# APPENDIX A: FLOTATION ANALYSIS

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# *Report on the Analysis of Flotation-recovered Plant Remains from the Warwick Site (18CE371). Cecil County, Maryland*

## *Phase III Archaeological Data Recovery*

SECTION 1,
U.S. ROUTE 301 DEVELOPMENT PROJECT,
NEW CASTLE COUNTY, DELAWARE

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# *Report on the Analysis of Flotation-recovered Plant Remains from the Warwick Site (18CE371), Cecil County, Maryland. Phase III Archaeological Data Recovery*

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July 9, 2013

## INTRODUCTION

Phase III archaeological data recovery at the Warwick Site (18CE371) in Cecil County, Maryland was recently conducted by Dovetail Cultural Resources Group as part of the Delaware Department of Transportation's U.S. Route 301 Development Project. Archaeology at Warwick documents a periodically but repeatedly utilized Late Archaic campsite. There is also evidence of a possible Early Woodland occupation at the site.

The data recovery effort included a rigorous program of soil flotation for the recovery of plant macro-remains. Key research questions focus on exploring site function, occupational duration, and subsistence. A total of 66 soil samples for flotation were collected from prehistoric cultural context excavated during Phase III data recovery. No cultural features were encountered during excavation. Soil samples were systematically collected from the plowzone (Ap, Stratum II) and the uppermost level of the subsoil (B1, Stratum III-1). The selected samples derive from 33 test units related to repeated use of the site during the Late Archaic and possibly Early Woodland periods. Archeobotanical results from the Warwick site provide the first paleoethnobotanical data from Cecil County, Maryland, and significantly increase the archeobotanical database for Maryland's Eastern Shore.

## METHODS

Soil samples collected from cultural features ranged from 2 to 6.25 liters in original sediment volume. Sixty-six individual samples were field-collected into vinyl bags and delivered to McKnight's Severna Park, Maryland laboratory for processing. Table 01 provides an overview of flotation samples studied. Each sample was thoroughly air-dried and then individually water-flotation processed using a Flote-Tech flotation system equipped with 0.325mm fine fraction and 1.0mm coarse fraction screens. The Flote-Tech system is a multi-modal flotation system which facilitates the separation and recovery of organic remains from the soil matrix. Processing resulted in light (flotable) and heavy (sinkable) fractions. Floted portions were air dried (Table 1; Figures 01 to 07).

Table 01: Summary of flotation samples from the Warwick Site.

| | number of samples | original soil volume (liters) | weight recovered materials (grams) |
|---|---|---|---|
| Ap Horizon | 33 | 126.5 | 8.28 |
| B1 horizon | 33 | 130.5 | 7.25 |
| total | 66 samples | 257 | 15.53 |

The poppy seed test (Wagner 1982) was conducted on randomly selected flotation samples from the Warwick Site in order to determine the effectiveness and consistency of the flotation system and proceedures employed in processing site soils. In lots of 100, a total of 500 carbonized, modern poppy seeds were introduced into five dry soil samples prior to flotation processing. The poppy seeds were recovered and quantified during the analysis of the flotation-recovered samples.

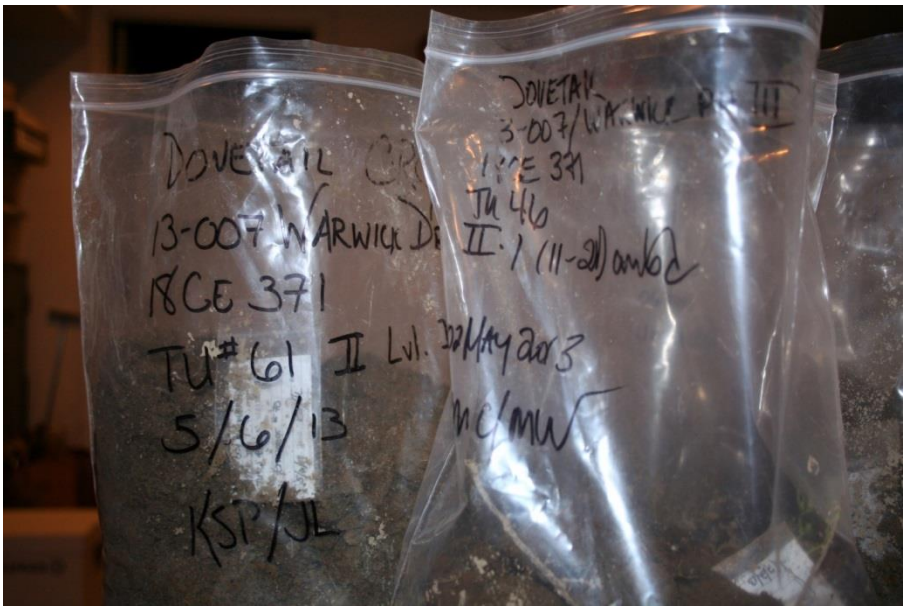


Figure 01: Soil samples are field-collected directly into vinyl bags and provided with interior and exterior provenience labeling.

Figure 02: Soil samples are thoroughly air-dried prior to water flotation.

Figure 03: The Flote-Tech flotation machine in operation.

Figure 04: The floating light fraction is captured.

Figure 05: Cleaning the heavy fraction from the sediment basket.

Figure 06: Capture of the heavy fraction.

Figure 07: The products of flotation: A heavy and a light fraction (Sample No. 67).

The light and heavy fractions of material recovered through flotation were individually passed through a 2mm geological sieve, yielding fractions of two different sizes for analysis. General sample descriptions of the resulting greater than or equal to 2mm and less than 2mm fractions were recorded. The greater than or equal to 2mm specimens were examined under low magnification (10X to 40X) and sorted into general categories of material (i.e. wood, nut, seed, cultigen, miscellaneous material, etc.). Specimen count and aggregate weight were taken for each category of the greater than or equal to 2mm carbonized material. The less than 2mm size fractions were examined under low magnification and the remains of cultivated plants and carbonized seeds were isolated for study.

Sample matrices were predominantly composed of coarse sands and gravel, with various inclusions of natural ecofacts and cultural debris (lithic debitage and possible ceramic sherds). Table 02 provides a list of non-archeobotanical materials observed within the analyzed flotation samples.

Table 02.

| Table 02 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **no.** | **TU** | **horizon** | **strat** | **level** | **depth (cmbd)** | **Volume** | **lithic debitage** | **Description** |
| **1** | 36 | Ap | II | | 8-14 | 2 | yes | roots, insect body parts, sclerotia, gravel |
| **2** | 36 | B1 | II | 1 to 2 | 15-38 | 3.5 | | roots, insect body parts, insect eggs, gravel matrix |
| **3** | 31 | Ap | II | 1 | 20-23 | 3.5 | | roots, deciduous leaf fragments, sclerotia, insect body parts, insect excrement |
| **4** | 31 | B1 | III | 1 | 23-73 | 4 | yes | roots, gravel, sclerotia |
| **5** | 30 | Ap | II | 1 | 17-26 | 5.25 | yes | roots, gravel, deciduous leaf fragments, sclerotia, insect body parts, insect excrement |
| **6** | 30 | B1 | III | 1 | 26-36 | 3 | | roots, gravel, sclerotia, insect body parts, insect eggs |
| **7** | 47 | Ap | II | 1 | 13-19 | 4 | | roots, gravel, deciduous leaf fragments, sclerotia, insect excrement, insect body parts, uncarbonized buds |
| **8** | 47 | B1 | III | 1 | 19-29 | 2.5 | | roots, gravel, sclerotia |
| **9** | 39 | Ap | II | 1 | 12-21 | 3.5 | yes | roots, gravel, insect body parts, clay peds, insect excrement, insect body parts |
| **10** | 39 | B1 | III | 1 | 21-31 | 3.25 | yes | roots, gravel, insect body parts |
| **12** | 40 | Ap | II | 1 | 13-23 | 3 | yes | roots, gravel, soil peds, insect eggs, sclerotia, uncarbonized buds, insect excrement, insect body parts |
| **13** | 40 | B1 | III | 1 | 23-33 | 3.75 | yes | roots, gravel, sclerotia, insect body parts |
| **16** | 35 | Ap | II | 1 | 18-22 | 2.75 | yes | roots, gravel, sclerotia, insect excrement, uncarbonized bud |
| **17** | 35 | B1 | III | 1 | | 3 | | roots, gravel, sclerotia, insect excrement |
| **19** | 45 | Ap | II | 1 | 15-21 | 3.75 | yes | roots, gravel, sclerotia, insect body parts, insect excrement |
| **20** | 45 | B1 | III | 1 | 21-31 | 3 | | roots, gravel, sclerotia, clay peds |
| **21** | 37 | Ap | II | 1 | 12-19 | 3.25 | | roots, gravel, sclerotia, insect body parts, insect excrement, uncarbonized buds |

