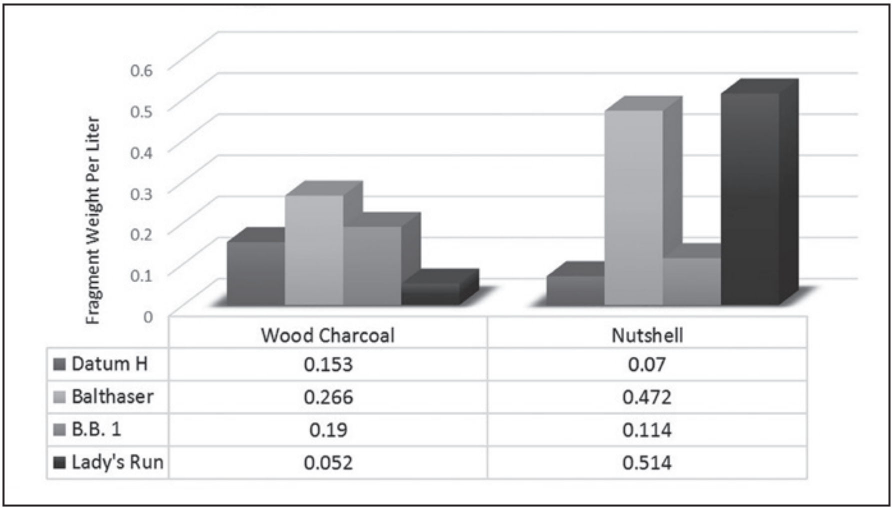


Figure 2. Comparision of the nutshell and wood charcoal densities (fragment weight per liter) for the Datum H (Hopewell Mound Group), Balthaser Home, Brown's Bottom #1, and Lady's Run sites.

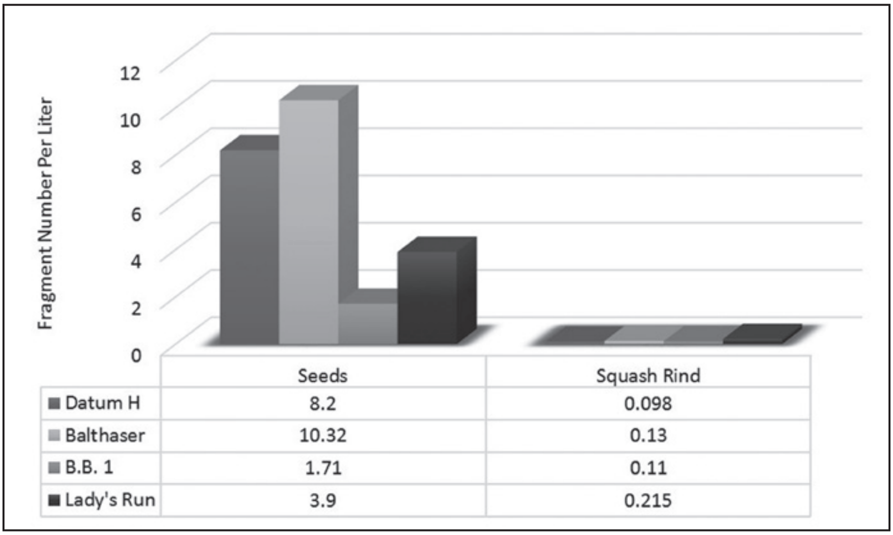


Figure 3. Comparision of the seed assemblage and squash rind densities (specimen number per liter) for the Datum H (Hopewell Mound Group), Balthaser Home, Brown's Bottom #1, and Lady's Run sites.

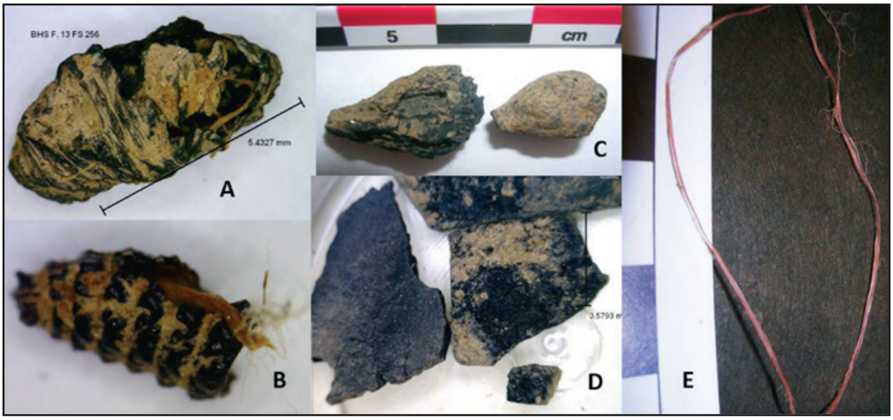


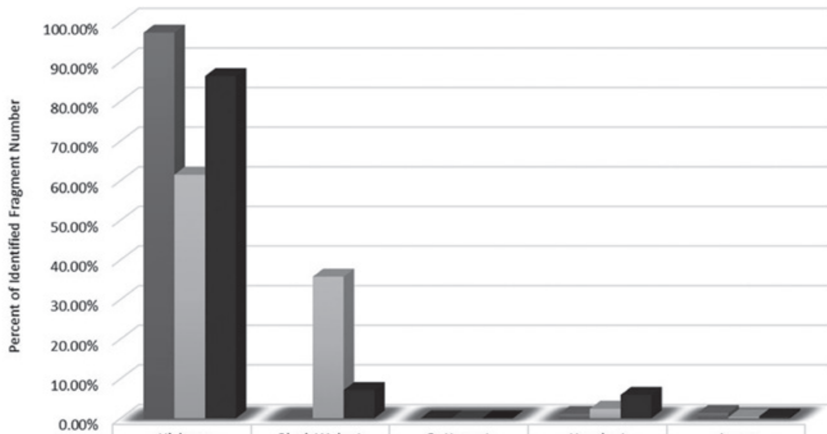
Figure 4. Photographs of (A and B) charred acorn weevil (*Curculio*) larvae from the Balthaser Home site; (C) charred spring tubers from the Datum H site; (D) large fragments of squash rind recovered during excavations from the Datum H site; (E) processed and possibly dyed fiber fragment from pelvic area of male burial from the Brown's Bottom #1 site.

unidentifiable organic/botanical debris, nutmeat, burned fruit fragments, and occasionally more unusual charred material (such as honey locust pod debris from the Brown's Bottom #1/Lady's Run midden area, carbonized spring tubers, or the burned acorn weevil grubs from several of the Balthaser flotation samples; Figure 4).

