Lamb Site Archaeobotanical Remains: Reconstructing Early Mississippian Plant Collection and Cultivation in the Central Illinois River Valley

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Archaeobotanical samples from the Lamb site (11SC24) provide an opportunity to examine early Eveland phase (A.D. 1100–1150) plant subsistence in the central Illinois River valley (CIRV). We discuss the range of plant resources exploited by the Lamb site residents as well as seasonality and site occupation. We also consider the role of maize in Eveland phase subsistence economies. The Lamb site archaeobotanical data indicate the rapid adoption of maize in the Eveland phase CIRV, although site residents continued to rely on a diverse array of native plant taxa.

The primary goals of the Lamb site (11SC24) archaeobotanical analysis are to document the range of plant resources exploited by early Eveland phase (A.D. 1100–1150) inhabitants of the central Illinois River valley (CIRV) and to evaluate the role of maize in Eveland phase subsistence economies. A secondary goal of the archaeobotanical analysis is to make inferences regarding seasonality and site occupation at the Lamb site. Speculations about Eveland phase subsistence economy have largely been made in the absence of systematically collected data. With a couple of exceptions (Kuehn and Blewitt 2013; VanDerwarker et al. 2013), regional scholars have made generalizations about Mississippian subsistence strategies based on earlier Late Woodland trends or have offered comparisons to the American Bottom or other regions of Mississippian occupation. We present the results of the Lamb site macrobotanical analysis in detail and report plant data in a manner that will allow for future synchronic and diachronic comparison to other CIRV and American Bottom sites as more data become available.

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Methods

The archaeobotanical analysis that follows includes the identification, tabular summation, and discussion of carbonized botanical remains retrieved from the site. As is typical with analyses of open-air sites in the Southeast and Midwest, only carbonized plant remains are considered. The Lamb site flotation samples were collected and floated as part of the 1990 salvage excavations and curated at Western Illinois University until they were transferred to the University of California, Santa Barbara (UCSB) for analysis in 2008. Plant data were recovered from 14 flotation samples (total soil volume = 85 liters) (Table 1). Although soil samples collected were not uniform in volume, volume was recorded for each sample and reported here, so this source of variation can be controlled for. Of the 14 samples collected, eight samples were recorded as collected from five specific features (Table 1). The remaining samples were also collected from features; however, the excavators did not record specific provenience data for these samples.

All flotation samples contained a light and heavy fraction; although sorted separately, the data were combined for reporting and analysis. Samples were weighed and sifted through 2.0-mm, 1.4-mm, and 0.7-mm standard geologic sieves. All carbonized plant remains were removed and sorted from the 2.0-mm sieve using a stereoscopic microscope (10–40X). All taxa not identified in the 2.0-mm sieve, as well as maize cupules and acorn nutshell, were removed and sorted from the 1.4-mm sieve, as these taxa tend to fragment into smaller pieces. Only seeds were removed from the 0.7-mm sieve and the pan.

Botanical remains were identified with reference to a seed identification manual (Martin and Barkley 1961) as well as the modern comparative collection housed in the Integrative Subsistence Lab (ISL) at UCSB. All plant specimens were identified to the lowest possible taxonomic level. If identification was probable but not definite, then specimens were recorded as cf. (e.g., "maize cupule cf."). If taxonomic identification was not possible (some remains lacked diagnostic features or were too highly fragmented), then the specimens were recorded as generally unidentifiable, unidentifiable seeds, and unidentifiable seed fragments. While included in the overall assemblage counts as unidentified (UID), these remains were excluded from further analysis. Once sorted and identified, analysis of plant specimens included the recording of counts, weights (in grams), portion of plant (e.g., maize kernel vs. cupule), provenience, and volume of soil floated. Wood was weighed but not counted, and no wood analysis was conducted. Generally, seeds were counted but not weighed, as weights of singular specimens were usually below 0.01 g. Measurements were taken on complete maize kernels and cupules as part of a separate project (VanDerwarker et al. 2016).

Beyond the reporting of counts and weights, plant data are quantified using ubiquity, density measures, and standardized counts (Godwin 1956; Hubbard 1975, 1976, 1980; Miller 1988; Popper 1988; Scarry 1986; Willcox 1974). Counts and weights may reflect differential preservation, sampling, or various other factors. Denser plants such as nutshell will yield higher weights, and some plants will yield higher counts by nature

Table 1. Provenience Data for Plant Samples.

Area	Feature Number	Plan Shape	Length (m)	Width (m)	Depth (m)	Volume (m^3)	Surface Area (m^2)	Profile Shape	Function	Sample Volume (L)	Wood Weight (g)	Total Plant Weight (g)
1	5	Circular	1.4	1.2	0.7	2.0	1.3	Vertical wall/flat base	Storage	5	7.9	8.0
1	8	Circular	1.6	1.6	0.6	1.7	1.3	Basin	Not classified	10	0.2	0.2
1	9	Circular	0.8	0.8	0.7	2.3	1.9	Vertical wall/flat base	Storage	7	0.3	0.4
1	10	Circular	1.8	1.6	1.7	9.5	2.2	Vertical wall/flat base	Cooking	15	1.5	3.6
1B[a]	1									13	6.6	7.7
NP[b]										35	31.9	32.7
Total										85	52.6	48.4

[a]Metric/profile data not recorded for this feature.
[b]No provenience information recorded.

of producing more seeds. Standardizing counts can correct for these biases and can be used to assess the relative abundance of plants at the site.