| Table 02 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **no.** | **TU** | **horizon** | **strat** | **level** | **depth (cmbd)** | **Volume** | **lithic debitage** | **Description** |
| **22** | 37 | B1 | III | 1 | 19-29 | 4 | yes | roots, gravel, sclerotia, insect body parts |
| **23** | 46 | Ap | II | 1 | 11-21 | 5.5 | yes | roots, gravel, deciduous leaf fragments, insect eggs, sclerotia, uncarbonized buds, insect body parts |
| **24** | 46 | B1 | III | 1 | 11-21 | 2.5 | | roots, gravel, sclerotia |
| **25** | 43 | Ap | II | 1 | 6-12 | 2.25 | | roots, gravel, soil peds, insect body parts, insect eggs, sclerotia, deciduous leaf fragments |
| **26** | 43 | B1 | III | 1 | 22-32 | 3 | yes | roots, snail, soil peds, insect body parts, sclerotia |
| **28** | 38 | Ap | II | 1 | 14-19 | 2.25 | yes | roots, gravel, sclerotia, insect body parts, uncarbonized buds |
| **29** | 38 | B1 | III | 1 | | 2.5 | yes | roots, ceramic? sclerotia, soil peds, insect body parts, snails |
| **30** | 49 | Ap | II | 1 | 14-25 | 4 | yes | roots, sclerotia, snails, insect body parts |
| **31** | 50 | Ap | II | 1 | | 3 | yes | roots, gravel, sclerotia, coal, deciduous leaf fragments, insect excrement, insect eggs, uncarbonized buds |
| **32** | 49 | B1 | III | 1 | | 6.25 | yes | roots, gravel, sclerotia, insect body parts, deciduous leaf fragments, granite shatter |
| **33** | 50 | B1 | III | 1 | | 4.5 | | roots, gravel, sclerotia |
| **34** | 44 | Ap | II | 1 | | 3 | yes | roots, gravel, insect eggs, uncarbonized buds, insect body parts |
| **35** | 44 | B1 | III | 1 | | 4.25 | | roots, gravel, clay peds, sclerotia, insect body parts |
| **36** | 41 | Ap | II | | | 4.75 | yes | roots, sclerotia, insect eggs, deciduous leaf fragments, insect body parts |
| **37** | 41 | B1 | III | | | 4 | | roots, sclerotia, gravel, soil peds |
| **38** | 48 | Ap | II | | | 4 | yes | roots, gravel, sclerotia, deciduous leaf fragments, uncarbonized buds, snails, insect excrement, insect bodies, insect eggs |
| **39** | 51 | Ap | II | 1 | | 3 | yes | roots, gravel, sclerotia, deciduous leaf fragments |

| Table 02 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **no.** | **TU** | **horizon** | **strat** | **level** | **depth (cmbd)** | **Volume** | **lithic debitage** | **Description** |
| **40** | 48 | B1 | III | | | 4 | yes | roots, gravel, sclerotia, insect excrement, glass (modern?), deciduous leaf fragments, uncarbonized buds |
| **41** | 51 | B1 | III | 1 | | 3.25 | | roots, sclerotia, gravel, clay peds, snail, insect body parts |
| **42** | 52 | Ap | II | 1 | | 5.5 | yes | roots, gravel, insect eggs, sclerotia, insect body parts |
| **43** | 52 | B1 | III | 1 | | 5 | yes | roots, gravel, insect eggs, sclerotia, insect body parts |
| **44** | 53 | Ap | II | 1 | | 3 | | roots, gravel, sclerotia, insect body parts, insect eggs, snails, woody buds |
| **45** | 53 | B1 | III | 1 | | 4 | yes | roots, gravel, sclerotia, insect eggs, rock shatter |
| **46** | 54 | Ap | II | 1 | | 5 | yes | roots, gravel, sclerotia, insect body parts, insect eggs |
| **47** | 54 | B1 | III | 1 | | 5 | yes | roots, gravel, insect body parts, deciduous leaf fragment, insect eggs |
| **48** | 55 | Ap | II | 1 | | 3.75 | yes | roots, gravel, coal clinker?, soil peds, sclerotia, insect body parts |
| **49** | 55 | B1 | III | 1 | | 3 | yes | roots, gravel, sclerotia, insect body parts |
| **50** | 56 | Ap | II | 1 | | 4.5 | | roots, gravel, sclerotia, red oak leaf fragments, insect body parts, uncarbonized buds |
| **52** | 57 | Ap | II | 1 | | 4 | yes | roots, gravel, sclerotia, deciduous leaf fragments |
| **53** | 54 | B1 | III | 1 | | 4 | yes | roots, gravel, sclerotia |
| **54** | 56 | B1 | III | 1 | 29-39 | 5.25 | yes | roots, gravel, sclerotia, deciduous leaf fragments, shatter**, insect body parts, insect excrement |
| **55** | 58 | Ap | II | 1 | | 4 | yes | roots, gravel, sclerotia, insect body parts, deciduous leaf fragments, insect eggs |
| **56** | 59 | Ap | II | 1 | | 5.25 | yes | roots, gravel, sclerotia, deciduous leaf fragments, insect eggs, insect body parts, soil peds |
| **57** | 59 | B1 | III | 1 | | 6 | yes | roots, sclerotia, soil peds, deciduous leaf fragments |

| Table 02 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **no.** | **TU** | **horizon** | **strat** | **level** | **depth (cmbd)** | **Volume** | **lithic debitage** | **Description** |
| **58** | 34 | Ap | II | 1 | | 3.75 | | roots, gravel, sclerotia, deciduous leaf fragments, insect excrement, uncarbonized buds, insect body parts |
| **59** | 34 | B1 | III | 1 | | 4 | | roots, gravel, snail, insect body parts, insect eggs, insect excrement |
| **61** | 58 | B1 | III | 1 | | 4.5 | yes | roots, gravel, sclerotia, insect body parts, deciduous leaf fragments, insect excrement |
| **62** | 42 | Ap | II | 1 | | 3.5 | yes | roots, gravel, sclerotia, deciduous leaf fragments, insect excrement, insect body parts |
| **63** | 42 | B1 | III | 1 | | 3 | yes | roots, gravel, sclerotia, uncarbonized bud, insect excrement, insect eggs, deciduous leaf fragments |
| **64** | 33 | Ap | II | 1 | | 5 | yes | roots, gravel, sclerotia, insect eggs, insect body parts, plastic |
| **65** | 33 | A1 | III | 1 | | 4 | yes | roots, soil peds, gravel, sclerotia, deciduous leaf fragments |
| **66** | 32 | Ap | II | 1 | | 2.75 | | roots, soil peds, gravel, sclerotia, insect body parts, insect excrement |
| **67** | 32 | B1 | III | 1 | | 4.5 | | roots, gravel, sclerotia, insect body parts, insect eggs, deciduous leaf fragments |
| **68** | 60 | Ap | II | 1 | | 2.5 | | roots, coal, quartz shatter, sclerotia, uncarbonized woody bud, insect excrement |
| **69** | 60 | B1 | III | 1 | | 4 | | roots, gravel, sclerotia, deciduous leaf fragments, insect body parts |
| **70** | 61 | Ap | II | 1 | | 5.75 | yes | roots, gravel, sclerotia, insect body parts, insect excrement, insect eggs |
| **71** | 62 | Ap | II | 1 | | 5.5 | | roots, gravel, sclerotia, insect excrement, insect body parts, insect eggs |
| **72** | 62 | B1 | III | 1 | | 5 | yes | roots, gravel, sclerotia, insect eggs, insect body parts, rock shatter, soil peds |

| Table 02 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **no.** | **TU** | **horizon** | **strat** | **level** | **depth (cmbd)** | **Volume** | **lithic debitage** | **Description** |
| **73** | 61 | B1 | III | 1 | | 5 | yes | roots, gravel, sclerotia, insect body parts |

The processed samples yielded carbonized, partially burned and uncarbonized plant remains. Carbonized plant remains were interpreted as having archaeological integrity. Uncarbonized plant remains observed in the flotation-derived botanical assemblage included modern roots, buds, and uncarbonized seeds and nuts/nutshells. Uncarbonized plant specimens from open site environments in the Middle Atlantic region are usually interpreted as representing modern intrusions into the archaeological record (Hastorf and Popper 1988; Minnis 1981; Pearsall 2000). Partially carbonized plant remains included seeds and a fragment of maize (corn). It is the opinion of the analyst that these specimens represent the remains of recent or historic plant material incorporated into the plowzone.