The Nutshell and Wood Charcoal Assemblages. For our habitation sites, the nutshell assemblage is remarkably similar, reflecting the local forest composition of the sites' surrounding environment augmented with yields from a monitored human-modified landscape (Figure 5).

The thick-shelled hickories (*Carya* spp.) are always dominant (at least pignut—*Carya glabra*, and shagbark—*C. ovata* varieties have been verified), followed by walnuts (especially *Juglans nigra*—black walnut) in the bottomland sites. Hazelnut (*Corylus americana*) is likewise universally present, followed by traces of acorn (*Quercus* spp.—several nearly complete specimens from the Balthaser Home site were recovered during excavation). Nutshell was also quite common in the flotation samples from the Datum H site (with nearly 22 grams recovered), and hickory was the most common nut type identified, followed by black walnut and hazelnut.

The degree of human modification to the immediate sites' environs is most clearly mirrored in the taxa identified in the wood charcoal assemblages—and also illustrates perhaps better than any other single component the distinction between the larger and more densely occupied sites on the bottoms (Brown's Bottom #1 and Lady's Run) with the smaller (and likely fewer people) Balthaser Home site (Table 3).



	Hickory	Black Walnut	Butternut	Hazelnut	Acorn
Balthaser n=3040	97.37%	0.16%	0.03%	1.09%	1.35%
B.B. 1 n = 1034	61.51%	35.78%	0	2.42%	0.29%
Lady's Run n=2362	86.41%	7.15%	0	5.93%	0.51%

Figure 5. Comparison of nutshell types (percent of identified nut taxa by fragment number) for the Balthaser Home, Brown's Bottom #1, and Lady's Run sites.

Table 3. Identified Wood Charcoal Assemblages for the Project Sites.

Taxa	Balthaser			Brown's Bottom #1			Lady's Run		
	Count	Weight(g)	%	Count	Weight(g)	%	Count	Weight(g)	%
Acer (maple)	—	—	—	13	0.77	4.47%	2	0.02	2.41%
Carya (hickory)	97	5.06	61.39%	21	2.1	7.22%	—	—	—
Fraxinus (ash)	4	0.12	2.53%	—	—	—	—	—	—
Gleditsia triacanthos (honey locust)	—	—	—	3	0.31	1.03%	3	0.12	3.61%
—possible honey locust	—	—	—	9	0.18	3.09%	—	—	—
Gymnocladus dioicus (Kentucky coffee tree)	—	—	—	9	0.3	3.09%	—	—	—
Gled/Gymno	—	—	—	83	5.85	28.52%	8	0.12	9.64%
Gled/Gymno/Robinia	—	—	—	11	0.57	3.78%	—	—	—
Gled/Gymno/Celtis (hackberry)	—	—	—	5	0.07	1.72%	9	0.19	10.84%
Juglans (walnut)	—	—	—	49	2.85	16.84%	—	—	—
Liriodendron tulipfera (tulip tree)	—	—	—	—	—	—	—	—	—

Taxa	Balthaser			Brown's Bottom #1			Lady's Run		
	Count	Weight(g)	%	Count	Weight(g)	%	Count	Weight(g)	%
Morus (mulberry)	—	—	—				8	0.13	9.64%
Pinus (pine)	—	—	—	4	0.05	1.37%			
—conifer	—	—	—	2	0.02	0.69%			
Plantanus occidentalis (sycamore)	—	—	—	15	0.99	5.15%	7	0.23	8.43%
Populus deltoides? (cottonwood)	—	—	—	—	—	—	1	0.02	1.20%
Quercus—Oak TOTAL	*38*	*3.58*	*24.05%*	*14*	*0.69*	*4.81%*	*7*	*0.17*	*8.43%*
Quercus—sp. (oak—general)	22	2.54	13.92%	6	0.07	2.06%	1	0.02	1.20%
Quercus—red group	6	0.4	3.80%						
Quercus—white group	10	0.64	6.33%	8	0.62	2.75%	6	0.15	7.23%
—white oak-chestnut (Castanea)	19	0.94	12.03%	—	—	—	—	—	—
Robinia pseudoacacia (black locust)	—	—	—	19	1.32	6.53%	6	0.27	7.23%
Robinia/Morus	—	—	—	13	1.83	4.47%	28	0.57	33.73%
Ulumus (elm)	—	—	—	3	0.07	1.03%	1	0.02	1.20%
—Ulmaceae	—	—	—	15	0.7	5.15%	—	—	—
Vitis (grape)	—	—	—	3	0.02	1.03%	3	0.04	3.61%
Totals for Identified Specimens	196	13.28		305	19.38		90	2.07	

Tree taxa indicative of regrowth of disturbed or open forest situations, such as honey locust (*Gleditsia triacanthos*), black locust (*Robinia pseudoacacia*), Kentucky coffeetree (*Gymnocladus dioicus*), and mulberry (*Morus*) are extremely common in the wood charcoal assemblage from both the Brown's Bottom #1 (54.29 percent of the identified wood charcoal fragment specimens) and Lady's Run sites (at 74.69 percent). Taxa more typical of bottomland species, such as maple (*Acer*), walnut (*Juglans*), sycamore (*Plantanus occidentalis*), and elm (*Ulmus*) are also represented in the identified wood specimens from the sites—along with the "classic" fuelwood types of hickory (*Carya*) and oak (*Quercus*). The Balthaser Home site, however, reveals a nearly complete dominance by hickory and oak (85.44 percent by fragment number; Table 3). The identified wood charcoal taxa from the Datum H site was dominated by oak and hickory, followed by elm and maple (*Acer*), and a few fragments