Archaeobotanical Remains

The Lamb site's samples yielded a total carbonized plant weight of 52.6 g, 48.4 g of which are represented by wood charcoal (Table 2). Excluding wood, the Lamb assemblage contains 1,396 specimens representing 24 taxonomic categories. Ubiquity values (or percentage presence) indicate that maize (*Zea mays*) and hickory (*Carya* spp.) were identified in all samples (Table 3). Other highly ubiquitous taxa include goosefoot (*Chenopodium berlandieri*), purslane (*Portulaca* spp.), and grass family seeds (Poaceae). The 100 percent ubiquity value of maize indicates a focus on maize production at the Lamb site, and confirms speculations of this particular subsistence strategy in the region during the Eveland phase.

To assess the relative importance of different plant resources at the site, we group the plants into categories of non-native cultigens (including maize), nuts, fruits, starchy/oily seeds, edible wild seeds, and miscellaneous seeds. There is some variability in the densities of the different plant groups that does not appear to be related to seasonality of occupation, as discussed further below. An evaluation of density measures (counts divided by soil volume) and standardized counts (counts divided by total plant weight) of different taxa groups at the site (Table 2) reveals the importance of non-native cultigens (primarily maize, as bottle gourd represents a very small contribution to the assemblage) relative to other types of plants, followed by nuts, and then other resources (including fruits, other native cultigens, and wild plants).

In the discussion that follows, we consider more closely the uses of plants within the various categories of identified plants (for detailed discussion and summaries of individual taxa, see D. Asch and N. Asch 1985; Green 1994; Scarry 2003; Yarnell and Black 1985). We draw on plant use data from the nearby American Bottom for qualitative comparisons; in contrast to the paucity of subsistence data available for Eveland phase sites, archaeological investigations of American Bottom sites in southwestern Illinois have produced the best archaeobotanical record for any area in the Eastern Woodlands (Scarry 2003:85; Simon and Parker 2006; see Johannessen's 1984 analysis of the extensive flotation series from Mississippian sites in the American Bottom excavated in the FAI-270 highway salvation projects). King (1984:40) points out that the general similarities between the plant foods of counties throughout Illinois suggest that extensive changes in subsistence would not have been necessary for indigenous groups moving about the region for purely environmental reasons *per se*. Although there are differences in the abundance and ripening periods of some resources, the basic set of resources is much the same from area to area (Scarry 2003:56).

Table 2. Inventory of Plants Identified at the Lamb Site.

Common Name	Taxonomic Name	N	Weight (g)[a]	Density (n/l)	Standardized Count[b]
Non-Native Cultigens					
Maize cob fragment cf.	*Zea mays* cf.	10	0.05	0.12	0.001
Maize cupule	*Zea mays*	631	1.84	7.42	0.035
Maize cupule cf.	*Zea mays* cf.	28	0.06	0.33	0.001
Maize kernel	*Zea mays*	171	0.73	2.01	0.014
Maize kernel cf.	*Zea mays* cf.	25	0.02	0.29	
Squash	*Cucurbita pepo*	3	0.04	0.04	0.001
Squash/gourd rind cf.	*Cucurbita/Lagenaria* sp. cf.	1		0.01	
Mean				1.46	0.007
Nuts					
Acorn cf.	*Quercus* spp. cf.	1		0.01	
Acorn	*Quercus* spp.	8		0.09	
Hazelnut	*Corylus americana*	5		0.06	
Hickory	*Carya* spp.	172	1.04	2.02	0.020
Walnut	*Juglans nigra*	4	0.24	0.05	0.005
Walnut family	Juglandaceae	10	0.03	0.12	0.001
Mean				0.39	0.004
Fruits					
Nightshade	*Solanum* spp.	3		0.04	
Plum/cherry	*Prunus* spp.	2	0.01	0.02	
Sumac	*Rhus* spp.	1		0.01	
Mean				0.02	
Starchy/Oily Seeds					
Chenopod	*Chenopodium* spp.	33	0.01	0.39	
Chenopod cf.	*Chenopodium* spp. cf.	1		0.01	
Knotweed/smartweed	*Polygonum* spp.	60	0.07	0.71	
Knotweed/smartweed cf.	*Polygonum* spp. cf.	1		0.01	
Little barley	*Hordeum pusillum*	7		0.08	
Maygrass	*Phalaris caroliniana*	5		0.06	
Sumpweed	*Iva annua*	5	0.01	0.06	

Table 2. Continued.

Common Name	Taxonomic Name	N	Weight (g)[a]	Density (n/l)	Standardized Count[b]
Sumpweed/Sunflower	*Iva/Helianthus*	1		0.01	
Mean				0.17	
Edible Wild Seeds					
Bedstraw	*Galium* spp.	1		0.01	
Purslane	*Portulaca* spp.	85		1.00	
Tick clover	*Desmodium* spp.	2		0.02	
Tick clover cf.	*Desmodium* spp. cf.	5		0.06	
Vetch cf.	*Vicia* spp. cf.	1		0.01	
Mean				0.22	
Miscellaneous					
Carpetweed	*Mollugo* spp.	1		0.01	
Cheno/am	*Chenopodium/Amaranthus*	1		0.01	
Grass family	Poaceae	41		0.48	
Mallow family	Malvaceae	1		0.01	
Morning glory cf.	*Ipomoea* spp. cf.	1		0.01	
Panic grass	*Panicum* spp.	3		0.04	
Panic grass cf.	*Panicum* spp. cf.	39		0.46	
Ragweed	*Ambrosia* spp.	1		0.01	
Ragweed cf.	*Ambrosia* spp. cf.	1		0.01	
Mean				0.12	
Unidentified		23			
Unidentified seeds and fragments		123	0.08		

Note: cf. = probable but uncertain identification
[a]Plant weight recorded if more than 0.01 g.
[b]Standardized counts not calculated if plant weight was insufficient to merit a result.