The flotation samples also contained moderate quantities of sclerotia. Sclerotium are a dense, compact mass of fungal mycelium that function as a resilient food reserve. This dormant fungal body is durable in the ground and is often found in association with tree roots. Sclerotia are small, spherical bodies (to 4 mm in diameter) belonging to many diverse groups of fungi. They are often confused with small seeds.

Taxonomic identifications were routinely attempted on all seed, nut, cultigen and miscellaneous plant remains, and on a sub-sample of twenty randomly selected wood fragments from each sample containing *more* than twenty specimens, in accordance with standard practice (Pearsall 2000). Identifications of all classes of botanical remains were made to the genus level when possible, to the family level when limited diagnostic information was available, and to the species level only when the assignment could be made with absolute certainty. When botanical specimens were found to be in such eroded or fragmentary condition as to prevent their complete examination or recognition, a variety of general categories were used to reflect the degree of identification possible: General wood categories within the analyzed assemblage include *'ring porous', 'deciduous'*, and *'unidentifiable'* where specimens were so fragmentary or minute that no clear section could be obtained upon which to base identification. The category *'amorphous carbon'* was used in this report to classify unidentifiable plant materials. Identifications were made under low magnification (10X to 40X) with the aid of standard texts (Panshin and deZeeuw 1980; Edlin 1969; Schopmeyer 1974; Martin and Barkley 1961), and checked against plant specimens from a modern reference collection representative of the flora of Maryland and Delaware (McAvoy 2011; Brown and Brown 1987; Brown and Brown 1972; Taber 1960; Tatnall 1946).

## RESULTS

Flotation-recovered plant remains from 66 soil samples collected from 33 excavation units were analyzed from Phase III excavations at the Warwick Site (18CE371). A total of 257 liters of feature fill was flotation-processed yielding 15.53 grams of carbonized plant macro-remains (an average of 0.0604 grams per liter of soil). The archeobotanical assemblage derives entirely from non-feature contexts, and a low concentration of carbonized material was anticipated. Results were surprising, however, as a moderate amount of wood charcoal along with carbonized nutshells, seeds, and vegetal miscellany were recovered. In addition to these carbonized remains, partially carbonized seeds and maize (corn) were also recovered through soil flotation.

A summary of the flotation-recovered archeobotanical assemblage is offered in Table 03. A full flotation inventory by Flotation Sample number is provided in the Appendix, Table 01. Discussion of each class of plant material encountered within the assemblage is detailed below.

*Wood Charcoal*

Wood charcoal was present in 100 percent of the 66 flotation samples analyzed. A total of 2,187 fragments of carbonized wood (>2mm in diameter) weighing 14.47 grams was recovered. Wood charcoal accounted for over 93 percent of the analyzed plant carbon, by weight, with an average of 8.5 wood charcoal fragments per liter of soil. Of the total wood charcoal, a sub-sample of 1,114 fragments (a maximum of 20 fragments per sample) was randomly selected for identification. This sub-sample revealed a predominance of deciduous wood types. White oak species (*Quercus spp. LEUCOBALANUS group)* (180 fragments or 16 percent of the selected sub-sample), oak (*Quercus sp.)* (49 fragments or four percent), red oak (*Quercus spp.*

Table 03: Summary of Flotation-recovered archeobotanical remains.

| | | **percentage presence** |
|---|---|---|
| **number of samples** | **66** | |
| **volume (liters)** | **257** | |
| **weight recovered materials (grams)** | **15.53** | |
| Wood Charcoal (fragment count) | 2187 | 100% |
| weight (grams) | 14.47 | |
| *Acer spp. (maple)* | 3 | 3% |
| *Carya spp. (hickory)* | 12 | 8% |
| *Cornus florida (flowering dogwood)* | 1 | 2% |
| *Quercus spp. (white oak group)* | 180 | 42% |
| *Quercus spp. (red oak group)* | 48 | 18% |
| *Quercus spp. (oak)* | 49 | 15% |
| ring porous | 21 | 9% |
| deciduous | 706 | 94% |
| unidentifiable | 94 | 24% |

| | | |
|---|---|---|
| total wood fragments identified | 1114 | 100% |
| Nut (carbonized) (fragment count) | 23 | 9% |
| weight (grams) | 0.26 | |
| *Carya spp. (hickory) thick-walled shell fragment* | 20 | 6% |
| *Quercus sp. (oak acorn) shell fragment* | 3 | 3% |
| Seeds (carbonized) (specimen count) | 27 | 23% |
| weight (grams) | 0.11 | |
| *Crataegus spp. (hawthorn) seed* | 1 | 2% |
| *Gaylussacia spp. (huckleberry) seed* | 17 | 14% |
| *Panicum/Setaria spp. (panic or foxtail grass) seed* | 1 | 2% |
| *Rhus spp. (sumac) seed* | 1 | 2% |
| *Rubus spp. (raspberry/blackberry) seed* | 1 | 2% |
| *Rubus spp. (raspberry/blackberry) seed fragment* | 1 | 2% |
| *Rubus spp. (raspberry/blackberry) (partially carb)* | 1 | 2% |
| *Vitis spp. (grape) seed fragment (partially carb)* | 1 | 2% |
| *possible ROSACEAE (rose family) fragment* | 1 | 2% |
| *possible spherical seed - eroded* | 1 | 2% |
| *unidentifiable* | 1 | 2% |
| Cultigens (partially carbonized) (specimen count) | 1 | 2% |
| *weight (grams)* | 0.01 | |

| | | |
|---|---|---|
| *Zea mays (maize) cupule (partially carb)* | 1 | 2% |
| Miscellaneous Plant Material (fragment count) | 85 | 41% |
| weight (grams) | 0.68 | |
| bud fragment | 2 | 3% |
| fungal fruit (fragment) | 7 | 9% |
| peduncle fragment | 15 | 14% |
| amorphous carbon | 61 | 20% |

*ERYTHROBALANUS group)* (48 fragments or four percent), hickory *(Carya spp.)* (12 fragments or one percent), maple *(Acer spp.)* (three fragments or less-than one percent), and flowering dogwood *(Cornus florida)* (one fragment or less-than one percent) were identified. Sixty-three percent of the wood sample selected for identification was not minimally classifiable to botanical family. These specimens were assigned to the categories *'ring porous'* (21 fragments or two percent), *'deciduous'* (706 fragments or 63 percent), and *'unidentifiable'* (94 fragments or eight percent). The composition of wood types documented is illustrated in Figure 08.

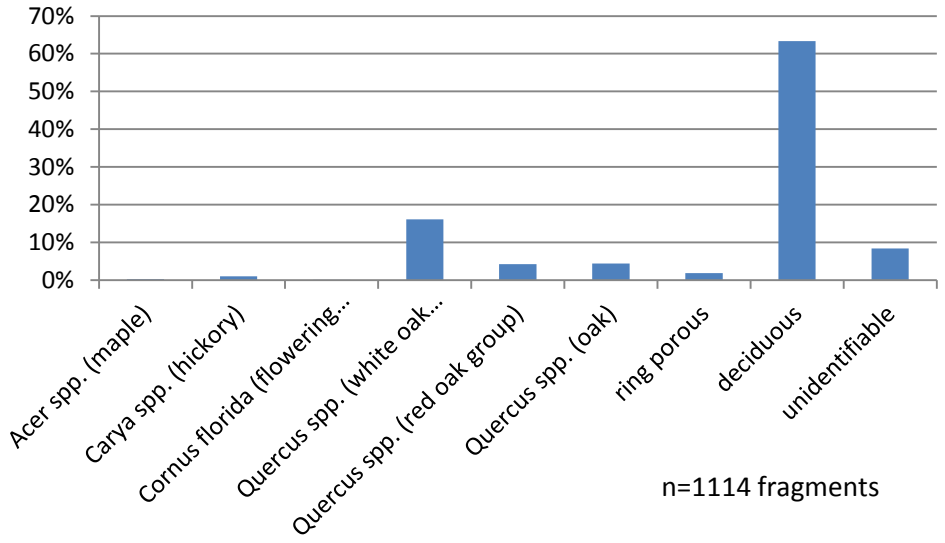


Figure 08: Percent composition of wood types represented in the flotation-recovered assemblage.