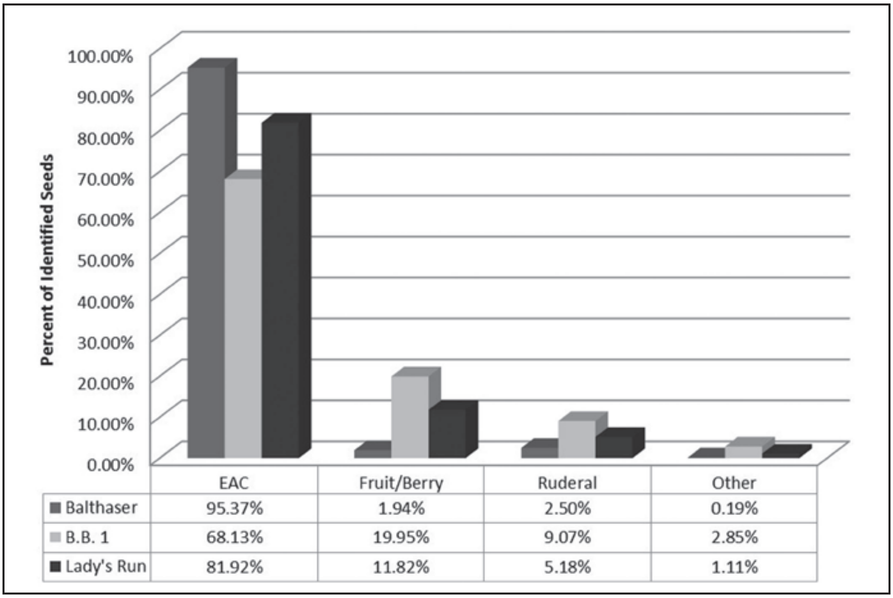
of walnut, tulip tree (*Liriodendron tulipfera*), black locust (*Robinia pseudoacacia*), and ash (*Fraxinus*).

The Seed/Achene Assemblages. The greatest complexity in the paleoethnobotanical material from the sites is found in the carbonized seed assemblages (Table 4; Figures 6 and 7).

Table 4. Identified Seed Assemblages from Project Sites.

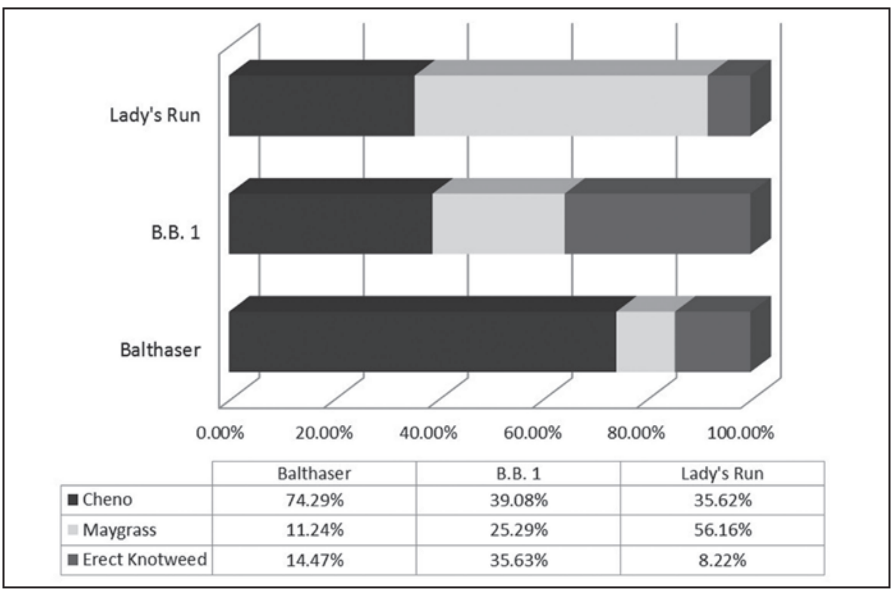
Carbonized Seed Taxa	Balthaser		Brown's Bottom #1		Lady's Run		TOTALS	
Eastern Agricultural Complex	Count	%	Count	%	Count	%	Count	%
Chenopodium—Goosefoot	*760*	*70.31%*	*102*	*26.42%*	*78*	*28.78%*	*940*	*54.09%*
Cheno.—thin-testa	482	44.59%	40	10.36%	46	16.97%	568	32.68%
Cheno.—thick-testa	26	2.41%	20	5.18%	11	4.06%	57	3.28%
Cheno.—unid.	252	23.31%	42	10.88%	21	7.75%	315	18.12%
Phalaris (maygrass)	115	10.64%	66	17.10%	123	45.39%	304	17.49%
Polygonum erectum (erect knotweed)	148	13.69%	93	24.09%	18	6.64%	259	14.90%
Hordeum pusillum (little barley)	—	—	—	—	1	0.37%	1	0.06%
Iva (sumpweed)	5	0.46%	2	0.52%	1	0.37%	8	0.46%
Helianthus (sunflower)	2	0.19%	—	—	1	0.37%	3	0.17%
Iva/Helianthus	1	0.09%	—	—	—	—	1	0.06%
Nicotiana (tobacco)	—	—	3	0.78%	—	—	3	0.17%
possible *Nicotiana*	—	—	1	0.26%	—	—	1	0.06%
Fruit/Berry								
Vitis (grape)	—	—	25	6.48%	3	1.11%	28	1.61%
Gleditsia triacanthos (honey locust)	4	0.37%	17	4.40%	18	6.64%	39	2.24%
Celtis (hackberry)	—	—	19	4.92%	2	0.74%	21	1.21%
Rubus (raspberry)	3	0.28%	—	—	—	—	3	0.17%
Rhus (sumac)	3	0.28%	1	0.26%	1	0.37%	5	0.29%
Sambucus (elderberry)	8	0.74%	2	0.52%	5	1.85%	15	0.86%
Frageria (strawberry)	3	0.28%	—	—	—	—	3	0.17%
Morus (mulberry)	—	—	8	2.07%	—	—	8	0.46%
Vaccinium (deerberry)	—	—			1	0.37%	1	0.06%

