SECTION 8.0 FLORAL AND FAUNAL STUDIES

To examine elements of the ecological setting and potential subsistence practices of Hickory Bluff's inhabitants, three main studies were undertaken, including a modern botanical study, and macrobotanical and faunal analyses from the archaeological record. The modern botanical community was examined to determine the type and extent of modern and historic forests and to provide comparative information for the macrobotanical study. Feature samples were subjected to flotation processing to determine the potential macrofloral species present on site. Faunal remains (small fragments of weathered and calcined bone) were submitted for taphonomic analysis and species identification.

MODERN BOTANICAL STUDY

A study of the contemporary Hickory Bluff botanical environment was conducted to provide generalized habitat observations and comparative information for the macrobotanical analysis. At the time of the archaeological investigations, portions of Hickory Bluff fronting the St. Jones River were forested in mixed stands of mature hardwoods. Archaeological excavation and examination of historic aerial photographs (Appendix A) suggested that this area had remained unplowed. The relatively pristine state of this wooded tract was therefore seen as having the potential to provide insights into the composition of the local forest environment prior to historic clearing and other landscape modifications in adjacent areas.

In addition to the relatively undisturbed state of the Hickory Bluff woods, several other factors made the location an excellent candidate for study. The study area encompassed the range of topographic features that together comprise the St. Jones River front (i.e., riverbank, bluff slope and terrace). Furthermore, the mature woods were adjacent to an abandoned field, providing the opportunity to study the composition of the fringe zone (transition from forest to field) and the colonization of the formerly cleared area by local pioneering species.

Paleoenvironmental studies for Delaware indicate that an oak-dominated forest was in place by approximately 5,800 years B.P. (Newby et al. 1994:35). A synthesis of local pollen data indicates that the forests of central Delaware were dominated by oak and hickory following ca. 6,000 years B.P. (Kellogg and Custer 1994:96). This make up is very similar to contemporary forest cover in the Upper Coastal Plain of Delaware (Custer 1994:17). Subtle changes in Holocene vegetation during the last 5,000 years are difficult to resolve (Kellogg and Custer 1994:104); however, the overall forest make up is likely to have changed relatively little in comparison to the changes that accompanied the onset of Holocene conditions. Contemporary tree communities can, therefore, be seen as an analogy for local prehistoric forests during the second half of the Holocene. An exception of note is chestnut. This economically important species has all but been destroyed across large areas as a result of the pandemic chestnut blight (1904-1950s) (American Chestnut Recovery Team 2000). While Custer (1994:17) notes that oak and hickory characterize the High Coastal Plain forests, the Low Coastal Plain is dominated by evergreen species. Within each of these broad distinctions, smaller and more specific communities are present (Custer 1994:17). These variations are dependant on elevation, drainage and other edaphic conditions.

Methodology

The northwest quadrant of Hickory Bluff was chosen as a study unit for the modern botanical survey. This parcel was bordered on its west side by the St. Jones River (Figure 8.1). The site access road/parking lot marked the north edge of the study unit; the abandoned field and recently constructed storm water drainage facility defined its eastern and southern limits. The forested tract encompassed an area measuring approximately 40 by 80 meters (m).

Figure 8.1 Modern Botanical Environment Survey Transect

The tally of individual trees was limited to mature specimens, and a 36-inch trunk circumference minimum was established for the forest canopy species. A cut-off of 24 inches was used in counting the deciduous fringe species (black cherry and sassafras) as these species mature at a smaller size. Occurrence of immature tree specimens, as well as understory and ground cover species was noted but was not quantified. The age of representative mature tree specimens was obtained from tree ring counts following clearing of the area prior to construction. The survey was conducted during September and October of 1998.

The Study Area

The study area consisted of a wide transect extending from the St. Jones River bank, east across the mature woods and into the fallow field. This transect encompassed five distinct topographic and/or environmental zones, each of which was surveyed as an individual study unit. The survey demonstrated that each of the different zones hosted distinct tree and plant communities (Figure 8.2 and Table 8.1).