*Carbonized Nutshells*

Carbonized nutshells were present in nine of the 66 flotation samples analyzed from the Warwick Site. A total of 23 fragments weighing 0.26 grams were recovered. Two genera of edible, native mast were identified: Thick-walled hickory *(Carya spp.)* (20 fragments) (Figure 09) and acorn *(Quercus spp.)* (3 fragments) (Figure 10).

*Carbonized and Partially Carbonized Seeds*

Carbonized and partially carbonized seed remains were present within 23 percent of the 66 flotation samples analyzed from Warwick. A site total of 27 specimens weighing 0.11 grams were recovered, representing seven taxa. The seeds of edible, fleshy fruits were particularly well-represented. Hawthorn *(Crataegus spp.)* (one fragment), huckleberry *(Gaylussacia spp.)* (17 seeds) (Figure 11), panic or foxtail grass *(Panicum/Setaria spp.)* (one seed), sumac (*Rhus spp.)* (one seed) (Figure 12), raspberry or blackberry *(Rubus spp.)* (one carbonized seed, one carbonized seed fragment, and one partially carbonized seed) (Figure 13), grape *(Vitis spp.)* (one partially carbonized seed fragment) (Figure 14), possible rose *(ROSACEAE)* (one seed fragment), and two unidentifiable seeds were recovered.

Figure 09: Thick-walled hickory *(Carya spp.)* nutshell fragments recovered from FS 47. *Scale = 1 grid*

Figure 10: Acorn *(Quercus spp.)* shell fragments recovered from FS 58.

*Scale = 1 grid*

*Partially Carbonized Cultigens*

A single, partially carbonized maize *(Zea mays)* cupule was recovered from FS 70, Test Unit 61, Ap horizon. See Figure 15.

*Carbonized Miscellany*

Miscellaneous archeobotanical materials were recovered from 41 percent of the flotation samples analyzed. A total of 85 specimens weighing 0.68 grams were isolated from the > or = to 2mm fraction. Two carbonized buds, seven fragments of fungal fruit, 15 peduncle (stem of fruit or flower) fragments, and 61 pieces of unclassifiable amorphous carbon were identified.

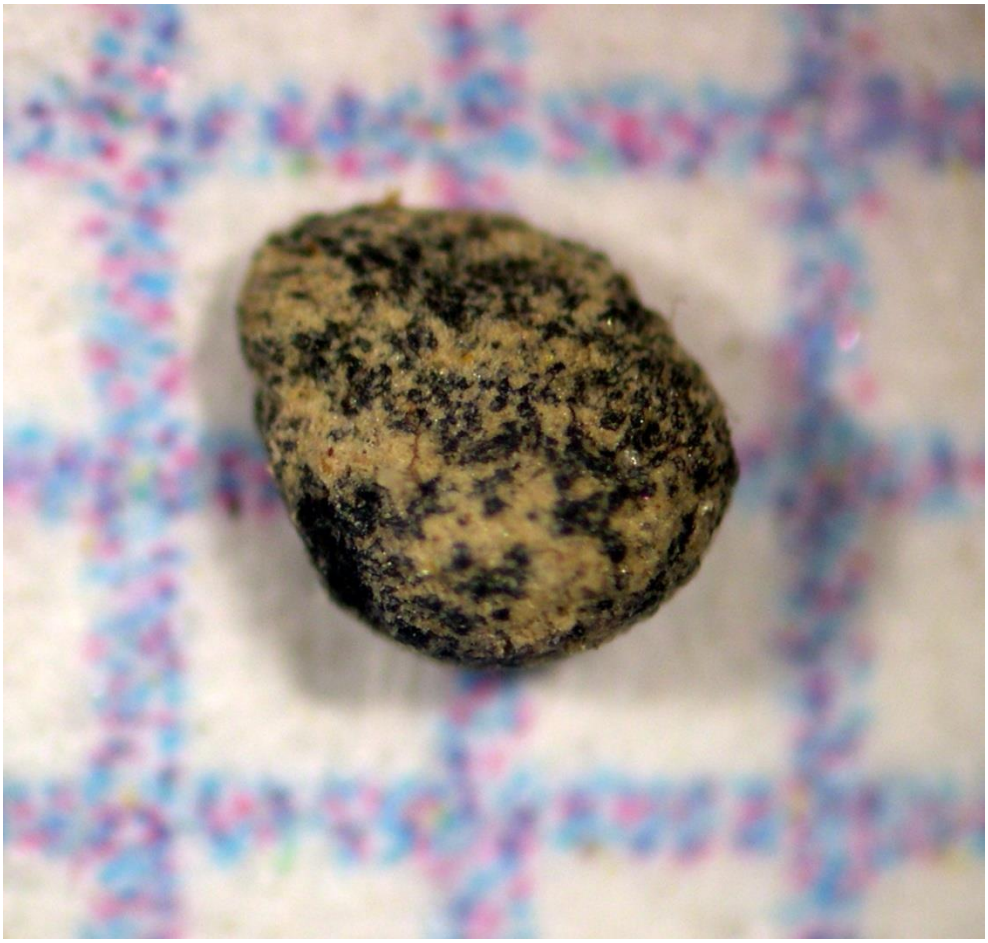

Figure 11: Huckleberry *(Gaylussacia spp.)* seed recovered from FS 70.

*Scale = 1 grid*

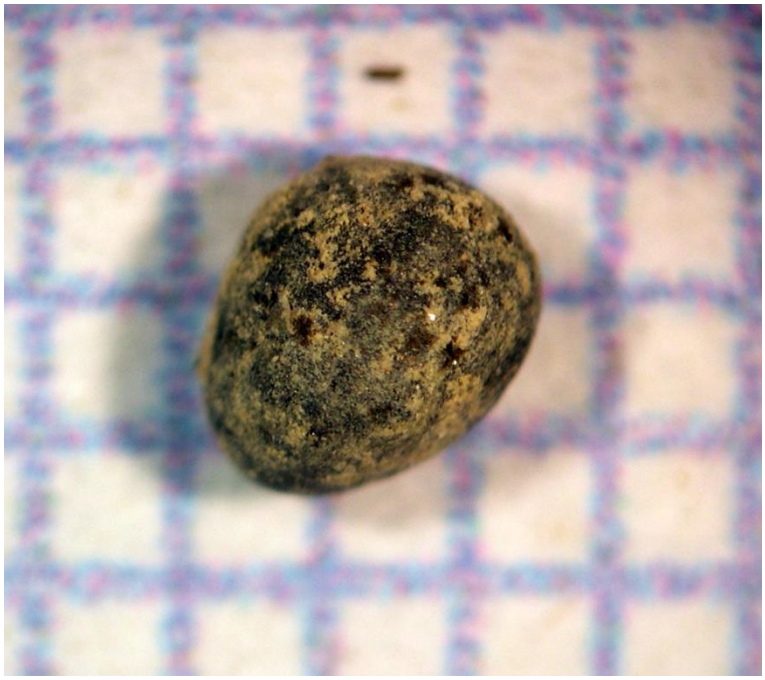

Figure 12: Sumac *(Rhus spp.)* seed recovered from FS 25

*Scale = 1 grid*

Figure 13: Raspberry/blackberry *(Rubus spp.)* seed recovered from FS 4.

*Scale = 1 grid*

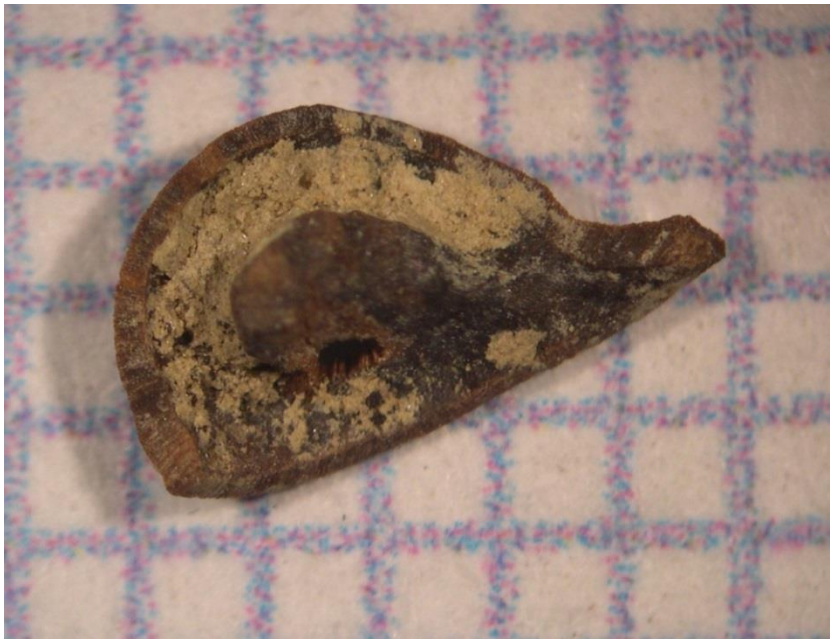

Figure 14: Partially carbonized grape *(Vitis spp.)* seed recovered from FS 70.