Carbonized Seed Taxa	Balthaser		Brown's Bottom #1		Lady's Run		TOTALS	
Eastern Agricultural Complex	Count	%	Count	%	Count	%	Count	%
Unid. Large fruit testa	—	—	4	1.04%	2	0.74%	6	0.35%
Unid. Fruit pit/stone	—	—	1	0.26%	—	—	1	0.06%
Ruderal								
Galium (bedstraw)	1	0.09%	7	1.81%	3	1.11%	11	0.63%
Portulaca (purslane)	2	0.19%	8	2.07%	—	—	11	0.63%
Phytolacca (pokeweed)	—	—	3	0.78%	1	0.37%	4	0.23%
Plantago rugellii (plantain)	2	0.19%	1	0.26%	—	—	3	0.17%
Silene? (catchfly)	—	—	1	0.26%	—	—	1	0.06%
Hedeoma (pennyroyal)	—	—	1	0.26%	—	—	1	0.06%
Polygonum spp. (knotweed)	—	—	1	0.26%	2	0.74%	3	0.17%
Grasses:								
Poaceace—general	5	0.46%	3	0.78%	—	—	8	0.46%
Panicum (panic grass)	15	1.39%	3	0.78%	4	1.48%	22	1.27%
Unid. Graminae (grass)	—	—	2	0.52%	—	—	2	0.12%
Echinochloa muricata (barnyard grass)	1	0.09%	—	—	—	—	1	0.06%
Cheno/Amaranth	1	0.09%	—	—	2	0.74%	3	0.17%
Compositae (aster family)	—	—	3	0.78%	—	—	3	0.17%
Unid. Mint (Labitae) family	—	—	—	—	1	0.37%	1	0.06%
Small legume	—	—	2	0.52%	1	0.37%	3	0.17%
Other								
Smilacina (false Solomon's seal)?	—	—	1	0.26%	—	—	1	0.06%
Naja/Juncus (rush family)	—	—	4	1.04%	—	—	4	0.23%
possible Cyperaceae	—	—	—	—	3	1.11%	3	0.17%
Unid. Type A	—	—	2	0.52%	—	—	2	0.12%
Mollugo	2	0.19%	—	—	—	—	2	0.12%
Unidentified	6		1		3		10	
Unidentifiable	229		257		143		629	
TOTALS	1316		644		417		2377	



	EAC	Fruit/Berry	Ruderal	Other
Balthaser	95.37%	1.94%	2.50%	0.19%
B.B. 1	68.13%	19.95%	9.07%	2.85%
Lady's Run	81.92%	11.82%	5.18%	1.11%

Figure 6. Comparison of the identified seed assemblages (seeds grouped by environmental and economic grouping) for the Balthaser Home, Brown's Bottom #1, and Lady's Run sites.



	Balthaser	B.B. 1	Lady's Run
Cheno	74.29%	39.08%	35.62%
Maygrass	11.24%	25.29%	56.16%
Erect Knotweed	14.47%	35.63%	8.22%

Figure 7. Comparision of the prevalence of goosefoot (*Chenopodium*), maygrass (*Phalaris caroliniana*), and erect knotweed (*Polygonum erectum*) among the high-carbohydrate Eastern Agriculture Complex cultigen assemblages for the Balthaser Home, Brown's Bottom #1, and Lady's Run sites.

Diversity indices are high for all sites, with the various taxa grouped into economic/environmental categories of members of the Eastern Agricultural Complex (representing cultivated species), specimens representing fruits/berries, *ruderal* (taxa of more recently disturbed soils), and a catchall category of "Other" (Table 4). There is some crossover with the wood charcoal assemblage (i.e., honey locust specimens and grape—these specimens could thus represent incidental carbonization of these seeds during the burning of firewood rather than from collected fruits) and some of the specimens placed in the Fruit/Berry category (such as honey locust, grape, sumac [*Rhus*], and raspberry [*Rubus*]) could as readily be placed in the Ruderal grouping but these broad categories do clearly indicate some significant trends and patterns. For example, in all cases members of the Eastern Agricultural Complex, especially the high-carbohydrate "starchy" species—goosefoot (*Chenopodium*; verified *Chenopodium berlandieri* ssp. *jonesianum*), maygrass (*Phalaris caroliniana*), and erect knotweed (*Polygonum erectum*)—are the most prominent taxa in the sites' seed assemblages, followed to a much lesser extent by the other economic/environmental groups (Figure 6). In fact, the EAC species account for 87.46 percent of all identified seeds from all three sites (Balthaser, Brown's Bottom #1, and Lady's Run) combined (Table 4), ranging from 68.13 percent at the Brown's Bottom #1 site, to 81.92 percent at the Lady's Run site, and to a high of 95.37 percent in the identified seed assemblage from the Balthaser Home site (Figure 7). Members of the EAC also dominated the seed assemblage for the Datum H samples, composing just over 69 percent of all identified specimens, followed by fruit/berry types (12 percent—dominated by elderberry), and taxa from disturbed environments (just over 17 percent).

Verified domesticated goosefoot, erect knotweed, and maygrass has been recovered from all three habitation sites (Table 4). Carbonized sumpweed (*Iva annua*) achenes or kernel fragments are also represented at all sites, while sunflower (*Helianthus annuus*) kernels have been identified in flotation samples from the Balthaser and Lady's Run sites. A single specimen of little barley (*Hordeum pusillum*) appeared in a sample from one of the pits from inside Structure 2 from the Lady's Run site and verified tobacco (*Nicotiana* cf. *rustica*) seeds were recovered from one of the larger "earth oven" features and one of the shallower basin features excavated adjacent to the structure at the Brown's Bottom #1 site. The prominence of any one of the "starchy" EAC species does vary from site to site (Figure 7), with goosefoot ("Cheno") numerically dominant at the Balthaser Home site and to a slight degree at the Brown's Bottom #1 site—with the widest

disparity in quantities for maygrass and erect knotweed. The same pattern, both of dominance of the starchy EAC members as well as the shift in prominence of any single species of this group from site to site was also noted in the Licking County sites forming the key discussion in my 1996 publication. Maygrass was prominent in the Datum H samples (approximately 37 percent of the entire identified seed assemblage), followed by goosefoot (including domesticated forms), and erect knotweed (56 specimens). Little barley (four specimens), sumpweed (three examples), sunflower (two specimens), and possibly a single example of tobacco were also recovered.

