XII. BOTANICAL ANALYSIS

Introduction

Twelve soil samples from Lums Pond were floated to recover charred macrofloral remains. Five samples were recovered from prehistoric pit features and seven samples came from prehistoric levels. Macrofloral analysis was used to provide information concerning plant resources that may have been utilized by the prehistoric occupants of the site.

Methods

The macrofloral samples were floated using a modification of the procedures outlined by Matthews (1979). One liter of sample was added to approximately 3 gallons of water. The sample was stirred until a strong vortex formed, which was allowed to slow before pouring the light fraction through a 150 micron mesh sieve. Additional water was added and the process repeated until all visible macrofloral material was removed from the sample (a minimum of 3 times). The material which remained in the bottom (heavy fraction) was poured through a 1mm mesh screen. The floated portions were allowed to dry.

The light fractions were passed through a series of graduated screens (US Standard Sieves with 2 mm, 1 mm, 0.5 mm and 0.25 mm openings) to separate charcoal debris and to initially sort the seeds. The contents of each screen were then examined. A representative sample of charcoal pieces larger than 2 mm in diameter were broken to expose a fresh cross-section and examined under a binocular microscope at magnifications up to 140x. The material which remained in the 2 mm, 1 mm, 0.5 mm, and 0.25 mm sieves was scanned under a binocular stereo microscope at a magnification of 10x, with some identifications requiring magnifications of up to 70x. The material which passed through the 0.25 mm screen was not examined. Analysis included examination of the coarse or heavy fractions. Macrofloral remains were identified using manuals (Martin and Barkley 1973; Montgomery 1977; Schopmeyer 1974) and by comparison with modern and archaeological references. The term "seed" is used to represent seeds, achenes, caryopses, and other disseminules. Remains from the light and heavy fractions were combined and recorded as charred and/or uncharred, whole and/or fragments.

Samples from archaeological sites commonly contain both charred and uncharred remains. Many ethnobotanists use the basic rule that unless there is a specific reason to believe otherwise, only charred remains will be considered prehistoric (Minnis 1981:147).

Minnis (1981:147) states that it is "improbable that many prehistoric seeds survive uncharred through common archaeological time spans." Few seeds live longer than a century, and most live for a much shorter period of time (Quick 1961; Harrington 1972; Justice and Bass 1978). It is presumed that once seeds have died, decomposing organisms act to decay the seeds. Sites in caves, water-logged areas, and in very arid areas, however, may contain uncharred prehistoric remains. Interpretation of uncharred seeds to represent presence in the prehistoric record is considered on a sample-by-sample basis. Extraordinary conditions for preservation are required.

Ethnobotanic Review

Ethnological (historic) plant uses are important in interpreting certain charred macrofloral remains as possible or even probable subsistence items in prehistoric times. The ethnobotanical literature gives evidence of the historic exploitation of numerous plants, both by broad categories, such as greens, seeds, roots, and tubers, etc., and by specific example, i.e., seeds parched and ground into meal which was formed into cakes and fried in grease. Repetitive evidence of the exploitation of resources indicates a widespread utilization and strengthens the possibility that the same or similar resources were used in prehistoric times. Ethnographic sources do document that the historic uses of some plants were developed and carried from the past. A plant with medicinal qualities was likely to have been discovered in prehistoric times, and the usage of that plant persisted into historic times. There also was a probable loss of knowledge concerning the utilization of other plant resources as cultures moved from subsistence to agricultural economies and/or were introduced to European foods during the historic period. The ethnobotanic literature serves only as a guide indicating that the potential for utilization existed in prehistoric times--not as conclusive evidence that the resources were used. Pollen and macrofloral remains, when compared with the material culture (artifacts and features) recovered by the archaeologists, can become indicators of use. Plants represented by charred macrofloral remains will be discussed in the following paragraphs in order to provide an ethnobotanical background for discussing the remains.