*Scale = 1 grid*

Figure 15: Partially carbonized maize *(Zea mays spp. mays)* cupule recovered from FS 70

*Scale = 1 grid*

*Uncarbonized Seeds and Nuts*

Uncarbonized seed and nut remains were present in 82 percent of the flotation samples analyzed (Table 04). Nineteen types were represented, including copperleaves *(Acalypha spp.)*, thick-walled hickory *(Carya spp.)*, partridgepea *(Chamaecrista spp.)*, spurge *(Euphorbia spp.)*, sheepsorrel *(Oxalis stricta)*, panic or foxtail grass *(Panicum/Setaria)*, poke *(Phytolacca americana)*, acorn *(Quercus spp.)*, sumac *(Rhus spp.)*, raspberry or blackberry *(Rubus spp.)*, sedge *(Scirpus spp.)*, violet *(Viola spp.)*, grape *(Vitis spp.)*, daisy *(ASTERACEAE)*, sedge *(CYPERACEAE)*, knotweed *(POLYGONACEAE)*, rose *(ROSACEAE)*, and carrot *(UMBELLIFERAE)*.

Table 04: Percentage presence of uncarbonized seed types within flotation samples.

| UNCARBONIZED SEEDS AND NUTS (presence within the 66 flotation samples analyzed) | | | 82% |
|---|---|---|---|
| **scientific name** | **common name** | **nativity** | **percentage presence** |
| *Acalypha spp.* | copperleaves | Native | 62% |
| *Carya spp. sp.* | thick-walled hickory | Native | 3% |
| *Chamaecrista spp.* | partridgepea | Native | 5% |
| *Euphorbia spp.* | spurge | Native | 20% |
| *Oxalis stricta* | sheep sorrel | Native | 11% |
| *Panicum/Setaria* | panic/foxtail grass | Native | 9% |
| *Phytolacca americana* | poke | Native | 24% |
| *Portulaca oleracea* | purselane | disputed | 2% |
| *Quercus spp.* | oak | Native | 3% |
| *Rhus spp.* | sumac | Native | 15% |
| *Rubus spp.* | blackberry/raspberry | Native | 30% |
| *Scirpus spp.* | sedge | Native | 6% |
| *Viola spp.* | violet | Native | 26% |

| | | | |
|---|---|---|---|
| *Vitis spp.* | grape | Native | 6% |
| *ASTERACEAE* | daisy | Native | 2% |
| *CYPERACEAE* | sedge | Native | 2% |
| *POLYGONACEAE* | knotweed | Native | 3% |
| *ROSACEAE* | rose | Native | 2% |
| *UNBELLIFERAE* | carrot | Native | 2% |

*Poppyseed Test*

The efficiency of flotation recovery equipment and techniques was tested as part of the archeobotanical study at the Warwick Site. Poppy seeds (in lots of 100) were introduced into five of the samples processed. Poppy seeds were added prior to flotation processing, and gleaned and counted during macro-botanical analysis following standard procedure (Wagner 1982). Recovery was good to very good, with rates ranging from 82 percent to 98 percent (Table 05) and averaging 90.4 percent. No damage of the seeds was noted, suggesting that the flotation machine and processing techniques were sufficiently gentle to preserve minute plant artifacts.

Table 05: Results of flotation recovery test.

| FS number | horizon | soil sample volume (liters) | *Papaver somniferum (poppy) seeds added* | *Papaver somniferum (poppy) seeds recovered* | recovery rate |
|---|---|---|---|---|---|
| 25 | Ap | 2.25 | 100 | 82 | 82% |
| 31 | Ap | 3 | 100 | 96 | 96% |
| 54 | B1 | 5.25 | 100 | 86 | 86% |
| 62 | Ap | 3.5 | 100 | 90 | 90% |
| 64 | Ap | 5 | 100 | 98 | 98% |
| total | | 19 | 600 | 452 | 90.4% |

## DISCUSSION

The archeobotanical data generated from 33 excavation units at the Warwick Site (18CE371) provide information about the history of human-plant interactions at this site on the Maryland/Delaware border. The overall density of plant remains recovered from the Warwick Site is surprising. The Phase III research design included a large number of flotation samples (N=66), and a total of 257 liters of sediment were processed as part of the data recovery effort.

Flotation yielded an average of 0.0604 grams of carbonized material per liter of soil. The APE contained no cultural features, and floral sampling was limited to culture-bearing deposits within the plowone (Ap) and upper subsoil (B1) horizons. While a rich floral data seta was not anticipated from the Warwick site, a moderately dense and truly informative archeobotanical assemblage was recovered. The Warwick assemblage yielded evidence of variety of potentially economically important plants. The carbonized remains of nuts and edible seeds (fleshy fruits were the most common seed type identified) indicate the exploitation of seasonally predictable mast and fruits. The assemblage also provides indicators of local landscape conditions over the locus. Wood charcoal identified from the sampled contexts document the burning of oak (especially white oak varieties) along with other native deciduous taxa.

In the absence of cultural features, all of the Warwick flotation samples were secured from general excavation unit contexts. Half of the samples derive from plowzone contexts, the other half from the upper levels of the subsoil. From non-feature contexts, low-density wood charcoal (such as that recovered from Warwick) can reflect debris from historic land clearing efforts. Scattered small native seeds, nuts and miscellaneous plant products can also be interpreted as incidental remnants of historic land use activities. Preliminary data from the Warwick Site suggested that this might be the pattern. However, the constellation of taxa represented (almost all are culturally preferred) and the high percentage of comestible genera within the nut and seed categories combined with a moderate density of wood charcoal within some units suggests a prehistoric cultural origin linked directly to the archaeology of the site. The recovery of partially carbonized seeds and maize from the plowzone, and the presence of ubiquitous, diverse and abundant unburned seeds within the Ap indicate the mixing of more modern materials within the upper soil horizons. The biologically-active nature of soils and a historic record of land clearing and farming of the site prevent precise determination of the origin of plant artifacts at the site.

The Warwick Site (18CE371) is located within Section 1 of the U.S. Route 301 Development Project Area in Cecil County, Maryland. The project area is located in the Mid-drainage Zone of the Lower Coastal Plain physiographic province. Today, the site is located within a fringe of deciduous, wet, woodland flanked on the east by a large agricultural field and on the west by a highway drainage ditch and the northbound lanes of U.S. Route 301 (Figure 16). Prior to the colonial encounter, Maryland supported vast forest and marshlands with plant communities largely determined by topography and the presence of water. Floristically, the site lies within the Oak-Pine Forest (Atlantic Slope Section) as defined by Braun (1950:192) and the Oak-Hickory-Pine forest association

outlined by Kuchler (1964). Native forest cover over the project area was characterized by a medium tall to tall forest of broadleaf deciduous and needleleaf evergreen trees. Dominant species would have included hickory, shortleaf pine, loblolly pine, white oak and post oak. The flotation-recovered wood assemblage from features at the Warwick Site is composed of taxa common to this forest association (Little 1971; Brown and Brown 1972; Sargent 1884; Taber 1960; Tatnall 1946). The predominance of white oak within many samples, and the complement of taxa represented across the site are entirely consistent with endemic forest cover.

At the time that Phase III fieldwork was conducted (April and May 2013) vegetative cover over the Warwick Site consisted of a mixed deciduous forest with a relatively open understory and an estimated age of 50 years. Dominant overstory species include beech, oaks, sweet gum, red maple and cherry. Dogwood, viburnums, blueberry and huckleberry were common in the understory community. Honeysuckle dominated the forest floor. Spring ephemerals at time of walkover included May apple.