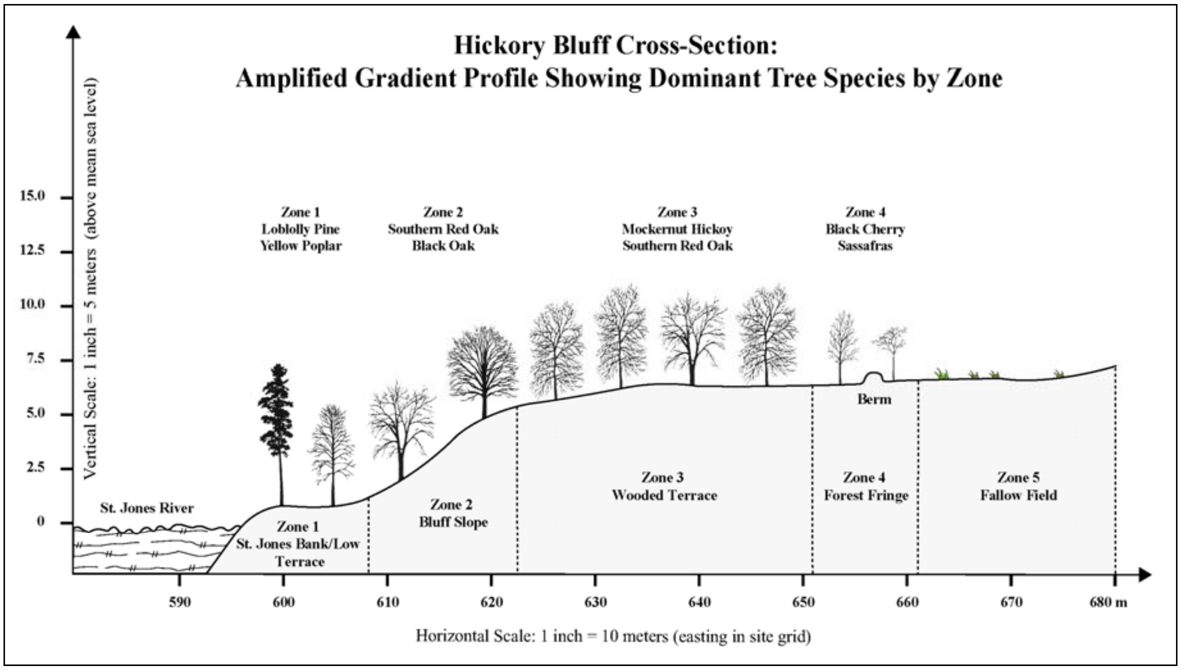

Figure 8.2 Modern Tree Species by Zone

The St. Jones River Bank and the Low Terrace Zone (Z-1)

This area comprised the St. Jones River bank and the base of the bluff. Also included within this designation was a very low terrace that extended out from the base of the bluff at the north end of study area. This low terrace was located between what is an intertidal zone to an elevation of nearly one meter at the base of the bluff. The low terrace was separated from the main terrace slope by a minor gully that held an active spring. Portions of this low-lying landform may have been disturbed during historic times through the transport of borrow material mined from pits evident in the immediate vicinity. This zone varied from just a few meters in width to as much as 10 m where the low terrace occurred.