Table 3. Ubiquity of the Lamb Site Plants in Descending Order (top five taxa, wood charcoal excluded).

Common Name	Taxonomic Name	N	Ubiquity (%)
Maize	*Zea mays*	865	100.0
Hickory	*Carya* sp.	172	100.0
Purslane	*Portulaca* sp.	35	50.0
Chenopod	*Chenopodium berlandieri*	85	35.7
Grass family	Poaceae	42	28.6

Non-Native Cultigens

Maize, which assumed primary dominance as a food resource during the Mississippian period in the American Bottom, makes up the most substantial part of the non-native cultigens at the Lamb site (and for the entire plant assemblage). Most of the maize remains represent inedible fragments: 80.6 percent are cupules, 18.3 percent are kernels, and 1.2 percent are cob fragments[1]. Complete maize kernels recovered from flotation samples indicate crescent-shaped flint kernels. Of 170 maize kernels identified, 11 were complete enough to record measurements of length, width, and thickness in micrometers (Table 4). Transporting maize on the cob is inefficient (Emerson et al. 2007:88); Lamb residents likely grew and harvested maize close to the site, processing it on site and storing it for winter, and ultimately discarding the inedible cob fragments and cupules. Cucurbits, the only other non-native cultigen aside from maize, are represented at the site by only one small possible bottle gourd rind fragment and a squash or gourd seed. Curcurbits do not appear to represent a particularly valued resource at the Lamb site, although their low representation may be a result of preservation bias. Aside from their technological uses, squash and gourd fruits are edible when eaten young (i.e., before the rind has hardened), and thus may be less likely to be charred and preserved in archaeobotanical assemblages.

Nuts

Charred nutshell was present in all of the samples. Hickory (*Carya* spp.) dominates the assemblage; the meats of these nuts would have provided a rich source of oil and protein for the Lamb site inhabitants. Hickory is regarded as the most frequently recovered nut type in the nearby American Bottom (Emerson et al. 2007:84; see also Johanessen 1984; Scarry 2003). The nutritious, abundant, and easily processed hickory nut was likely a dietary staple for the Lamb residents, with inedible nutshell portions intentionally discarded and burned or added to fires as a source of fuel. Small quantities of other nuts, including acorn (*Quercus* spp.), black walnut (*Juglans nigra*), and hazelnut (*Corylus* spp.) were also identified, consistent with Late Woodland nut use in the American Bottom reported by Johannessen (1984:202). Acorn would have provided a

Table 4. Metric Data for Complete Maize Kernels Recovered from Flotation Samples.

Site Area	Feature	Weight (g)	Length (µm)	Width (µm)	Thickness (µm)
1B	NP[a]	0.06	4,081.6	6,288.3	5,395.4
1B	13	0.07	5,229.6	6,581.6	4,808.7
1B	13	0.11	6,020.4	8,469.4	5,102.0
1B	13	0.12	6,377.6	8,699.0	5,420.9
1B	13	0.06	4,311.2	7,066.3	3,890.3
1B	13	0.08	4,196.4	8,826.5	5,102.0
1B	13	0.06	3,469.5	7,359.7	3,826.5
1B	13	0.07	3,826.5	6,824.0	5,459.2
1B	13	0.09	6,581.6	8,112.2	5,688.8
1B	13	0.06	3,724.5	7,321.4	4,668.4
1B	13	0.06	4,311.2	6,670.0	5,650.5

[a]No provenience.

good source of carbohydrates (Scarry 2003:66). Although total density of acorn is low (value of 0.1) compared to hickory (value of 2.0; Table 2), this pattern may be due to differential preservation of nutshell remains; e.g., the fact that acorn is more likely to fragment and turn to ash than a denser nutshell such as a hickory (Lopinot 1984:134). Walnut and hazelnut are also present in low quantities in the Lamb samples; the low quantity of hazelnut in the Lamb assemblage is perhaps unsurprising, as hazelnut has only been found in small amounts in Late Woodland and Mississippian nutshell assemblages from the American Bottom FAI-270 flotation series.

Fruits

Fruits represent a minimal component of the Lamb site plant assemblage, likely due to preservation issues. The types represented, including sumac (*Rhus* spp.), nightshade (*Solanum* spp.), and a member of the genus *Prunus* (likely wild plum or wild cherry), and overall low abundance may not reflect the entire range of fruit consumption by the Lamb inhabitants. Small seeds of fleshy fruits are less likely to be recovered in archaeological assemblages as they are often consumed in their entirety with the fruit, such as strawberries (*Fragaria* spp.) and blueberries (*Vaccinium* spp.). The recovered fruit seeds are all available in the local vegetation, and there are many known uses for each, either as food, beverages, medicines, or dyes.

Starchy/Oily Seeds

Members of the starchy-seed complex, including goosefoot (*Chenopodium* spp.), knotweed/smartweed (*Polygonum* spp.), maygrass (*Phalaris caroliniana*), little barley (*Hordeum pusillum*), along with oily seeds sunflower (*Helianthus annuum*) and sumpweed

Table 5. Metric Data for Complete Sunflower (*Helianthus annuum*) and Sumpweed (*Iva annua*) Seeds Recovered from Flotation Samples.