Native Plants

Carya (Hickory)

Hickory nuts (Carya sp.) are recorded as the most important nut used by Indians of North America at the time of contact (Reidhead 1981:189). Several species of hickory are sweet and edible, although some are bitter. The nuts usually were harvested in the fall when the outer husks dried and split. Hickory nuts had to be collected early before competing

animals harvested them all. Nuts usually were shelled by crushing, often using two rocks. Wooden mortars were used historically for processing large quantities of hickory nuts. After the nuts were crushed, they usually were placed in boiling water. Most of the shell fragments would sink to the bottom, while the nutmeats would float or be held in suspension. The nutmeats could then be skimmed off and used immediately or dried for storage. Many ethnographic sources suggest that hickory nut oil and "milk" were the desired product. The pulverized nuts were placed in slowly boiling water for a long period of time. The oil from the nutmeats (hickory butter) would separate and float to the surface where it was skimmed off and stored for later use. The rest of the nutmeats would dissolve into a milky fluid (hickory milk) that was drunk or used as stock for soup. Hickory sap can be used like maple sap. The various species of edible hickories are found in a variety of habitats including rich moist soils of bottomland woods, dry to moist upland woods, alluvial floodplains of major streams, slightly acidic soils, dry ridges, and well-drained hillsides (Peterson 1977:190; Talalay et al. 1984:338-359).

Gaylusscaia (Huckleberry)

Gaylussacia (huckleberry) is a native of North America. This small, deciduous shrub has blue or black berries that ripen from July through September. Huckleberries may be eaten fresh, cooked, or dried. Black huckleberry (G. baccata) is the most widespread and common huckleberry, especially in the eastern United States. Black huckleberry is noted to have been an important food for the Iroquois. Berries were eaten fresh, dried for winter use, made into a drink, and used as a medicine for the liver and blood. The leaves also were smoked (Bye 1970 in Erichsen-Brown 1979:187). Hoffman (1885) noted that huckleberries formed "one of the chief articles of trade during the summer" for the Ojibwa. Huckleberries are found in dry or moist ground in woods, thickets, and clearings (Angell 1981:110, 198; Kirk 1975; Peterson 1977:220; Schopmeyer 1974:427-428).

Lamiaceae (Mint family)

Members of the Lamiaceae (mint) family are characterized by square stems and hairlike oil glands of the surfaces of the leaves and stems (McGee 1984:204). Mints are well-known from ancient times as foods, flavorings, scents, and medicines. Agastache (giant hyssop, horsemint), Dracocephalum (dragon head), and Salvia (sage) seeds were noted to have been eaten, while Lycopus (bugleweed) and Stachys (hedge nettle) have edible tubers that were eaten raw or cooked. The young plants of Lycopus, Stachys, and Monarda (bee balm, wild bergamot) may have been cooked as potherbs. Young Mentha (mint) plants are good sources of vitamins A and C. The fresh or dried leaves of several plants were commonly used to make a tea. Plants that are noted to have been used for

flavoring tea include Agastache, Mentha, Monarda, Prunella (self-heal, heal-all), and Satureja douglasii (yerba buena). Several members of the mint family were important medicinal resources as well. Mentha, Leonurus (motherwort), Prunella, Nepeta (catnip), Monarda, Lycopus, and Scutellaria (skullcap) are some of the mints that are noted to have medicinal uses (Angier 1978:172; Erichsen-Brown 1979; Kirk 1975; Peterson 1977).

Quercus (Acorn)

Acorns (Quercus) are noted to have been a food source for aboriginal groups in North America. Acorns have a high degree of tannic acid, that must be removed in order to be palatable. Acorns were parched, then immersed or buried whole, with or without the shell, for a long period of time. The moisture diluted or dissolved the tannin. Tannin also was removed by leaching, which involved pulverizing the shelled, parched acorn meats and soaking the acorn meal in running or frequently changed water, or boiling the ground meal in several changes of water. Wood ash could be added to the boiling water to help neutralize the tannin. The leached meal was most commonly baked into a cake or pancake. The meal also was made into a gruel, porridge, or soup. The ground, roasted acorn shells were used to make a beverage similar to coffee. Oil also was extracted from acorns. Acorns have a high percentage of carbohydrates and relatively low percentages of protein, fat, and fiber.