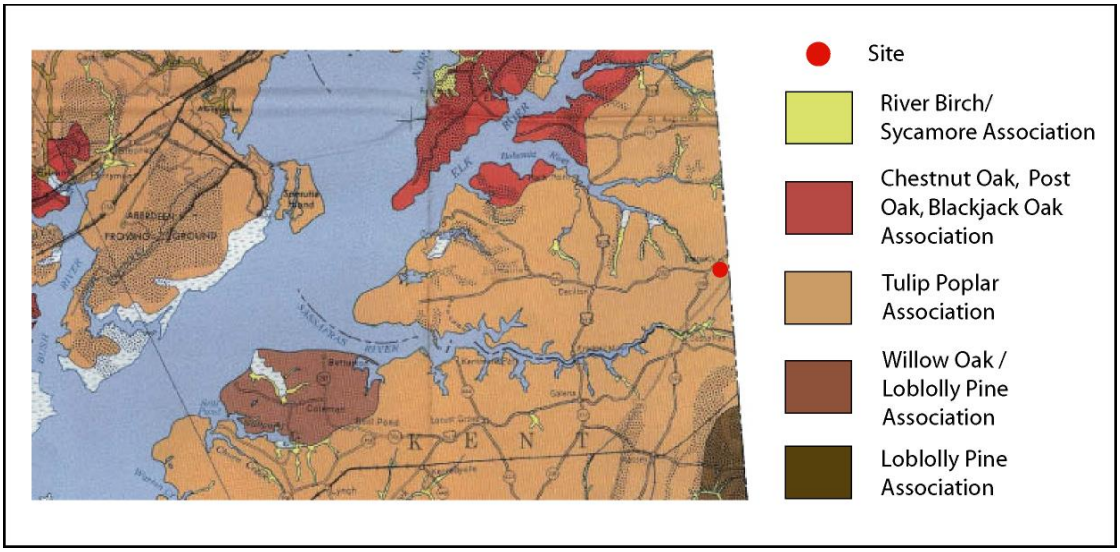


Figure 16: Existing forest cover in the vicinity of the Warwick Site. Adapted from Brush et al. 1976.

Table 06: Summary of recovered plant remains by soil horizon.

| | Ap Horizon | B1 Horizon | total |
|---|---|---|---|
| | 33 samples | 33 samples | 66 samples |
| volume (liters) | 126.5 | 130.5 | 257 |
| weight recovered materials (grams) | 8.28 | 7.25 | 15.53 |

| | | | |
|---|---|---|---|
| Wood Charcoal (fragment count) | 1199 | 988 | 2187 |
| weight (grams) | 7.78 | 6.69 | 14.47 |
| *Acer spp. (maple)* | 2 | 1 | 3 |
| *Carya spp. (hickory)* | 3 | 9 | 12 |
| *Cornus florida (flowering dogwood)* | | 1 | 1 |
| *Quercus spp. (white oak group)* | 76 | 104 | 180 |
| *Quercus spp. (red oak group)* | 30 | 18 | 48 |
| *Quercus spp. (oak)* | 8 | 41 | 49 |
| ring porous | 10 | 11 | 21 |
| deciduous | 421 | 285 | 706 |
| unidentifiable | 48 | 46 | 94 |
| total wood fragments identified | 598 | 516 | 1114 |
| Nut (carbonized) (fragment count) | 4 | 19 | 23 |
| weight (grams) | 0.03 | 0.23 | 0.26 |
| *Carya spp. (hickory) thick-walled shell fragment* | 1 | 19 | 20 |
| *Quercus spp. (oak acorn) shell fragment* | 3 | | 3 |
| Seeds (carbonized) (specimen count) | 18 | 9 | 27 |
| weight (grams) | 0.075 | 0.035 | 0.11 |
| *Crataegus spp. (hawthorn) seed* | | 1 | 1 |
| *Gaylussacia sp. (huckleberry) seed* | 11 | 6 | 17 |
| *Panicum/Setaria spp. (panic or foxtail grass) seed* | 1 | | 1 |
| *Rhus spp. (sumac) seed* | 1 | | 1 |
| *Rubus spp. (raspberry/blackberry) seed* | | 1 | 1 |
| *Rubus spp. (raspberry/blackberry) seed fragment* | 1 | | 1 |
| *Rubus spp. (raspberry/blackberry) (partially carb)* | 1 | | 1 |

| | | | |
|---|---|---|---|
| *Vitis spp. (grape) seed fragment (partially carb)* | 1 | | 1 |
| *possible ROSACEAE (rose family) fragment* | 1 | | 1 |
| *possible spherical seed - eroded* | | 1 | 1 |
| *unidentifiable* | 1 | | 1 |
| Cultigens (partially carbonized) (specimen count) | 1 | 0 | 1 |
| *weight (grams)* | 0.01 | 0 | 0.01 |
| *Zea mays (maize) cupule (partially carb)* | 1 | | 1 |
| Miscellaneous Plant Material (fragment count) | 35 | 50 | 85 |
| weight (grams) | 0.385 | 0.295 | 0.68 |
| bud fragment | 1 | 1 | 2 |
| fungal fruit (fragment) | 5 | 2 | 7 |
| peduncle fragment | 10 | 5 | 15 |
| amorphous carbon | 19 | 42 | 61 |

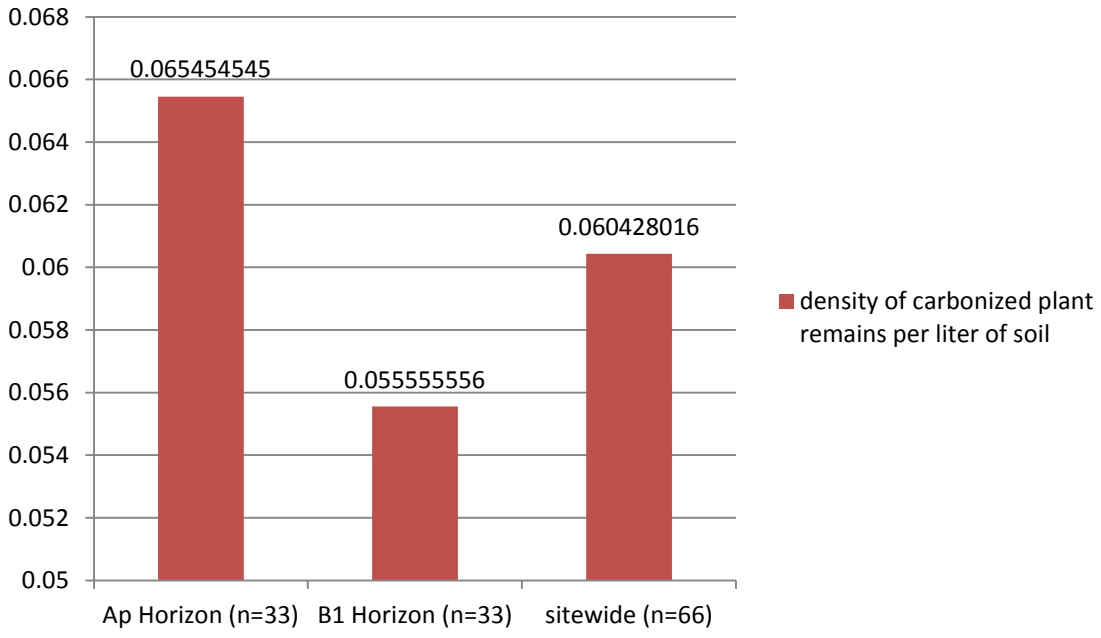


Figure 17: Density of carbonized plant material per liter of soil.

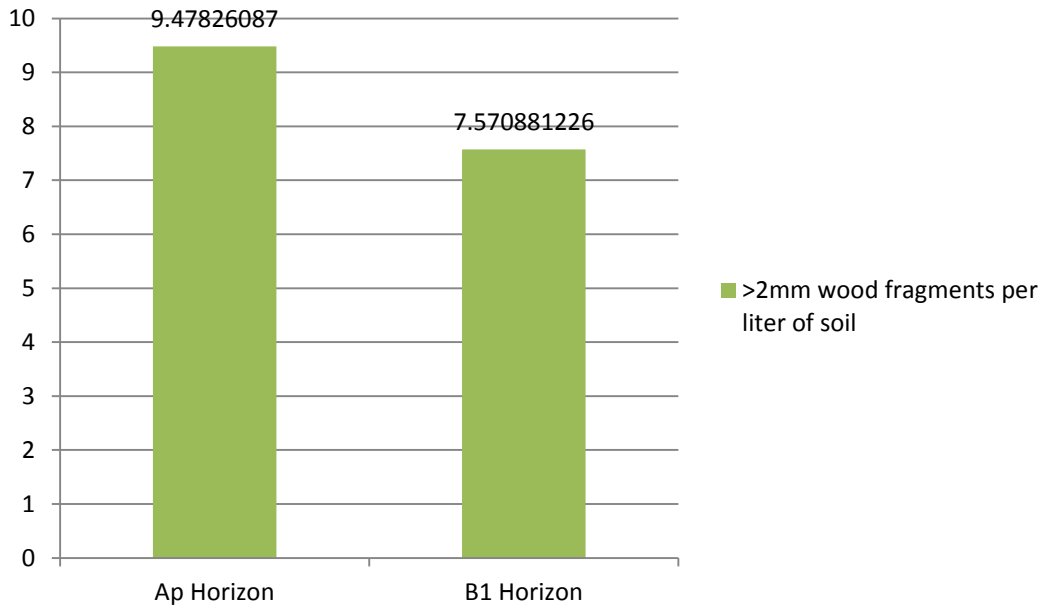


Figure 18: Density of wood charcoal by soil horizon.