Site Area	Feature	Taxon	Length (μm)	Width (μm)
1	10	Sunflower	3,725.1	1,704.8
1	10	Sunflower	3,481.6	1,588.6
1	10	Sumpweed	4,760.2	3,060.9
1	10	Sumpweed	4,577.5	2,833.8
1	10	Sumpweed	4,577.5	2,944.7
1	10	Sumpweed	3,453.9	1,981.6

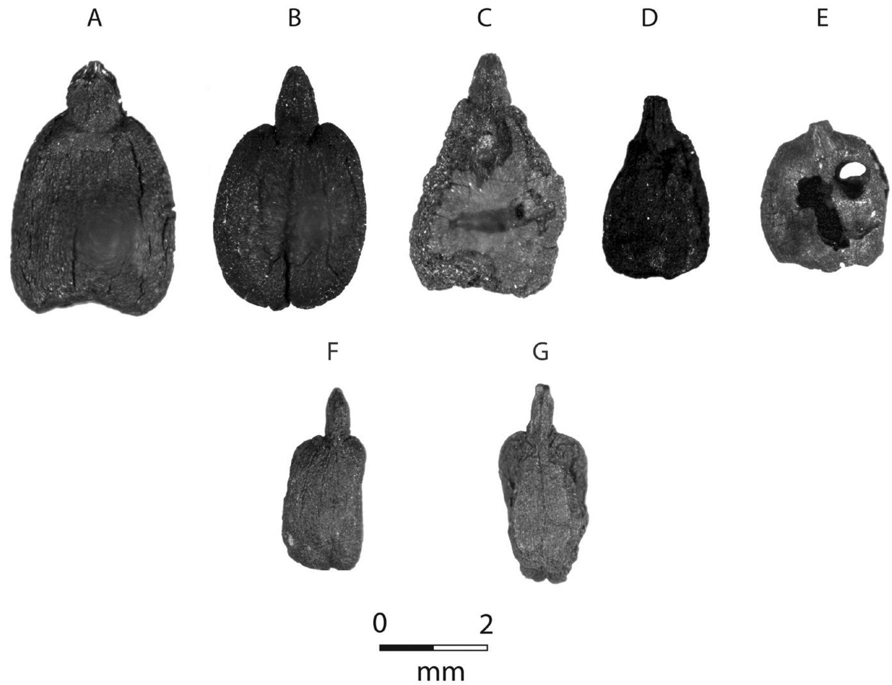

Figure 1. Oily seeds, including sumpweed (**Iva annua*****) (A-E) and sunflower (*****Helianthus annuum*****) (F-G).***

(*Iva annua*), are found in modest quantities in the Lamb site samples. Two sunflower seeds and four sumpweed seeds were complete enough to recover metric data (length and width) in micrometers (Table 5). All of these oily seeds lacked seed coats entirely (Figure 1). The knotweed seeds are not consistent with morphological indicators for erect knotweed (*Polygonum erectum*); the Lamb site *Polygonum* specimens were directly compared with confirmed samples of erect knotweed from the West Park site, Illinois (samples provided courtesy of Dr. Gayle Fritz, Washington Univeristy, St. Louis). The Lamb site goosefoot seeds that still had attached seed coats were more consistent with wild forms based on inspection of cross-sectional margins (see images in Smith 1985).

None of the seeds demonstrated the truncate margin that is consistent with domesticated specimens; that said, the majority of goosefoot seeds identified at Lamb lacked seed coats entirely. Goosefoot seeds may have been gathered from wild stands rather than sown in monocrop plots; the practical necessities of sowing and harvesting small-grain plants makes them difficult to grow in mixed gardens (Johannessen 1993:68). Abundance of maygrass and little barley are low in the Lamb site assemblage. This pattern is perhaps unsurprising; Emerson et al. (2005) document the paucity of these cultigens north of the American Bottom proper, and the late Eveland phase (A.D. 1150–1200) C.W. Cooper site in the CIRV evinces similar low densities of maygrass and little barley (VanDerwarker et al. 2013).

Edible Wild Seeds

The Lamb site samples generally contain a low amount of edible wild seeds. The most numerous seed type in the group is purslane (*Portulaca* spp.). Purslane stems, leaves, and flower buds are all edible; the leaves would have been eaten raw throughout the growing season as salad greens (Moerman 1998:434). The remaining small weed seeds, including bedstraw (*Galium* spp.), tick clover (*Desmodium* spp.), and vetch (*Vicia* spp.), have known economic uses; alternatively, they may represent incidental inclusions.

Miscellaneous Seeds

With the exception of grasses, the remaining miscellaneous seeds are all low in abundance. The relatively high abundance of grasses, including panic grass (*Panicum* spp.) and grass family seeds classified under the broad rubric of Poaceae, is noteworthy. There is debate in the literature as to whether the presence of grasses in archaeological assemblages reflects incidental deposition and charring, consumption, or other uses, such as thatching or storage pit lining (Arzigian 2000; Asch and Green 1995; Parker 2006; Voight and Mohlenbrock 1964). Although grasses may represent incidental inclusions or food for consumption, a possible use at the Lamb site consistent with ethnohistoric accounts is lining for earth ovens. Indeed, the majority of grass seeds were found in L1-F10, the large, central earth oven (discussed further below); layers of grasses were likely piled over foods for steam cooking. The late Mississippian Hill Creek site in the lower Illinois Valley evinced a similar deep pit feature with several episodes of grasses and twigs lining the pit (N. Asch and D. Asch 1985; Conner 1985). The remaining miscellaneous weed seeds, represented by only one specimen each, likely represent incidental inclusions.

Context of Deposits

Small sample size precluded statistical analysis of intrasite spatial patterning, but the consideration of plant deposition by feature provides some interesting results (Table 6). L1- F10, the large, central earth oven (see Bardolph, this volume), had the most diverse

Table 6. Inventory of Plant Taxa Counts by Feature.