Beech and yellow poplar were present on the St. Jones River Bank and Low Terrace (Z-1). These species typically thrive in bottomland settings (Neelands 1968:58, 90). However, the most abundant mature tree species in the low-lying zone was the loblolly pine. In addition to the living specimens, a number of large pine tree stumps were noted in this same area. Hardwoods consisted of various species belonging to the Red Oak Group (black oak, northern and southern red oak). Mature white oaks as well as large numbers of new and intermediate growth white oaks were also present. The occurrence of baldcypress was noteworthy as southern Delaware is generally recognized as the northern limit of their range (Neelands 1968:8; Sutton and Sutton

Table 8.1 Plant Species Identified at Hickory Bluff

Hickory Bluff Environmental Zones	**St. Jones River Bank / Low Terrace Zone (Z-1)**	**Bluff Slope Zone (Z-2)**	**Wooded Terrace Zone (Z-3)**	**Forest Fringe Zone (Z-4)**	**Abandoned Field Zone (Z-5)**
Tree Species					
Red Maple (*Acer rubrum*)	2				
Mockernut Hickory (*Carya tomentosa*)		1	12		
American Beech (*Fagus grandiflora*)	1				
Yellow Poplar (*Liriondendron tulipifera*)	4		1		
Loblolly Pine (*Pinus taeda*)	8	1			
Black Cherry (*Prunus serontina*)			2	14	
White Oak (*Quercus alba*)	2	2			
Southern Red Oak (*Quercus falcata*)	1	6	4		
Willow Oak (*Quercus phellos*)			2		
Northern Red Oak (*Quercus rubra*)	1	1	1		
Black Oak (*Quercus velutina*)	1	5	4		
Sassafras (*Sassafras albidum*)				14	
TREE TOTAL	20	16	26	28	0
Understory Species					
Dogbane (*Amsonia sp.*)					X
Aster (*Aster sp.*)					X
Trumpet Creeper (*Campsis radicans*)					X
Flowering Dogwood (*Cornus florida*)		X			
White Avens (*Geum canadense*)					X
American Holly (*Ilex opaca*)		X			
Sweet Gum (*Liquidambar styraciflura*)	X				
Honeysuckle (*Lonicera japonica*)			X	X	X
Virginia Creeper (*Parthenocissus quinquefolia*)					X
Pokeweed (*Phytolaccaceae*)					X
New growth Black Cherry					X
Immature White Oak	X	X			
Smooth Sumac (*Rhus glabra*)					X
Poison Ivy (*Toxicodendron radicans*)				X	X
Blackberry/ raspberry (*Rubus sp.*)					X
Sassafras		X		X	X
Common Greenbriar (*Smilax rotundifolia*)	X	X			
Goldenrod (*Solidago sp.*)					X
Baldcypress (*Taxodium distichum*)	X				
Arrowwood (*Viburnum dentatum*)	X	X			
Grape (*Vitis sp.*)					X
Shagbark Hickory (*Carya ovata*)			X		
Pignut Hickory (*Carya glabra*)			X		

1985:365). The wetland areas along the St. Jones River proper contained arrow-arrum (*Pentandra viginica*) as the dominant emergent vegetation. Cattails (*Typhas sp.*) stood in dense stands along the upstream end of the study unit.

The Bluff Slope Zone (Z-2)

The bluff slope covered an area approximately 20 to 30 m in width. From the base of the slope to the terrace rim, elevation was approximately 6 m, giving the landform a gradient of approximately 20 percent. With the obvious exception of an old borrow pit excavated into the base of the terrace near the southern limits of the study area, the bluff slope appeared to have remained relatively undisturbed by cultural activity.

The Bluff Slope (Z-2) was marked by a high degree of diversity, with species characteristic of both the upland and the low-lying zones present. These species included a loblolly pine and a mockernut hickory specimen, as well as members of the Red Oak Group (black oak, northern and southern red oak). Two mature white oaks were also present. The understory was also composed of a diversity of species. However, as with the St. Jones River Bank and Low Terrace (Z-1), new and intermediate growth white oaks accounted for a large percentage of the secondary vegetation.

The Wooded Terrace Zone (Z-3)

The high terrace overlooking the St. Jones River was nearly level, with an elevation of approximately 6 m above the river. The area was forested in mature stands of mixed hardwoods. These stands extended approximately 25-30 m east from the bluff edge.