Oaks are commonly divided into the white oak group and the black or red oak group. White acorns are relatively sweeter than black oak acorns. In the eastern United States, white oak acorns are generally available from mid-September to late November. White oak acorns require less processing, but are more rapidly eaten by mammals, birds, and insects. Black oak acorns are more bitter and often are available from late September to mid-February. Black oak acorns tend to have a higher percentage of fat and a lower percentage of carbohydrates than white oak acorns. Black oak acorns also provide more calories per 100 grams. Oak wood is very hard, heavy, and strong. It was valued as firewood because the hard wood would burn slowly, and a large log could burn all night. Oaks are distinctive deciduous or evergreen, hardwood shrubs to large trees found in dry to moist ground in many different habitats (Gallagher 1977:113; Kirk 1975:104-106; Munson 1984:468; Petruso and Wickens 1984:360-378).

Discussion

Site 7NC-F-18 is located at the headwaters of St. Georges Creek in Lums Pond State Park, just south of Newark in New Castle County, Delaware. Lums Pond is a man-made pond currently used for recreation. The project area generally consists of poorly drained woodlands lying on the drainage divide between the Delaware River and the Chesapeake Bay. The site was discovered in an area that was historically used as agricultural field. A dense growth of vines, briars, and ivies covered the site area. Dominant trees in the local woodlands include oak (Quercus sp.), yellow-poplar (Liriodendron tulipifera), sweetgum (Liquidambar styraciflua), blackgum (Nyssa sylvatica), holly (Ilex sp.), swamp maple (Acer sp.), hickory (Carya sp.), beech (Fagus grandifolia), and locust (Robinia sp.).

Prehistoric Features

Area 2, Block C at the site contained a cluster of ten features, mostly straight-sided, flat-bottomed, silo-shaped pits. Five of the ten pits were sampled for macrofloral remains.

Feature 2

Feature 2 measured 130 cm in diameter and 76 cm in depth. The feature fill was a uniform silt loam with charcoal throughout. Artifacts recovered from this pit included a Late Archaic point, Early Woodland ceramics, lithic debitage, and fire-cracked rock. Sample 3392 was collected from the silt loam fill (Table 41). This sample contained three charred Carya nutshell fragments (Tables 42 and 43), suggesting that hickory nuts were processed in this pit. Uncharred rootlets represent modern plants. The presence of Quercus charcoal indicates that oak wood was burned as fuel. Oak trees also would have been available for providing edible acorn resources, as well as wood for fuel. The sample also contained a possible lithic flake, a few sclerotia, and insect fragments. Sclerotia are commonly called "carbon balls". They are mycorrhizae associations produced in the soil by the fungi Cenococcum graniforme (McWeeney 1989:227). They are the resting structures of the fungus, identified by Dr. Kristiina Vogt, Professor of Ecology in the School of Forestry and Environmental Studies at Yale University. Sclerotia are small, black, solid or hollow balls that range from 0.5 to 4 mm in size. Sclerotia appear to be ubiquitous and are found with coniferous and deciduous trees including Abies (fir), Juniperus communis (common juniper), Larix (larch), Picea (spruce), Pinus (pine), Pseudotsuga (Douglas fir), Acer pseudoplatanus (sycamore maple), Alnus (alder), Betula (birch), Carpinus caroliniana (American hornbeam), Carya (hickory), Castanea dentata (American chestnut), Corylus (hazelnut), Crataegus monogyna (hawthorn), Fagus (beech), Populus (poplar, cottonwood,

aspen), Quercus (oak), Rhamnus fragula (alder bush), Salix (willow), Sorbus (chokecherry), and Tilia (linden) (McWeeney 1989:229-130; Trappe 1962).

Feature 14

Feature 14 contained a stratified fill with flakes, fire-cracked rock, and charcoal. This pit measured 150 cm in diameter and 60 cm in depth. Flotation sample 3394 was recovered from the charcoal-rich loam forming the main stratum of fill. This sample also contained a charred Carya nutshell fragment, suggesting that hickories were processed. Carya and Quercus charcoal suggest that hickory and oak wood were burned as fuel. The sample also contained two possible flakes, uncharred remains from modern plants, sclerotia, and insect fragments.

Feature 16

Feature 16 also contained a stratified fill with flakes, fire-cracked rock, and charcoal. The measurements for this pit included a diameter of 100 cm x 120 cm and a depth of 48 cm. The charcoal-flecked loam in the basal stratum was sampled as flotation sample 3395. This sample contained two Quercus acorn shell fragments, suggesting that acorns were processed. Quercus charcoal also was recovered; therefore, acorns may have been accidentally charred through use of oak wood as fuel. The sample also contained uncharred rootlets and sclerotia.