A TALE OF PRESERVATION AND MORPHOLOGY

Qualitative data—insights generated from the careful observation and recording of features of specimen morphology and diagnostic characteristics, for example—are equally important as the quantitative data noted above. For example, at the beginning of my paleoethnobotanical career researchers had begun to confirm the archaeological presence of a domesticated (genetically adapted) variant of goosefoot—eventually designated as *Chenopodium berlandieri* Moq. ssp. *jonesianum*-based primarily on the morphological characteristics of testa/pericarp (seed "coat") and seed/fruit shape and size (Asch D. and N. Asch 1977, 1985a, 1985b; Asch and Hart 2004; Fritz 1993, 1997; Fritz and Smith 1988; Gremillion 1993, 1996, 2003; Smith 1984, 1985a, 1985b, 1987, 1989, 2006; Smith and Cowan 1987; Smith and Fritz 1987; Smith and Funk 1985). A clear timeline pattern emerged of the first onset of incipient domestication circa 4000–3500 BP, with increased changes (larger seeds, and thinner, reduced, or absent testa) documented for a number of Middle Woodland sites, with final changes to a pale-testa and/or naked form in the Late Woodland circa 1200 BP (although research also reveals that the domestication process was not even across the entire region of eastern North America—see Gremillion 1993). However, recent investigations of archived collections reveal that the "hyperdomesticated" or pale-testa cultigen form of *Chenopodium* is now documented far earlier than expected—recovered from the Riverton site at circa 3800 BP (Smith and Yarnell 2009; Yarnell 2004). The verification of the domesticated variant of *Chenopodium* was aided by the unusual preservation conditions at this site which yielded uncarbonized specimens and thus "... the complete loss of the hard, black outer epiderm ... leaves only the thin, translucent inner epiderm layer through which the white perisperm can be observed" (Smith and Yarnell 2009:6565).

For paleoethnobotanists in the midst of analyzing laboratory samples from archaeological sites, an immediate identification and assessment of carbonized *Chenopodium* specimens into "domesticated" or "cultigen" forms is readily based upon close examination of the testa/pericarp thickness (hence the "thin-testa" and "thick-testa" category in Table 4) as well as the overall shape and size of the endosperm—IF specimen preservation permits such an identification. Thus, examination of the *Chenopodium* assemblage from the Balthaser, Brown's Bottom #1, and Lady's Run sites reveals that the majority of the specimens exhibited the thin-testa and endosperm shape attributable to the domesticated *C. berlandieri* ssp. *jonesianum* (Table 4). This same pattern was also noted in the goosefoot seeds/fruits from the Datum H site.

However, a significant number of the *Chenopodium* examples had been placed in the "Cheno-unid." category (unidentifiable to thin or thick testa forms) because the fragile and often paper-thin testa is missing (which can occur in the carbonization, preservation, and flotation/laboratory processing or if the specimen may never originally have had a testa—such as the "hyper-domesticated" pale/naked testa forms). I had begun to suspect a number of years ago that some of the carbonized goosefoot specimens that had been recovered during our more recent excavations may represent not just the thin-testa cultigen form of *Chenopodium* but may indeed be examples of the pale/absent testa morph (Chia-"like") of the "hyper-domesticated" variant of this taxon. Unfortunately, it has been impossible to differentiate between testa absence versus testa loss due to the carbonization process and preservation conditions for the material from our Hopewell sites—until now.

The Balthaser Home site has revealed an unexpected bonus of many samples with unusually well-preserved, and numerous, charred seed specimens and in at least one context an extremely rare preservation situation (Figure 8).

We recovered from the very bottom of one of our large pit features (filled with secondary refuse of "typical" Hopewell domestic debris) approximately half of a large Hopewell ceramic vessel, with the broken side facing up, and the interior covered with large sherds—thus the material within the interior had been encapsulated by surrounding ceramic fragments as well as the sediment from refuse that had been thrown into the pit on top of this unique microcontextual "moment." Recognizing the potential for the recovery of well-preserved and more unusual material we carefully collected the sediment from the vessel's interior, as well as the sediment lying underneath the larger vessel wall.[3]

Figure 8. Excavation photograph of large Hopewell vessel in situ in Feature 14 from the Balthaser Home site. Note the large sherds covering the interior portion of the vessel (photograph by author).

The extra precaution proved to be prudent. The sediment contained within the vessel yielded over several hundred charred seed specimens, along with the "typical" assortment of wood charcoal (maple, hickory, oak), nutshell (hickory, acorn, hazelnut, and hazelnut nutmeat), and charred tuber and unidentifiable small stem fragments. The carbonized seed assemblage was dominated by very well-preserved goosefoot (all thin-testa where identifiable) and erect knotweed, with maygrass and two sumpweed (*Iva*) kernels. Additionally, specimens of elderberry (*Sambucus*) and strawberry (*Fragaria*) "seeds" were recovered, along with *Panicum* grass, a plantain seed (*Plantago rugelii*) and one intriguing specimen of *Echinochloa muricata* (barnyard grass; see comments below).

Examination of the *Chenopodium* revealed a number of small "clumps" or masses of the seeds burned together that are largely endosperm or embryo fragments that had been charred but in which some of the specimens exhibited

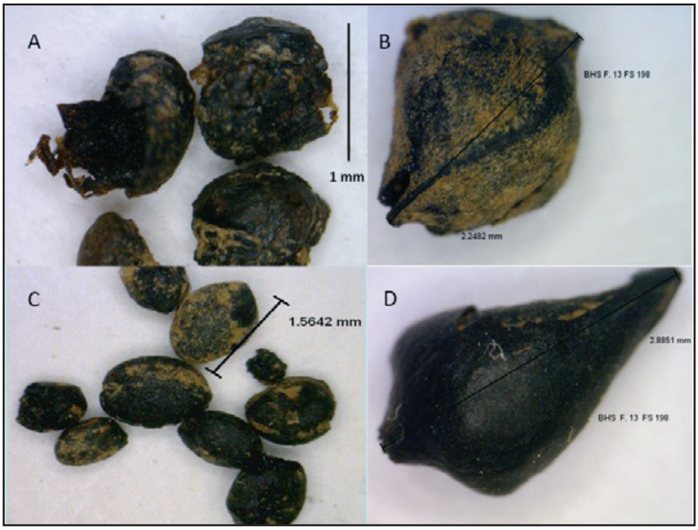


Figure 9. Seed/Achene specimens from project sites: (a) *Chenopodium* specimens from interior of vessel from Feature 14, Balthaser Home site, note the fibrous tissue-looking material on the edges of the endosperms which are uncarbonized testa; (b) maygrass specimens from interior of Feature 14 vessel; (c) *Polygonum erectum* thick-testa morph achene from Feature 13, Balthaser Home site; (d) *Polygonum erectum* slender thin-testa morph from same sample as (c).

unburned yet still intact testa fragments—and those examples produced a distinctive translucent smooth pale or reddish-colored morphology (Figure 9).