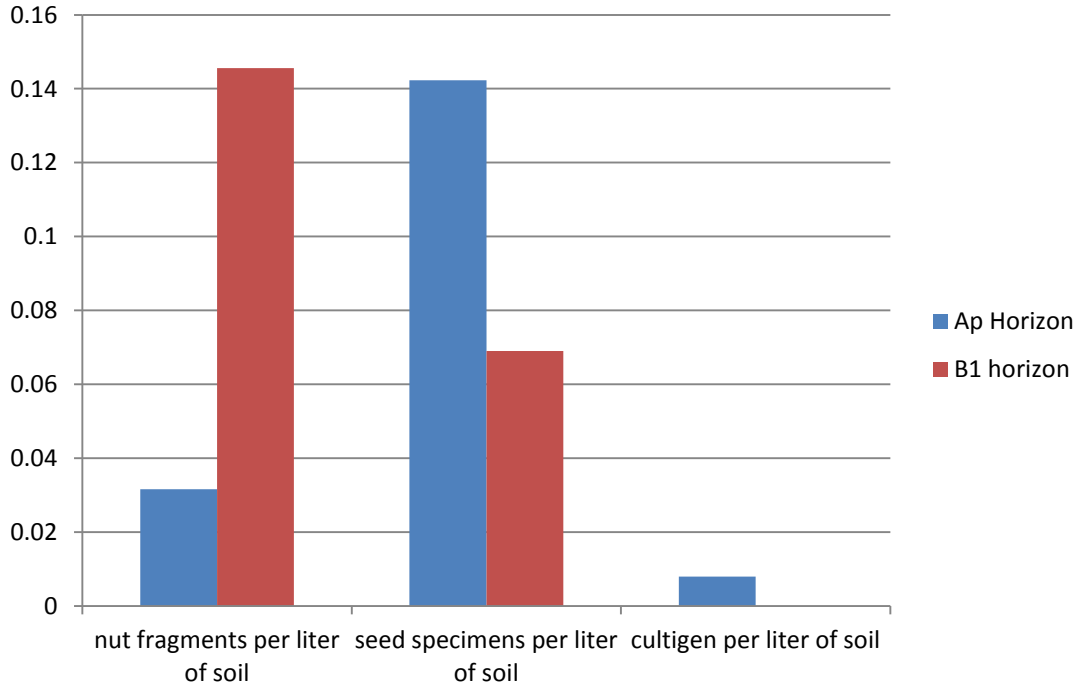


Figure 19: Density of comestible plant remains by soil horizon.

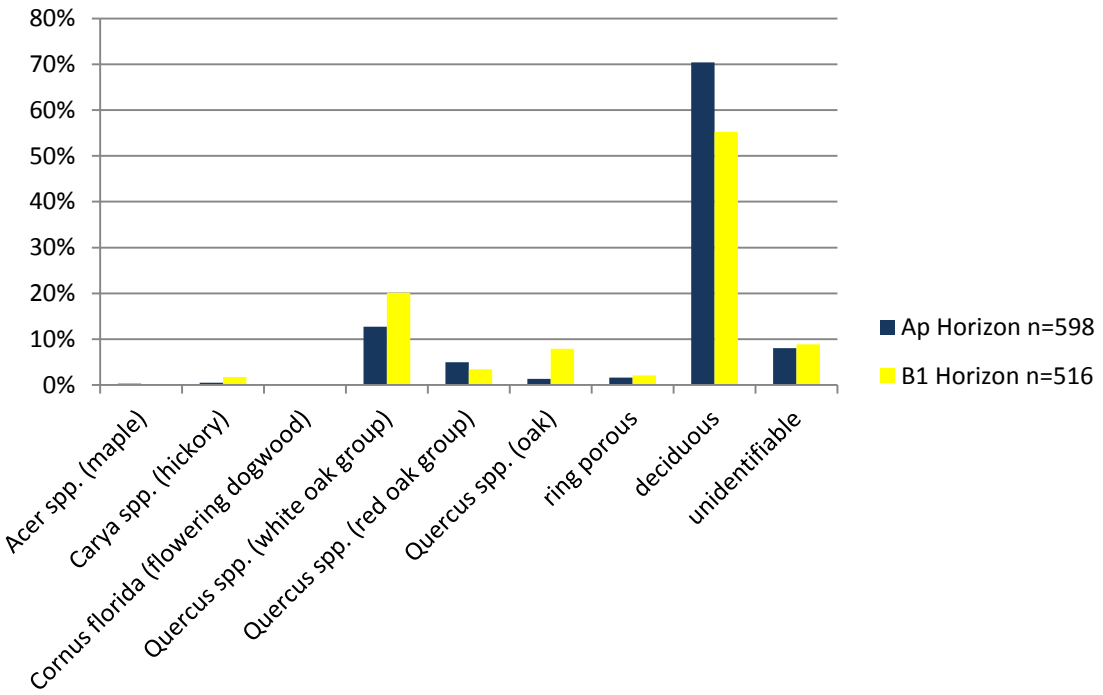


Figure 20: Percentage presence of wood types identified by soil horizon.

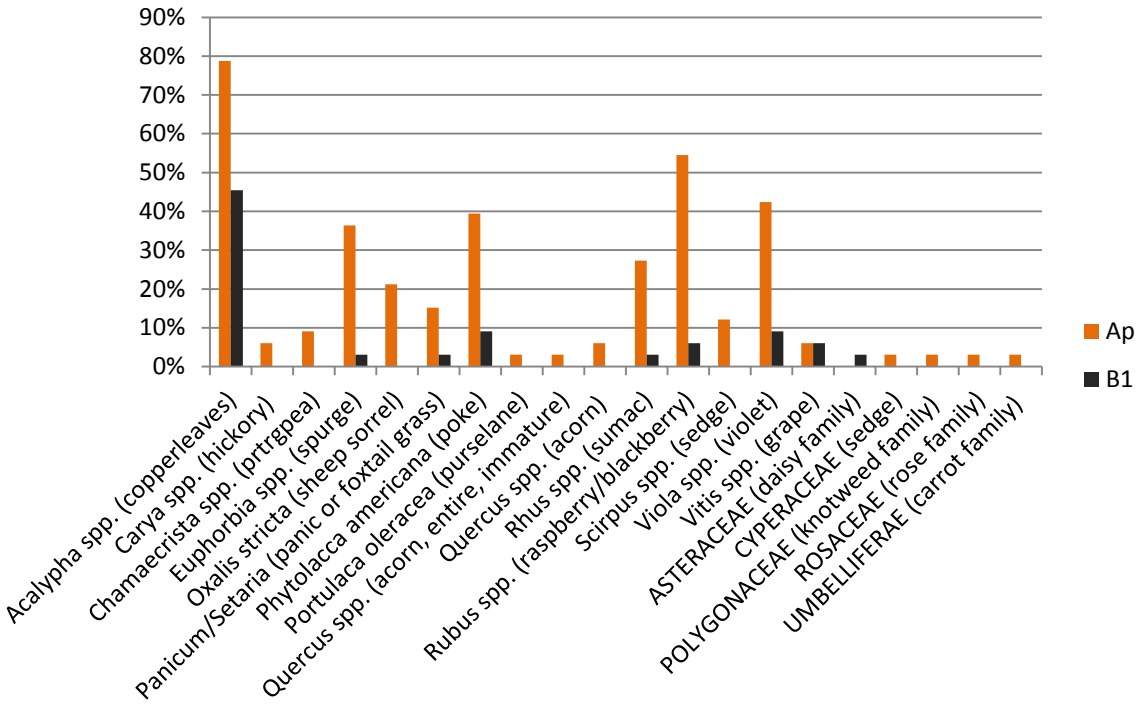


Figure 21: Uncarbonized seeds and nuts by soil horizon.