Common Name	Taxonomic Name	L1B-F1	L1-F5	L1-F8	L1-F9	L1-F10	Unknown	Total
Non-Native Cultigens								
Maize cob fragment cf.	*Zea mays* cf.						10	10
Maize cupule	*Zea mays*	42	2	2	9	551	38	644
Maize cupule cf.	*Zea mays* cf.	19				8	1	28
Maize kernel	*Zea mays*	67	1	13	10	14	66	171
Maize kernel cf.	*Zea mays* cf.		1		1	23		25
Squash	*Cucurbita pepo*						3	3
Squash/gourd rind cf.	*Cucurbita/Lagenaria* sp. cf.		1					1
Nuts								
Acorn cf.	*Quercus* spp. cf.		1					1
Acorn	*Quercus* spp.		7			1		8
Hazelnut	*Corylus americana*	5						5
Hickory	*Carya* spp.	37	8	1	3	80	43	172
Walnut	*Juglans nigra*						4	4
Walnut family	Juglandaceae					10		10
Fruits								
Nightshade	*Solanum* spp.						3	3
Plum/cherry	*Prunus* spp.					2		2
Sumac	*Rhus* spp.					1		1
Starchy/Oily Seeds								
Chenopod	*Chenopodium* spp.	3				26	4	33
Chenopod cf.	*Chenopodium* spp. cf.				1			1
Knotweed/smartweed	*Polygonum* spp.					60		60
Knotweed/smartweed cf.	*Polygonum* spp. cf.					1		1
Little barley	*Hordeum pusillum*					7		7
Maygrass	*Phalaris caroliniana*					5		5
Sumpweed	*Iva annua*					5		5
Sumpweed/sunflower	*Iva/Helianthus*						1	1
Edible Wild Seeds								
Bedstraw	*Galium* spp.					1		1
Purslane	*Portulaca* spp.					76	9	85

Table 6. Continued.

Common Name	Taxonomic Name	L1B-F1	L1-F5	L1-F8	L1-F9	L1-F10	Unknown	Total
Tick clover	*Desmodium* spp.					2		2
Tick clover cf.	*Desmodium* spp. cf.					5		5
Vetch cf.	*Vicia* spp. cf.						1	1
Miscellaneous								
Carpetweed	*Mollugo* spp.					1		1
Cheno/am	*Chenopodium/Amaranthus*					1		1
Grass family	Poaceae					39	2	41
Mallow family	Malvaceae					1		1
Morning glory cf.	*Ipomoea* spp. cf.					1		1
Panic grass	*Panicum* spp.					3		3
Panic grass cf.	*Panicum* spp. cf.					39		39
Ragweed	*Ambrosia* spp.						1	1
Ragweed cf.	*Ambrosia* spp. cf.					1		1
Unidentified		3			2	18		23
Unidentified seeds/seed fragments		5	4	1		111	2	123
Sample volume (L)		13	5	10	7	15	35	85
Total wood weight (g)		6.59	7.93	0.21	0.32	1.46	31.88	48.39
Total plant weight (g)		14.33	15.89	0.45	0.69	5.02	16.22	52.60

Note: cf = probable but uncertain identification.

array of charred plant material at the site. Nearly all of the starchy/oily seeds along with edible weed seeds were found in L1-F10. Subterranean cooking facilities such as earth ovens that provide moist-heat cooking are often used to prepare starchy foods, including seeds (Buikstra et al. 1987; Dering 1999; Peacock 2008; Thoms 1989, 2008; Wandsnider 1997). Gremillion (2004:226) cites work by Schlarb and Pollack (2002), who report on the analysis of the contents of an earth oven at Military Wall rockshelter in Kentucky. That earth-oven feature produced small quantities of carbonized seeds of maygrass, goosefoot, knotweed, and sumpweed, similar to the assemblage at the Lamb site (although it is not clear whether these taxa are associated with the feature's original use). Taxa present in the samples from L1-F10 at the Lamb site may be a result of incineration of seeds from foods cooking in that earth oven, vegetation used for lining or fuel, or simply remains that were discarded when L1-F10 was no longer in use as an earth oven and was ultimately converted into a refuse pit.

Seasonality and Site Occupation

Plant seasonality profiles can be used to assess the nature of plant production and collection activities as well as the nature of site occupation. A consideration of plant season of bloom, referenced from the USDA PLANTS database (U.S. Department of Agriculture 2015) indicates the collection and production of plants from April through November (Table 7). The lack of a seasonal signature from December through April is not surprising as wild plants are typically not available during the winter months, nor is winter a season for the planting or harvesting of crops. The scheduling and labor needed to collect, plant, tend, harvest, and store a diverse spectrum of plants probably meant that the site inhabitants were fairly sedentary. Given the storability of maize and nuts through the winter, we suggest that the Lamb site was likely occupied year-round. Inhabitants of the Eastern Woodlands that focused on deer (see Kuehn and VanDerwarker, this volume) may have experienced nutritional shortages in late winter and early spring due to leanness of game (Speth and Spielmann 1983). Thus, stored mast (hickory in particular) would have been an important source of dietary fat. Mast was probably more important as a stored commodity in winter and spring than as a fresh food in the fall, as it usually disappears within a few weeks from the forest floor (Gardner 1997).

The presence of several large subterranean storage pits at the Lamb site (see Bardolph, this volume) suggests that people invested in long-term food storage. VanDerwarker et al. (2013:162) document an increase in feature volume from earlier Late Woodland sites to the Lamb site. The correlation between the increase in maize and the increase in pit-feature capacity at these Early Mississippian sites suggests a linkage between increased food production and increased storage that is commonly attributed to permanent, year-round settlements. With that consideration in mind, along with the plant seasonality profile, we can speculate a longer occupation than one would expect for a specialized task group, such as a nutting or hunting camp (e.g., Fortier and Jackson 2000).