These goosefoot specimens tend to be quite large in size and, with the distinctive shape (truncate margin) of the domesticated form, undoubtedly represent verifiable highly domesticated cultivars and cultigens (see also discussion below). A selection of these domesticated *Chenopodium* specimens from this vessel yielded a direct AMS radiocarbon age of 1790 +/-23 BP (cal AD 175; cal AD 191; UGAMS 28074); domesticated *Chenopodium* specimens from the Balthaser site's Feature 87—one of the refuse backfilled post molds—returned an AMS radiocarbon age of 1860+/-24 (cal AD 90, AD 99 UGAMS 28073; Stuiver and Reimer 1993; Nolan et al. 2017).

In addition to the identification of *Chenopodium* from all three sites that exhibits the full-suite of cultivated domesticated attributes is the recovery of a distinc-

tive variant or morph of *Polygonum erectum* that has long been suspected as representing a shift to a genetically adapted cultigen. New research is substantially verifying this assessment and formally ascribing this now extinct domesticated subspecies as *Polygonum erectum* ssp. *watsoniae* (see the impressive work of Mueller 2016). Paleoethnobotanists, first noted in early work by the Aschs (Asch D. and N. Asch 1985b; Asch N. and D. Asch 1985), and confirmed by other researchers (for example, Cowan 1985; Fritz 1987, 1997; Gremillion 1993; Lopinot et al. 1991), have identified two distinctive variants for *Polygonum erectum*. These forms include a "stouter" more triangular shaped fruit ("seed") with a thick and patterned (striate-papillose) pericarp (Mueller's "tubercled morph") along with another form that is longer and slender in shape, with a larger size and distinctive thin and smooth pericarp or testa (Figure 9).

Thus, knotweed appears to mirror the "domestication syndrome" documented for *Chenopodium* and other domesticated crops (larger endosperm for faster growth, thinner pericarp or testa for immediate germination, and other such factors), although this attribution is complicated by erect knotweed's seasonally influenced growth response to produce the two distinct morphs naturally (Mueller's evolutionary bet-hedgers; see Asch D. and N. Asch 1985b; Asch N. and D. Asch 1985; and comments in Simon 2001). However, the recent work by Mueller (2016) indicates that the increase in the number of the slender, smooth, thin-pericarp forms recovered in archaeological samples is indicative of the domestication process. The timing—with the larger, slender form becoming more numerically dominate over the "wild-type" morph in at least the Middle and Late Woodland periods—also matches the increase in the appearance and domestication characteristics for the other EAC taxa.

I have identified the presence of both morphs—including the larger, smooth testa cultigen form—in samples from the Brown's Bottom #1 and the Balthaser Home sites (in fact, it is common to find both variants in the same individual samples) and, although analysis is still on-going, the slender morph appears to be slightly more dominant over the thick-walled "wild-type" form (Figure 9). Most of the specimens cannot be attributed to either form since their pericarp ("testa") is missing but I suspect, as noted above for the goosefoot specimens, that the outer seed coat is missing from these specimens because they had originally exhibited the thin and more fragile pericarp cultigen version.

The carbonized seed assemblage from the Balthaser Home site also revealed another unexpected revelation. The maygrass specimens from the site, especially

those from the vessel sample which yielded the intriguing well-preserved *Chenopodium* examples noted above, exhibited what appears to be perhaps slightly larger sizes than is typical for this taxon (Figure 9). Although this research is currently on-going, and thus sample numerics for seed sizes have not yet been systematically generated, preliminary examination revealed carbonized seed lengths for some specimens around the 1.5 mm to 2 mm length (as well as apparently thicker "girth" or widths/diameters)—charred *Phalaris caryopses* ("seeds") tend to range around the 1.3 to 1.5 mm length. At the least the sizes of these specimens caught my attention in displaying a characteristic that seems to be outside the range of my normal experience with archaeological specimens of EAC *Phalaris* in eastern North America—and I have sorted, identified, and analyzed undoubtedly thousands of carbonized *Phalaris caroliniana* caryopses in my lifetime thus far. Johannessen (1981, 1984), in samples from the Mississippian Julian site in Illinois also noted what appears to be increased caryopsis size for some of the maygrass from that site.

What is significant about this observation is that, as several authors have noted, maygrass is perhaps, until now, the only cultigen of the EAC that has not revealed any observable, recognizable morphological characteristics demonstrative of the genetic shift to a domesticate (such as increase in seed size or pericarp/testa changes documented for goosefoot, erect knotweed, sunflower, or sumpweed). Cultigen status for this taxon has been based upon the archaeological pattern of its recovery from sites, which includes its prehistoric presence in locales far outside the natural growth range for this species, as well as its co-occurrence with the other EAC members (Asch D. and N. Asch 1985b; Asch and Hart 2004; Chapman and Shea 1981; Cowan 1978, 1985; Crites and Terry 1984; Fritz 2014; Johannessen 1984, 1993; Wymer 1992, 2003; Wymer and Abrams 2003; Yarnell and Black 1985). In fact, Yarnell (1969, 1974, 1993) identified numerous maygrass specimens in the human coprolites from the noteworthy Salts Cave project—certainly proof at least of dietary importance.

One well-accepted suggestion for the lack of changes in grain size or morphology has been the apparent harvesting practice of pulling up entire maygrass bundles as evidenced by dissected examples from several rockshelters (perhaps to allow for the drying of the grains in the massed florets for ease of winnowing the grain free from the tightly enclosing glumes; see discussions in Cowan 1978, 1979; Cowan et al. 1981; Fritz 2014; Gremillion 2004) thus averting inadvertent seed selection for larger sizes (although the more recent understanding that seed size increases may also reflect germination and seedling growth competition

within the garden/field space could impact this original conjecture—see discussion below). If the larger grain size for *Phalaris* at the Balthaser Home site proves to be a real and significant trait for this assemblage, the implications are profound. In addition I have also documented that a number of the maygrass grains from the Balthaser Home site exhibited traces of attached (and also carbonized) glumes (the enclosing floret parts—or chaff—found in grasses) and at least one specimen with parts of an intact floret still extant—typically maygrass "seeds" are found "naked" with only the quite distinctive ovoid grain or caryopsis recovered. All of this does suggest the possibility that maygrass may have been undergoing a different husbandry practice or regimen within the Ohio Hopewell garden system.