Examination of the recovered archeobotanical assemblage by soil horizon reveals some interesting patterns (see Table 06). The greatest density of carbonized plant macro-remains is evident within the Ap horizon (Figure 17). This plowzone layer produced the greatest density of wood charcoal than the B1 horizon (Figure 18), along with greater densities of seed and cultigens (including all partially carbonized specimens) (see Figure 19). Nutshell remains were more abundant within the B1 contexts sampled, but a greater diversity of nut types were represented in the plowzone samples. The distribution of wood types is relatively consistent throughout the Ap and B1 horizons (Figure 20). The majority of the subsample selected for identification was not minimally identifiable to genus level, and oaks were the most common genera identified within both horizons. Minor amounts of maple and hickory occur within both the plowzone and subsoil, and dogwood was unique to the deeper horizon. Uncarbonized seeds were more ubiquitous within the upper layers of the site, and a greater diversity of seed types were present within the plowzone samples (Figure 21).

Scrutiny of the recovered plant remains by excavation unit reveals a high density of carbonized material within the neighboring excavation units #38 (0.32 grams per liter) and #37 (0.187 grams per liter). Excavation units 43, 45 and 55 follow with carbon densities over 0.1 grams per liter. See Figure 22.

Archeobotanical remains can provide strong markers for seasonality. However, these data can often be skewed by the presence of storable food resources which can enter the archaeological record at other times of the seasonal cycle than those in which the product ripened. While the recovery of late-summer and fall ripening fruits (sumac, huckleberry, hawthorn, raspberry/blackberry, hickory, acorn) from the Warwick Site suggest that the site was occupied during this part of the seasonal round , the recovered plant remains could reflect stored food resources consumed and discarded at any time of the year.

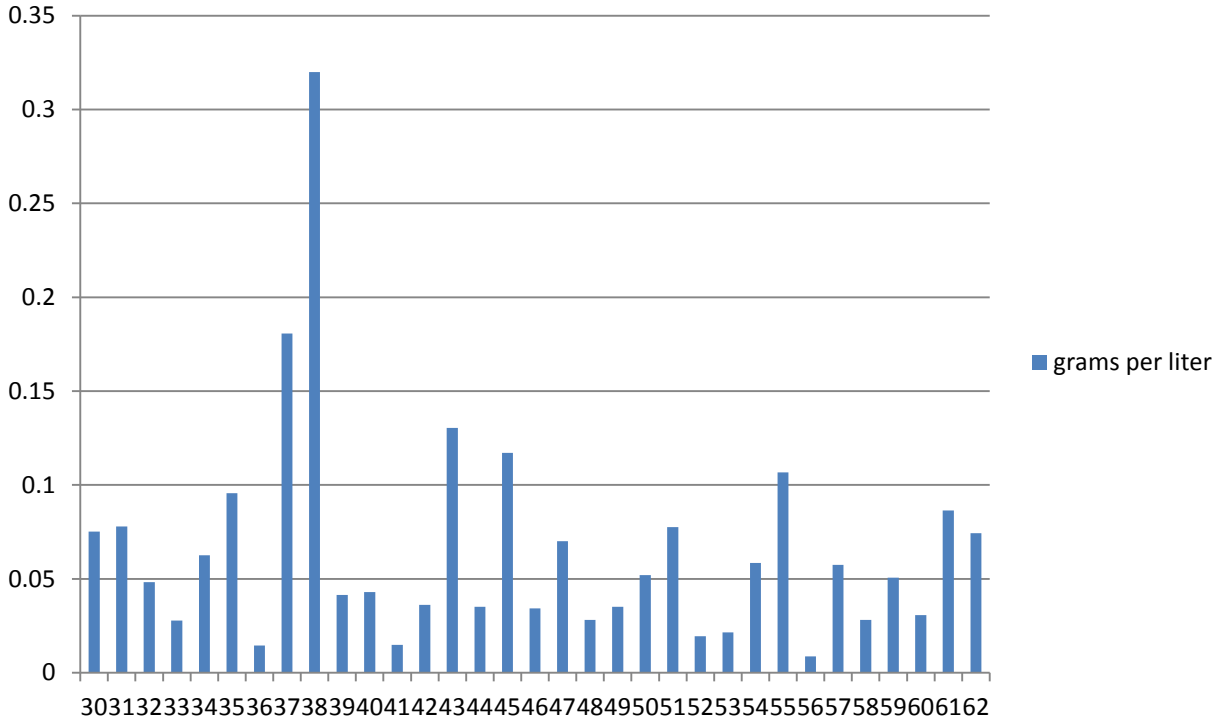


Figure 22: Density of carbonized plant remains by excavation unit.

Table 07: Summary of Late Archaic floral data from the Coastal Plain of Maryland.

| Name | Number | N of flot samples | Liters | Description |
|---|---|---|---|---|
| Koubeck[1] | 18CA239 | 1 | 7 | Unidentifiable wood. Concentration of hickory nutshells (439 fragments [4.47 grams]) |
| Chapmans Landing[2] | 18CH380 | 1 | 1.5 | Oak wood, galls, nightshade seeds |
| Beehive[3] | 18HO206 | 13 | >12 | Woods: oak, hickory, ash, elm. knotweed and pigweed seeds |
| P-SWB-43 [4] | 18PR723 | 1 | 4 | miscellaneous |
| Site 1 BARC Woods [5] | 18PR545 | 2 | 4 | Woods: oaks, hickory. |

([1]Emory 2009; Emory and Cheshauk 2011; McKnight 2009; McKnight 2010; [2]Hornum et al. 1995; [3]Goodwin 1995; Maymon et al. 1996; [4]Parker 2006; Lothrop et al. 2006; [5] Hornum et al. 2000)

The data recovery effort at the Warwick Site provides the largest floral assemblage from a Late Archaic period site on Maryland's coastal plain. A review of flotation-recovered archeobotanical assemblages from comparable Late Archaic sites excavated in Maryland

reveals consistency in the use of deciduous forest products – wood and nuts (especially hickory). Five sites in Maryland offer small but comparable assemblages (Table 07).

Comparable floral datasets from nearby Delaware include Late Archaic features at the Frederick Lodge Complex (7NC-J-97, 7NC-J-98 and 7NC-J-99) (Versar 2011a); Sandom Branch Complex (7NC-J-227 and 7NC-J-228) (Versar 2011b); Two Guys (7S-F-68) (LeeDecker et al. 1996); Hockessin Valley (7NC-A-17) (Custer and Hodny 1989); Puncheon Run (7K-C-51) (LeeDecker et al. 2005); Pollack (7K-C-203) (Custer et al. 1997); Delaware Park (7NC-E-41) (Thomas 1981); Hickory Bluff (7K-C-411) (Petraglia et al. 2005); Leipsic (7K-C-194A) (Custer et al. 1996); Carey Farm (7K-D-3) (Custer et al. 1996) and Lums Pond (7NC-F-18) (Petraglia et al. 1998). Wood charcoal was well represented at these sites, and a general pattern of Late Archaic subsistence focused on the wild products of a coastal plain forest (mast and fleshy fruits and small seeds) is evidenced. Of particular interest among the Delaware sites is the recovery of sumpweed *(Iva annua)* from Archaic contexts at the Two Guys Site.

## SUMMARY

Phase III data recovery at the Warwick Site (18CE371) included the collection, processing and analysis of 66 flotation samples retained from 33 excavation units which reveal Late Archaic and possibly Early Woodland period cultural occupations on the Maryland/Delaware border.

While expectations for a rich floral data set at Warwick were low, plant materials gleaned from the site were moderately abundant and highly informative. Carbon densities across the site averaged 0.0604 grams per liter of soil. Wood charcoal dominated the assemblage and was ubiquitous, with oak species being the most common wood type identified. Dominant comestibles include nuts (hickory and acorn) and fleshy fruits (huckleberry, hawthorn, sumac, raspberry/blackberry). The presence of partially carbonized seed and maize and an abundance of fresh, unburned seeds – especially within the plowzone – suggest the mixing of modern and historic remains in upper soil horizons. The presence of these materials may record the incorporation of plant remains burned in historic land clearing or crop management into the archaeology of the site.

The Warwick data reveal a strong dependence on the wild products of the native woodland environment, and a pattern of late summer and fall plant resources is evidenced. Archeobotanical data from the Warwick Site provide important baseline information regarding human-plant interactions during the Late Archaic and possibly Early Woodland periods in central Delmarva. Importantly, these investigations at the Warwick Site provide the largest systematically collected archeobotanical assemblage from Late Archaic contexts on Maryland's coastal plain.

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