Table 7. Seasonality Profile for the Lamb Site Plant Remains.

Taxon	January	February	March	April	May	June	July	August	September	October	November	December
Maygrass				X	X	X						
Little barley					X	X	X					
Squash					X	X	X	X	X			
Bedstraw					X	X	X	X				
Purslane					X	X	X	X	X			
Plum/cherry						X	X	X	X			
Carpetweed						X	X	X				
Sumac						X	X	X	X	X		
Nightshade						X	X	X	X	X	X	
Maize							X	X	X			
Panic grass							X	X	X			
Hazelnut							X	X	X			
Sunflower							X	X	X	X		
Sweet gum							X	X	X	X		
Chenopod							X	X	X	X	X	
Knotweed/ sumpweed							X	X	X	X	X	
Tick clover								X	X	X		
Pine nut								X	X	X	X	
Ragweed								X	X	X	X	
Sumpweed									X	X	X	
Acorn									X	X	X	
Hickory										X		
Walnut										X		

Note: taxonomic list does not include probable identifications (cf.)

Summary and Discussion

The residents of the Lamb site appear to have focused on maize as a major crop and dietary staple, but supplemented their diets with the farming of native cultigens and the collection of wild nuts, fruits, and greens. Plant seasonality profiles, in combination with the presence of deep storage pits at the site, indicate that the site was likely occupied year round. Scholars (e.g., Johannessen 1983, 1984, 1985a, 1985b; Lopinot 1991; Parker 1990, 1992) have documented that people in the American Bottom intensified their agricultural efforts in the Late Woodland period, restructuring cropping strategies to move from an agricultural system based on native crops to a mixed economy in which the principle cultigen was maize (Scarry 2003:87). However, as discussed above, Mary Simon's (2014) recent reassessment of AMS and archaeobotanical data from the American Bottom and western Illinois indicates that maize did not likely play a major part in Late Woodland subsistence economies. Rather, she argues for a rapid and repeated introduction of maize in the American Bottom and western Illinois during the tenth century and beyond (Simon 2014:128). The Lamb site archaeobotanical data indicate the rapid adoption of maize in the Eveland phase CIRV. Maize is the most ubiquitous and densest taxon at the Lamb site, and the amount of maize documented at Lamb is significantly higher than in the preceding Late Woodland period (VanDerwarker et al. 2013).

Furthermore, the Lamb site residents appear to have been harvesting and processing maize at levels comparable to their Stirling phase American Bottom counterparts (Bardolph 2012). This pattern challenges uncritical links that are often made between political complexity and maize-based agriculture; assumptions have long been held that cultural groups exhibiting less complex political hierarchies must have had less stable and efficient horticultural (as opposed to agricultural) systems (Griffin 1943, 1952; Hall 1980; Willey 1966). The Lamb site data indicate that a focus on maize agriculture can take place outside of the formation of complex political institutions (see Emerson et al. 2005; VanDerwarker et al. 2013). Despite the abundance of maize at the Lamb site, its residents also relied on other starchy and oily seeds, nuts, and wild greens. Kuehn and Blewitt (2013) document a similar pattern in botanical remains from the Eveland phase features at the Tree Row and Baker Preston sites in the CIRV, with assemblages characterized by a high ubiquity of maize, low proportion of nutshell, and the presence of starchy grains and local wild seeds. Along with maize, the Lamb site residents relied on a diverse array of native species, preparing foods in a traditional Late Woodland style of cooking in communal earth ovens (see Bardolph, this volume). The Lamb site thus evinces a unique blend of Mississippian and Late Woodland influences on local CIRV foodways. The analysis of plant remains from Lamb begins to fill a gap in regional knowledge of the CIRV as well as shed light on changing subsistence practices in an era of culture contact and change.

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End Notes

[1]In general, cobs and cob fragments are less-often recovered in carbonized samples than kernels in southeastern and midwestern archaeobotanical assemblages.

References Cited

Arzigian, Constance
2000 Middle Woodland and Oneota Contexts for Wild Rice Exploitation in Southwestern Wisconsin. *Midcontinental Journal of Archaeology* 25(2):245–268.

Asch, David L., and Nancy B. Asch
1985 Prehistoric Plant Cultivation in West Central Illinois. In *Prehistoric Food Production in North America*, edited by Richard I. Ford, pp. 149–203. Anthropological Papers No. 75 Museum of Anthropology, University of Michigan, Ann Arbor.

Asch, David L., and William Green
1995 Archaeobotanical Analysis. In *Phase III Excavations at 13ML118 and 13ML175, Mills County*, Iowa, edited by Toby Morrow, pp.69–69. Contract Completion Report No. 469. Office of the State Archaeologist, University of Iowa, Iowa City.

Asch, Nacncy B., and David L. Asch
1985 Archeobotany. In *The Hill Creek Homestead and the Late Mississippian Settlement in the Lower Illinois Valley*, edited by Michael D. Conner, pp. 115–170. Research Series Volume 1. Center for American Archaeology, Kampsville, Illinois.

Bardolph, Dana N.
2012 Culinary Encounters and Cahokian Contact: Food Preparation, Serving, and Storage in the Central Illinois River Valley. Paper presented at the 69th annual Southeastern Archaeological Conference, Baton Rouge, Lousiana.