WHAT DOES THIS ALL MEAN?

The Ohio Hopewell paleoethnobotanical database, though much enriched and augmented since the 1996 publication, essentially reveals the same patterns, trends, and basic observations outlined in the original treatise. This more recent research also reveals that there is a greater degree of similarity, I would propose, between the central Ohio "core region" and east-central Ohio (Newark region) archaeobotanical assemblages than there are differences (and the same statement would also apply to the databases for Illinois and Ohio Hopewell as well). The paleoethnobotanical record reflects the Hopewell populations' sophisticated and wide-ranging food procurement strategy—one geared towards utilization of natural gathered resources from local environs, including intact dense primary forests, as well as the collection and processing of material from the more human-modified and manipulated biome. In fact, Caldwell's (1958, 1965) seminal concept of "Primary Forest Efficiency" is perhaps more than apt in this regard, although a more appropriate term in today's theoretical parlance may be "Primary Ecosystem Efficiency" (Pacheco 1996; Pacheco and Dancey 2006; Wymer 1996, 1997). All of this, however, had been based upon a stable foundation of food production.

Recent archaeological exploration and excavation, utilizing new technologies (such as LiDAR and magnetometry) and new theoretical insights all disclose the incredible and very deliberate impact that Hopewell populations had upon their landscape (e.g., Burks and Cook 2011). This impact plays out not only in terms of their large scale, and smaller, ceremonial centers but also in their everyday lives lived within their small scattered horticultural hamlets. Land was cleared for substantial residential structures, outside work spaces were created for craft and subsistence activities, and rough land adjacent to living spaces was shaped into garden plots. Women laughed as they collected hazelnuts from the edges of abandoned

regrown garden plots and created decoctions for the Healing Way, men grumbled to think of the days of winter chill and wondered when a brother would return from his Long Trek, and children were sent to spend time in the new gardens in summer to keep the crows and raccoons at bay.

FROM THE GARDEN AND THE FIELD . . .

One significant advancement, however, over our initial understanding of the role of cultigens within Hopewell subsistence and settlement strategies over the past several decades hinges upon elucidating and understanding the unique selection pressures and environment of the garden itself. Understanding Hopewell food production has only been possible with insights generated by new research into the origins of the EAC and plant husbandry within North America—which combines a more nuanced treatment and exploration of archaeobotanical material from Early Woodland sites as well as an expanded analytical "toolkit" (i.e., genetic research, AMS dating technologies, and new chemical assays) and a more sophisticated appreciation for the coevolutionary relationships between people and their resources. It is now clear that some selected Early Woodland (and even earlier) populations in Ohio and other areas utilized some members of the EAC (especially the high-carbohydrate taxa)—an initial first experimentation into the food production process if you will. The rind of domesticated squash has also been found in these sites and Rafferty's (2002, 2004, and 2006) research on Early Woodland/Adena pipes suggests that tobacco was perhaps grown or at least traded into these regions. These "Incipient Crop Complex" (Abrams and Patton 2015; Patton, this volume; Patton and Curran 2016) seeds are typically found in fairly low quantities and only just beginning to exhibit some of the characteristics of archaeologically observable domestication morphology (but this verification of this first shift in the domestication process is critically important). The full suite of the "domestication syndrome" morphological changes (see Mueller 2016) is not yet evident and most certainly not to the extent found in specimens from later Hopewell (Middle Woodland) sites. In addition, there is a rather dramatic increase in the number of cultigens ("seeds" and rind), along with the typical presence of all species of the EAC for the latter time period. This trend also continues for the early villages of the Late Woodland timeframe.

What I find most compelling are the "hyperintensified" morphological changes indicative of domesticated status that I have documented above for the EAC specimens, especially for goosefoot and erect knotweed from our Ohio Hopewell sites—a clear indicator of the increasing intensification of these populations' plant

husbandry practices (with a possible temporal threshold somewhere around AD 300). The morphological changes we view as indicative of the genetic shift towards domestication, such as the increase in seed size, reduced or absent "seed coats" (pericarp/testa/surficial waxes), as well as a number of other characteristics (such as floral maturation sequencing) are not necessarily (even principally?) due to deliberate human selection behaviors on the plants themselves (see Mueller 2016). Rather, these changes emerged due to intense competition among the seedlings themselves that can only come about within a human-created ecosystem—the garden and field. Seeds that germinate first (having reduced germination inhibitors such as thinner testa) and grow the quickest (larger endosperms that serve as food for the growing seedling) become established sooner than their less genetically "gifted" brethren—dominating garden soil and space. And additional factors favoring human attention and care (ease of harvesting and processing) add another element to the domestication process. Thus, what I see in our Ohio Hopewell paleoethnobotanical assemblages clearly indicates that this process had been well underway within these ancient societies. In fact, contrary to Yerkes's (2006) assertion noted above that the EAC taxa are not "true cultigens" because they were not dependent upon humans for their "propagation," recent genetic analysis of a number of the EAC cultigens (such as goosefoot) confirms that the archaeological specimens were fully domesticated species—distinct from extant "wild" forms and Mexican cultivars, and reflecting an indigenous, local domestication process (Blackman et al. 2011; Kistler and Shapiro 2011; Smith 2006).

A final indicator of the degree of selection pressures that must have been occurring within the Hopewell human-mediated environment is a concept that has been receiving increasing attention in today's agricultural and ecological research—that of crop mimicry (Vavilovian mimicry; McElory 2014). Vavilovian mimicry occurs as a coevolutionary strategy on the part of weedy invaders of agricultural fields when, to adapt to unintended selection factors caused by various human plant husbandry practices, some weed species begin to "mimic" the plant size, growth characteristics, or flower/color pattern found for crops—or find ways to "hide" among the crops (Barrett 1983; Ellstrand et al. 2010; Gugliemini et al. 2007; and see the seminal work of Harlan 1965, 1982). The specific mimicry depends upon the nature of harvesting and processing techniques—for example, if the crop from a field is hand-scythed at a foot above ground level any weeds that mature below that size may remain to eventually scatter their seeds in the post-harvested land (or, in a similar manner, some individual weed plants may be taller than average and thus

get picked up with the harvested crops to have their seeds—if similar to the crops—inadvertently collected and re-sown in the next year's agricultural cycle).