Feature 19

Feature 19 measured 145 cm in diameter and 79 cm in depth. Artifacts recovered from this pit include untyped ceramics, lithic debitage, fire-cracked rock, and charcoal. Flotation sample 3398 was taken from the charcoal-rich loam that formed the main stratum of the stratified fill. This sample contained pieces of Carya and Quercus charcoal, indicating that hickory and oak wood were burned. Two lithic flakes, uncharred rootlets, and sclerotia also were recovered.

Feature 23

The fill of Feature 23 appeared to be a uniform silt loam with untyped ceramics, lithic debitage, fire-cracked rock, and charcoal flecks. This pit had a diameter of 145 cm and a depth of 33 cm. Flotation sample 3398 was collected from the silt loam fill. Pieces of charred Carya nutshell in this sample suggest processing of hickory nuts. Quercus charcoal again indicates use of oak wood as fuel. Uncharred remains from modern plants and sclerotia were the only other remains to be recovered.

Prehistoric Levels

Flotation sample 3400 was collected from Stratum B, Level 9 of Unit N314/E332 in Block D of Area 2. This sample contained a charred Carya nutshell fragment, reflecting processing of hickory nuts. A variety of uncharred remains represent modern plants. A moderate amount of very small Quercus charcoal pieces indicate that oak wood was burned. Two insect fragments also were present.

The remaining buried strata were found in Area 3 on a low terrace adjacent to the modern floodplain of one of the streams in the southern portion of the project area. This area contained a buried azonal profile (an Ab-C succession) that suggests the possibility that the deposits had been rapidly buried during one or more flood events.

Flotation sample 3401 was recovered from the A-b horizon, Stratum C, Level 1 of Unit N230/E241. A charred Gaylussacia seed and a charred Lamiaceae seed were found in this sample, suggesting that huckleberries and a member of the mint family were utilized. Mint may have been used as a flavoring or a medicinal resource. A variety of uncharred seeds represent modern plants at the site. A moderate amount of Quercus charcoal suggest that oak wood was burned as fuel, and a few pieces of unidentifiable vitrified charcoal were present. Vitrified charcoal has a glassy appearance due to fusion by heat. Insect fragments and numerous sclerotia also were recovered.

Flotation sample 3405 was taken from Levels 1-3 of Stratum C in Units N232/E242 and N229/E240. A charred Gaylussacia seed in this sample again suggests processing of huckleberries. Quercus charcoal was abundant, suggesting use of oak wood as fuel. Uncharred remains from modern plants and sclerotia were the only other remains to be recovered.

Flotation samples 3402 and 3406 were collected below the A-b horizon from Stratum D in Area 3-A. Flotation samples 3407 and 3404 represent the lower levels of Area 3-B. A charred Carya nutshell fragment in sample 3402 again suggests use of hickory nuts,

and Quercus charcoal suggests use of oak wood as fuel. A charred unidentified seed fragment, uncharred remains from modern plants, sclerotia, and possible lithic flakes also were recovered from this sample.

Sample 3406 also contained charred Gaylussacia seeds, as well as Quercus and unidentifiable charcoal. Three lithic flakes were recovered from this sample, reflecting lithic-related activities. Uncharred Lamiaceae and Rubus seeds represent a modern member of the mint family and blackberries.

A charred Quercus acorn shell in sample 3407 suggests that acorns were processed in this area of the site. The presence of Quercus charcoal suggests that it also is possible for an acorn to have accidentally been charred through use of oak branches as fuel. Sample 3407 also contained unidentifiable charcoal, a lithic flake, uncharred remains from modern plants, sclerotia, and an insect fragment.

Sample 3404 contained pieces of Quercus charcoal and unidentifiable vitrified charcoal. Uncharred rootlets from modern plants were the only other remains to be recovered from this sample.