Buikstra, Jane E., Jill Bullington, Douglas K. Charles, Della Cook, Susan R. Frankenberg, Lyle Konigsberg, Joseph B. Lambert, and Liang Xue
1987 Diet, Demography, and the Development of Horticulture. In *Emergent*

Horticultural Economies of the Eastern Woodlands, edited by William F Keegan, pp. 67–85. Occasional Papers No. 7. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Conner, Michael David

1985 Site Structure and Function. In *The Hill Creek Homestead and the Late Mississippian Settlement in the Lower Illinois Valley*, edited by Michael D. Conner, pp. 193–220. Research Series Volume 1. Center for American Archaeology, Kampsville, Illinois.

Dering, Phil

1999 Earth-Oven Plant Processing in Archaic Period Economies: An Example from a Semi-Arid Savannah in South-Central North America. *American Antiquity* 64:659–674.

Emerson, Thomas E., Kristin M. Hedman, and Mary L. Simon

2005 Marginal Horticulturalists or Maize Agriculturalists? Archaeobotanical, Paleopathological, and Isotopic Evidence Relating to Langford Tradition Maize Consumption. *Midcontinental Journal of Archaeology* 31(1):67–118.

Emerson, Thomas E., Phillip G. Millhouse, and Marjorie B. Schroeder

2007 The Lundy Site and the Mississippian Presence in the Apple River Valley. *The Wisconsin Archeologist* 88(2):1–123.

Fortier, Andrew C., and Douglas K. Jackson

2000 The Formation of a Late Woodland Heartland in the American Bottom, Illinois cal A.D. 650–900. In *Late Woodland Societies: Tradition and Transformation across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 123–148. University of Nebraska Press, Lincoln.

Gardner, Paul

1997 The Ecological Structure and Behavioral Implications of Mast Exploitation Strategies. In *People, Plants, and Landscapes: Studies in Paleoethnobotany*, edited by Kristen Gremillion, pp. 161–178. University of Alabama Press, Tuscaloosa.

Godwin, Harry

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

Green, William B.

1994 *Agricultural Origins and Development in the Midcontinent*. Report 19. Office of the State Archaeologist, University of Iowa, Iowa City.

Gremillion, Kristen J.

2004 Seed Processing and the Origins of Food Production in Eastern North America. *American Antiquity* 69:215–233.

Griffin, James B.

1943 *The Fort Ancient Aspect: Its Cultural and Chronological Position in Mississippi Valley Archaeology*. Anthropological Papers 28. Museum of Anthropology, University of Michigan, Ann Arbor. (Reprinted 1966).

1952 Culture Periods in Eastern United States Archaeology. In *Archaeology of Eastern United States*, edited by James B. Griffin, pp. 352–364. University of Chicago

Press, Chicago.

Hall, Robert L.

1980 An Interpretation of the Two-Climax Model of Illinois Prehistory. In *Early Native America*, edited by David L. Browman, pp. 401–462. Mouton, The Hague.

Hubbard, R.N.L.B

1975 Assessing the Botanical Component of Human Paleoeconomies. *Bulletin of the Institute of Archaeology* 12:197–205.

1976 Crops and Climate in Prehistoric Europe. *World Archaeology* 8(2):159–68.

1980 Development of Agriculture in Europe and the Near East: Evidence from Quantitative Studies. *Economic Botany* 34(1):51–67.

Johannessen, Sissel

1983 Mississippian Plant Remains. In *The Florence Street Site (11-S-458)*, edited by Thomas E. Emerson, George R. Milner, and Douglas K. Jackson, pp. 200–2013. American Bottom Archaeology FAI-270 Site Reports Vol. 2. University of Illinois Press, Urbana.

1984 Paleoethnobotany. In *American Bottom Archaeology*, edited by Charles J. Bareis and J.W. Porter, pp. 197–214. University of Illinois Press, Urbana.

1985a Plant Remains. In *The Carbon Dioxide Site and The Robert Schneider Site*, edited by Fred Finney and Andrew C. Fortier, pp. 97–112. American Bottom Archaeology FAI-270 Site Reports Vol. 11. University of Illinois Press, Urbana.

1985b Emergent Mississippian Plant Remains. *In The Carbon Dioxide Site and the Robert Schneider Site*, edited by Fred A. Finney and Andrew C. Fortier, pp. 284–288. American Bottom Archaeology FAI-270 Site Reports Vol. 11. University of Illinois Press, Urbana.

1993 Farmers of the Late Woodland. In *Foraging and Farming in the Eastern Woodlands*, edited by C. Margaret Scarry, pp. 57–77. University Press of Florida, Gainesville.

King, Frances

1984 *People, Plants, and Paleoecology*. Scientific Papers Vol 20. Illinois State Museum, Springfield.

Kuehn, Steven R., and Rosemarie Blewitt

2013 Mississippian Faunal and Botanical Remains from the Tree Row (11F53) and Baker-Preston (11F20) Sites, Fulton County, Illinois. *Illinois Archaeology* 25:27–62.

Lopinot, Neil B.

1984 *Archaeobotanical Formation Processes and Late Middle Archaic Human-Plant Interrelationships in the Midcontinental USA*. Ph.D. dissertation, Southern Illinois University. University Microfilms, Ann Arbor.

1991 Archaeobotanical Remains. In *The Archaeology of the Cahokia Mounds ICT-II: Biological Remains*, edited by Neil H. Lopinot, Lucretia S. Kelly, George R. Milner, and Richard Paine, pp.1–268. Illinois Cultural Resources Study No. 13. Illinois Historic Preservation Agency, Springfield.