One of the best studied, and clearest examples, of this mechanism, interestingly, has been found for the *Echinochloa* genus—specifically *E. crus-galli* (barnyard grass) and other *Echinochloa* varieties—in traditional Japanese rice fields in which this grass evolved a variant that mimics the rice plant and rice grain (Ehara and Abe 1952; Barrett 1983; Barrett and Wilson 1981). Many species of grasses—such as *Panicum* and the *Poa* groups—have also been documented to shift their phenotypic characteristics to "hide" from mechanical weeding/harvesting technologies. It is only recently, first found in samples from the Datum H Hopewell Mound Group site, that I have identified *Echinochloa muricata* in Ohio sites—this species has a consistent presence in Illinois and Wisconsin sites (Asch D. and Asch N. 1985b; Simon 2001). Originally termed Gramineae Type 6F before being definitely identified to taxon, a number of paleoethnobotanists suggest that this grass species represents an economically utilized plant or one adapted to invading gardens and cleared areas. In fact, Smith and Yarnell (2009) go so far as to suggest that the reason that the thick-testa "weedy" *Chenopodium* specimens are found in paleoethnobotanical assemblages dominated by the domesticated thin-testa *Chenopodium* is that the "wild" form specimens are actually non-domesticated invaders of the goosefoot crop plots (thus, in essence, also exhibiting crop mimicry). We may thus be seeing evidence of crop mimicry or phenotypic shifts due to human plant husbandry techniques in our Hopewell paleoethnobotanical assemblages—a distinctive sign of increased selection pressures within a human-created microenvironment.

... TO THE FRONT DOOR ...

Food production, not surprisingly, also has strong implications for the sociological realm of the human condition. Food producers are characterized by nearly universal characteristics comprehensively documented in the archaeological record—in all regions with a well-studied sequence of sites that reveal the shift from non-agricultural subsistence lifeways to that of farming, from the Old World to the New World, residential places and residence spaces changed in a nearly identical manner. Habitation locales for settled communities became increasingly organized, with well-differentiated private and public spaces, with dedicated areas for specific tasks, with locations for garbage, and with paths and trails for movement and access (Binford 1990; Murdock and Wilson 1972). And in nearly every case personal residences—households and houses—shift from circular/oval to rectangular/square

in shape (profound cultural patterns demonstrated and recognized yet still not thoroughly explained; Feather 1996; Flannery 1972, 2002; McGuire and Schiffer 1983; Rapoport 1969; Whiting and Ayres 1968). So too our Hopewell populations mirror these changes recognized for food producers worldwide.

Finally, there is simply no argument among paleoethnobotanical specialists in the field about whether the Hopewell were food producers or that cultigens were an important component of their diet. The terms and phrases of "pre-maize husbandry," "crop husbandry practices," "indigenous crop complex," "prehistoric agriculture," and "food production economies" abound within the published paleoethnobotanical literature for this time period, and prehistoric culture, for eastern North America (see, for example, Asch and Hart 2004; Ford 1985; Gremillion 1996, 2004; Johannessen 1993; Scarry 2008; Smith 1989, 1992, 2006; Smith and Yarnell 2009; Watson 1985, 1988, 1989).

. . . AND BEYOND . . .

For over a generation now, from those paleoethnobotanical practitioners with "boots on the ground," to researchers conducting laboratory and field experiments, and to individual scholars gifted at the creation of theoretical and/or regional syntheses, the attribution of food-production to these Middle Woodland populations has been corroborated, verified, and well-documented. Questions still do remain, not surprisingly, about the specific nature of the "crop husbandry practices" (*sensu* Scarry 2008) for Hopewell gardeners, with discussions about "scale" (Fritz 2000; Smith 1992) and that ". . . [in] some times and in some places, the plots in which Native Americans raised indigenous crops may have been quite modest. At other times and in other places they were probably expansive" (Scarry 2008:398). I would argue that cultigens were an important component of the subsistence lifeways for the Ohio Hopewell populations that I have documented thus far. The shift to food production, in this region and timeframe, regardless of the horticultural details, would have had a significant impact on the psychological, sociological, and practical elements of Hopewell society. Cleared/worked land would have had a different import for raising families and creating the Houses of a Thousand Years—and established spaces can create bases from which to cast a far-viewing eye towards a distant land that holds strange red-eyed birds or western mountains with unusual deer sporting long curved horns. Connections are woven among scattered small settlements and somehow ties had been created between adjacent and far-flung river valleys. The implications generated from recognizing that the Hopewell were food-producers can be utilized to segue a more nuanced exploration of how this

remarkable culture emerged, functioned, and ultimately shifted into Late Woodland village societies. Indeed, I would hope that "another Hopewell conference in twenty years will find some of the above questions answered—as well as sparking a new set of inquiries" (Wymer 1996:49).

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NOTES

1. I find it quite interesting, and perhaps insightful, that although Yerkes has tried to cast doubt upon the status of the Eastern Agricultural Complex taxa as "true" cultigens and that they had been domesticated—and the role they played in the Ohio Hopewell diet—he appears to be silent about the data and the interpretation for this suite of plants from Illinois Hopewell sites.

2. Yerkes is absolutely correct when he discusses the Eastern Agricultural Complex as representing something quite distinct from later field agriculture based upon maize husbandry, and that the shift in crops, crop practices, and intensity of production is a continuum from Middle Woodland into Late Woodland and into the Late Prehistoric period—this is exactly the major point that formed the core of my earlier disseration and is the main theme in all of my publications.

3. This is truly where the Old World met the New World—the method we utilized to document and excavate the Hopewell vessel in Feature 14 at the Balthaser Home site was inspired by a microcontextual approach and technique I had created to handle processing two foundation deposits we uncovered at a new temple excavation at Mendes, Egypt in 2010 and 2012. The foundation deposits were filled with small ceramic vessels used in rituals before the deposits, honoring the creation of the temple, were placed at the corners of the temple's foundation. We photographed each layer as it was exposed, printed the photograph, numbered each vessel on the photograph in the field, and carefully brought each vessel (with intact contents) into my laboratory to sieve through the sediment—thus recovering preserved beeswax, date and fig seeds, and other such offerings.

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