Summary and Conclusions

Macrofloral analysis of pit fill and stratigraphic samples from Site 7NC-F-18 within Lums Pond State Park suggest that the prehistoric occupants utilized this area for hickory nut processing and possibly for acorn processing. Charred hickory nutshell fragments were recovered from Features 2, 14, and 23, and from stratigraphic samples 3400 and 3402. Charred acorn shell fragments were found in Feature 16 and in stratigraphic sample 3407. Because acorn shells are thinner and would burn more easily to ash in a fire, acorn processing may have been more important than the macrofloral record suggests. A charred mint family seed from stratigraphic sample 3402 and charred huckleberry seeds from stratigraphic samples 3405 and 3406 suggest that these resources also were utilized. The charcoal record was dominated by oak, with a few pieces of hickory and unidentifiable vitrified charcoal also present. The charred macrofloral remains from Site 7NC-F-18 suggest that the site was occupied at least during the fall months when hickory nuts, acorns, and huckleberries are available.

Table 41
Provenience Data for Flotation Samples

Sample No.	Feature No.	Area	Provenience/Description	Liters Floated
3392	2	2-C	Silt loam fill from pit with Late Archaic point, Early Woodland ceramics, lithic debitage, and fire-cracked rock	3.35
3394	14	2-C	Silt loam fill from pit with flakes and fire-cracked rock	5.4
3395	16	2-C	Silt loam fill from pit with flakes and fire-cracked rock	3.0
3397	19	2-C	Silt loam fill from pit with untyped ceramics, lithic debitage, and fire-cracked rock	3.5
3398	23	2-C	Silt loam fill from pit with untyped ceramics, lithic debitage, and fire-cracked rock	4.5
3400		2-D	Unit N314/E332; Fill from Stratum B, Level 2	7.1
3401		3-A	Unit N230/E241; Fill from Stratum C, Level 1	3.6
3405		3-A	Units N232/E242 and N229/E240; Fill from Stratum C, Level 1-3	2.0
3402		3-A	Unit N232/E242; Fill from Stratum D, Level 3-4	5.5
3406		3-A	Units N230/E240 and N232/E240; Fill from Stratum D, Level 3-4	5.2
3407		3-B	Units N238/E2554 and N241/E258; Fill from Stratum D, Level 2-3.	3.9
3404		3-B	Unit N241/E258; Fill from Stratum D, Level 3-4	3.3

Table 42
Macrofloral Remains

Sample No.	Identification	Part	Charred		Uncharred		Weights/ Comments
			W	F	W	F	
3392	LF Weight						8.37 g
Feat. 2	FLORAL REMAINS:						
	Carya	Nutshell		3			
	Rootlets					X	Moderate
	Sclerotia				X		Few
	CHARCOAL/WOOD:						
	Quercus	Dominant		30			
	NON-FLORAL REMAINS:						
	cf. Flake				1		
	Insect					132	
3394	LF Weight						25.74 g
Feat. 14	FLORAL REMAINS:						
	Carya	Nutshell		1			
	Portulaca	Seed			2	1	
	Rootlets					X	Few
	Sclerotia				X		Few
	CHARCOAL/WOOD:						
	Carya	Present		3			
	Quercus	Dominant		47			
	NON-FLORAL REMAINS:						
	cf. Flake				2		
	Insect					14	
3395	LF Weight						12.95 g*
Feat. 16	FLORAL REMAINS:						
	Quercus	Acorn shell		2			
	Rootlets					X	Few
	Sclerotia				X		Moderate
	CHARCOAL/WOOD:						
	Quercus	Dominant		12			

Table 42 (cont'd)

3397	LF Weight						24.51 g*
Feat. 19	FLORAL REMAINS:						
	Rootlets					X	Few
	Sclerotia				X		Few
(3397)	CHARCOAL/WOOD:						
Feat. 19	Carya	Present		1			
	Quercus	Dominant		19			
	NON-FLORAL REMAINS:						
	Flake				2		
3398	LF Weight						33.95 g*
Feat. 23	FLORAL REMAINS:						
	Carya	Nutshell		9			
	Polanisia	Seed			1		
	Rootlets					X	Few
	Sclerotia				X		Few
	CHARCOAL/WOOD:						
	Quercus	Dominant		10			
3400	LF Weight						3.22 g
	FLORAL REMAINS:						
	Carya	Nutshell		1			
	Amaranthus	Seed			1		
	Asteraceae	Seed			1		
	Euphorbia	Seed			2		
	Lamiaceae	Seed			5		
	Mollugo verticillata	Seed			20		
	Oenothera	Seed			4		
	Polanisia	Seed			1		
	Polygonum	Seed			1		
	Unidentified	Seed			5	1	
	Rootlets					X	Few
	CHARCOAL/WOOD						
	Total charcoal ≥ 1 mm						0.01 g
	Quercus	Dominant		9			0.01 g
	NON-FLORAL REMAINS:						
	Insect					2	