Martin, Alexander C., and William D. Barkley
1961 *Seed Identification Manual*. University of California Press, Berkeley.
Miller, Naomi F.
1988 Ratios in Paleoethnobotanical Analysis. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, edited by Christine A. Hastorf and Virginia S. Popper, pp. 72–96. University of Chicago Press, Chicago.
Moerman, Daniel E.
1998 *Native American Ethnobotany*. Timber Press, Portland, Oregon.
Parker, Kathryn E.
1990 Archaeobotany. In *Selected Early Mississippian Household Sites in the American Bottom*, edited by Douglas K. Jackson and Ned H. Hanenberger, pp. 491–497. American Bottom Archaeology FAI-270 Site Reports Vol. 22. University of Illinois Press, Urbana.
1992 Archaeobotany. In *The Sponemann Site 2: The Mississippian and Oneota Occupations*, edited by Douglas K. Jackson, Andrew C. Fortier, and Joyce A. Williams, pp. 305–324. American Bottom Archaeology FAI-270 Site Reports Vol. 24. University of Illinois Press, Urbana.
2006 Ethnobotanical Remains. In *Late Woodland Frontiers: Patrick Phase Settlement along the Kaskaskia Trail, Monroe County, Illinois*, edited by Brad Koldehoff and Joseph M. Galloy, pp. 167–176. Transportation Archaeological Research Reports No. 23. Illinois Transportation Archaeological Research Program, University of Illinois at Urbana-Champaign.
Peacock, Sandra L.
2008 From Complex to Simple: Balsamroot, Inulin, and the Chemistry of Traditional Interior Salish Pit-Cooking Technology. *Botany* 86:116–128.
Popper, Virginia
1988 Selecting Quantitative Measures in Paleoethnobotany. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, edited by Christine Hastorf and Virginia Popper, pp. 53–71. University of Chicago Press, Chicago and London.
Scarry, C. Margaret
1986 *Change in Plant Procurement and Production during the Emergence of the Moundville Chiefdom*. Ph.D. Dissertation, University of Michigan. University Microfilms, Ann Arbor.
2003 Patterns of Wild Plant Utilization in the Prehistoric Eastern Woodlands. In *People and Plants in Ancient Eastern North America*, edited by Paul Minnis, pp. 50–104. Smithsonian Institution Press, Washington, D.C.
Schlarb, Eric J., and David Pollack
2002 *An Archaeological Evaluation of the Military Wall Rockshelter (15P0282), Daniel Boone National Forest, Powell County, Kentucky*. Submitted to Red River Gorge Climbers' Coalition. Kentucky Archaeological Survey Report No. 4. Kentucky

Archaeological Survey, Lexington, Kentucky.

Simon, Mary L.

2014 Reevaluating the Introduction of Maize into the American Bottom and Western Illinois. *Midwest Archaeological Conference Inc. Occasional Papers* 1: 97–134

Simon, Mary L., and Kathryn E. Parker

2006 Prehistoric Plant Use in the American Bottom: New Thoughts and Interpretations. *Southeastern Archaeology* 25:170–211.

Smith, Bruce D.

1985 *Chenopodium berlandiersi* ssp. *Jonesanum*: Evidence for a Hopewellian Domesticate from Ash Cave, Ohio. *Southeastern Archaeology* 4:107–133.

Speth, John D., and Katherine A. Spielmann

1983 Energy Source, Protein Metabolism, and Hunter-Gatherer Subsistence Strategies. *Journal of Anthropological Archaeology* 2:1–31.

Thoms, Alston V.

1989 The Northern Roots of Hunter-Gatherer Intensification: Camas and the Pacific Northwest. Unpublished Ph.D. dissertation, Department of Anthropology, Washington State University, Pullman.

2008 The Fire Stones Carry: Ethnographic Records and Archaeological Expectations for Hot-rock Cookery in Western North America. *Journal of Anthropological Archaeology* 27:443–460.

USDA

2015 Plants Database. United States Department of Agriculture (http://plants.usda.gov). Accessed March 23, 2015.

VanDerwarker, Amber M., Gregory D. Wilson, and Dana N. Bardolph

2013 Maize Adoption and Intensification in the Central Illinois River Valley: An Analysis of Archaeobotanical Data from the Late Woodland through Early Mississippian Periods (AD 400–1200). *Southeastern Archaeology* 32:147–168.

VanDerwarker, Amber M., Allison M. Gracer, and Gregory D. Wilson

2016 Farming under Fire in the Central Illinois River Valley: Changes in Farming Strategies in Response to Intensified Warfare during the Mississippian Period. *Journal of Ethnobiology*, in press.

Voight, John W., and Robert H. Mohlenbrock

1964 *Plant Communities of Southern Illinois*. Southern Illinois University Press, Carbondale.

Wandsnider, LuAnn

1997 The Roasted and the Boiled: Food Composition and Heat Treatment with Special Emphasis on Pit-Hearth Cooking. *Journal of Anthropological Archaeology* 16:1–48.

Willcox, G.H.

1974 A History of Deforestation as Indicated by Charcoal Analysis of Four Sites in Eastern Anatolia. *Anatolian Studies* 24:117–33.

Willey, G. R.
1966 *An Introduction to American Archaeology*, *Vol. 1*, *North and Middle America*. Prentice Hall, Englewood Cliffs, New Jersey.
Yarnell, Richard A.
1982 Problems and Interpretations of Archaeological Plant Remains of the Eastern Woodlands. *Southeastern Archaeology* 1:1–7.
Yarnell, Richard A., and M. Jean Black
1985 Temporal Trends Indicated by a Survey of Archaic and Woodland Plant Food Remains from Southeastern North America. *Southeastern Archaeology* 4:93–106.