Table 42 (cont'd)

3401	LF Weight						28.57 g
	FLORAL REMAINS:						
	Gaylussacia	Seed		1			
	Lamiaceae	Seed	1				
	Brassicaceae	Seed			1		
	Liliaceae	Seed			4		
	Oenothera	Seed			3		
	Oxalis stricta	Seed			1		
	Trifolium	Seed			20		
	Rootlets					X	Moderate
	Sclerotia				X		Numerous
	CHARCOAL/WOOD:						
	Quercus	Moderate		6			
	Unidentifiable	Present		4			Vitrified
	NON-FLORAL REMAINS:						
	Insect					11	
3405	LF Weight						5.50 g
	FLORAL REMAINS:						
	Gaylussacia	Seed	1				
	Lamiaceae	Seed			4		
	Mollugo verticillata	Seed			2		
	Oenothera	Seed			2		
	Rootlets					X	Moderate
	Sclerotia				X		Numerous
	CHARCOAL/WOOD						
	Total charcoal	≥ 2mm					0.62 g
	Quercus (white oak)			20			0.46 g
3402	LF Weight						51.51 g*
	FLORAL REMAINS:						
	Carya	Nutshell		1			
	Unidentified	Seed		1			
	Liliaceae	Seed			1		
	Oxalis stricta	Seed			1		
	Rootlets					X	Moderate
	Sclerotia				X		Numerous

Table 42 (cont'd)

(3402)	CHARCOAL/WOOD:						
	Quercus	Dominant		10			
	NON-FLORAL REMAINS:						
	cf. Flake				5		
	CHARCOAL/WOOD						
	Total charcoal ≥ 1 mm						0.06 g
	Quercus	Dominant		7			0.05 g
	Unidentifiable	Present		3			0.01 g
	NON-FLORAL REMAINS:						
	Flake				3		
	Insect					1	
3406	LF Weight						13.60 g
	FLORAL REMAINS:						
	Gaylussacia	Seed	3				
	Lamiaceae	Seed			2		
	Rubus (Blackberry)	Seed			5		
	Unidentified	Seed				2	
	Rootlets					X	Numerous
	Sclerotia				X		Numerous
3407	LF Weight						4.85 g
	FLORAL REMAINS:						
	Quercus	Acorn shell		1			
	Lamiaceae	Seed			2		
	Unidentified	Seed			1		
	Rootlets					X	Few
	Sclerotia				X		Moderate
	CHARCOAL/WOOD						
	Total charcoal ≥ 1 mm						0.12 g
	Quercus	Moderate		4			0.11 g
	Unidentifiable	Present		3			0.01 g
	NON-FLORAL REMAINS:						
	Flake					1	
	Insect					1	

Table 42 (cont'd)

3404	LF Weight						17.41 g*
	FLORAL REMAINS:						
	Rootlets					X	Few
	CHARCOAL/WOOD:						
	Quercus	Present		2			
	Unidentifiable	Present		3			Vitrified

W = Whole
F = Fragment
X = Presence noted in sample
LF = Light Fraction
g = grams

* Indicates an elevated weight due to the presence of sand in the light fraction.

Table 43
Index of Macrofloral Remains Recovered

Scientific Name	Common Name
FLORAL REMAINS:	
Amaranthus	Amaranth
Asteraceae	Sunflower family
Brassicaceae	Mustard family
Carya	Hickory, Pecan
Euphorbia	Spurge
Gaylussacia	Huckleberry
Lamiaceae	Mint family
Liliaceae	Lily family
Mollugo verticillata	Carpetweed
Oenothera	Evening primrose, sun drops
Oxalis	Wood sorrel
Polanisia	Clammy weed
Polygonum	Knotweed, smartweed
Portulaca	Purslane
Rubus	Blackberry
CHARCOAL/WOOD:	
Carya	Hickory, Pecan
Quercus	Oak

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