Mockernut hickory dominated the Wooded Terrace (Z-3). Immature mockernut hickories also comprised what little understory was present. Also noted within this zone were intermediate growth shagbark and pignut hickories, other examples of which were absent from the study area. Four species of the Red Oak Group were present (black oak, northern and southern red oak and willow oak). Interestingly, while white oak is prevalent elsewhere in the study area, it was absent from the Wooded Terrace (Z-3). The preponderance of mockernut and the absence of white oak are likely due to the soil conditions on the landform. Mockernut hickory thrives on drier soils found on hills and ridges (Neelands 1968:46) while white oak grows best on deeper, more loamy soils (Neelands 1968:102) and often favors bottomland settings and swamp margins.

The Forest Fringe Zone (Z-4)

This designation was applied to the eastern fringe of the mature forest. This narrow (ca. 10 m wide) transition between old growth trees and the open field correlated with a linear earthen berm likely to have functioned as a historic property boundary marker that delineated the plowed and unplowed portions of the landform.

A nearly straight row of mature black cherry and sassafras trees defined the Forest Fringe (Z-4). Black cherry, in particular, is a specialized fringe species intolerant of competition. These trees can only establish themselves in areas that have been completely cleared, but then succumb when the slower growing forest canopy species shade them out (Neelands 1968:88).

The mature cherry and sassafras specimens clearly marked the original field boundary. With time, however, the wood line extended outwards as the oak and hickory trees matured and their crowns expanded over and beyond the fringe species.

The Fallow Field Zone (Z-5)

The area east of the wood line consisted of an abandoned field. This field had, until relatively recently, been an orchard (Appendix A). Some years prior, the orchard trees had been removed and the area allowed to lay fallow. At the time of the investigations, the field was heavily vegetated by herbaceous growth. At the start of the Hickory Bluff excavations in December of 1997, the Fallow Field (Z-5) was heavily overgrown. The area was heavily vegetated in black cherry and sassafras saplings, blackberry brambles, goldenrod and poison ivy. Smooth sumac, pokeweed and Virginia creeper were also present.

Results

Pines were present only along the St. Jones River Bank and Low Terrace (Z-1) indicating that they were relegated to the landform margins by the dominant hardwood species (Figure 8.3). The presence of new and intermediate growth as well as mature oak trees, amid mature as well as dead pines, demonstrated that this forest zone was actively moving towards a climax state. By contrast, the Wooded Terrace (Z-3) essentially was already in a climax state where the dominant hardwoods monopolize the forest canopy, crowding out other species and suppressing the understory. The community composition of the Fallow Field (Z-5) was also informative. Interestingly, despite the presence of mature loblollies in the study area, new growth pines were completely absent while herbaceous fringe/pioneer species dominated. Normally, while loblolly thrives in a variety of sites, it is so adept at colonizing open areas that it is often called “old field pine” (Neelands 1968:16). This suggests that edaphic conditions in this area favor herbaceous pioneer species.

Tree ring counts obtained from representative mature specimens yielded a nearly uniform age determination of 75-80 years for the oak and hickory species on the Wooded Terrace (Z-3). The mature loblolly pines on the St. Jones River Bank and Low Terrace (Z-1) proved to be circa 50 years of age. On close examination, the downed trees appeared to have been healthy with no evidence of disease, insect infestation or internal rot present in any specimen.

In addition to the two fruit bearing species previously mentioned (black cherry and blackberry), several other edible plants were noted on Hickory Bluff, albeit just outside of the proscribed study area limits. These were highbush blueberry (*Vaccinium corymbosun*) and a red mulberry (*Morus rubra*).

Conclusions

The modern botanical survey demonstrated that the relatively narrow area fronting the St. Jones River along Hickory Bluff is not ecologically homogeneous but rather consists of narrow, linear micro-environmental zones, with each zone hosting distinct tree and plant communities. This diversity in the contemporary communities has implications for Native American occupation.

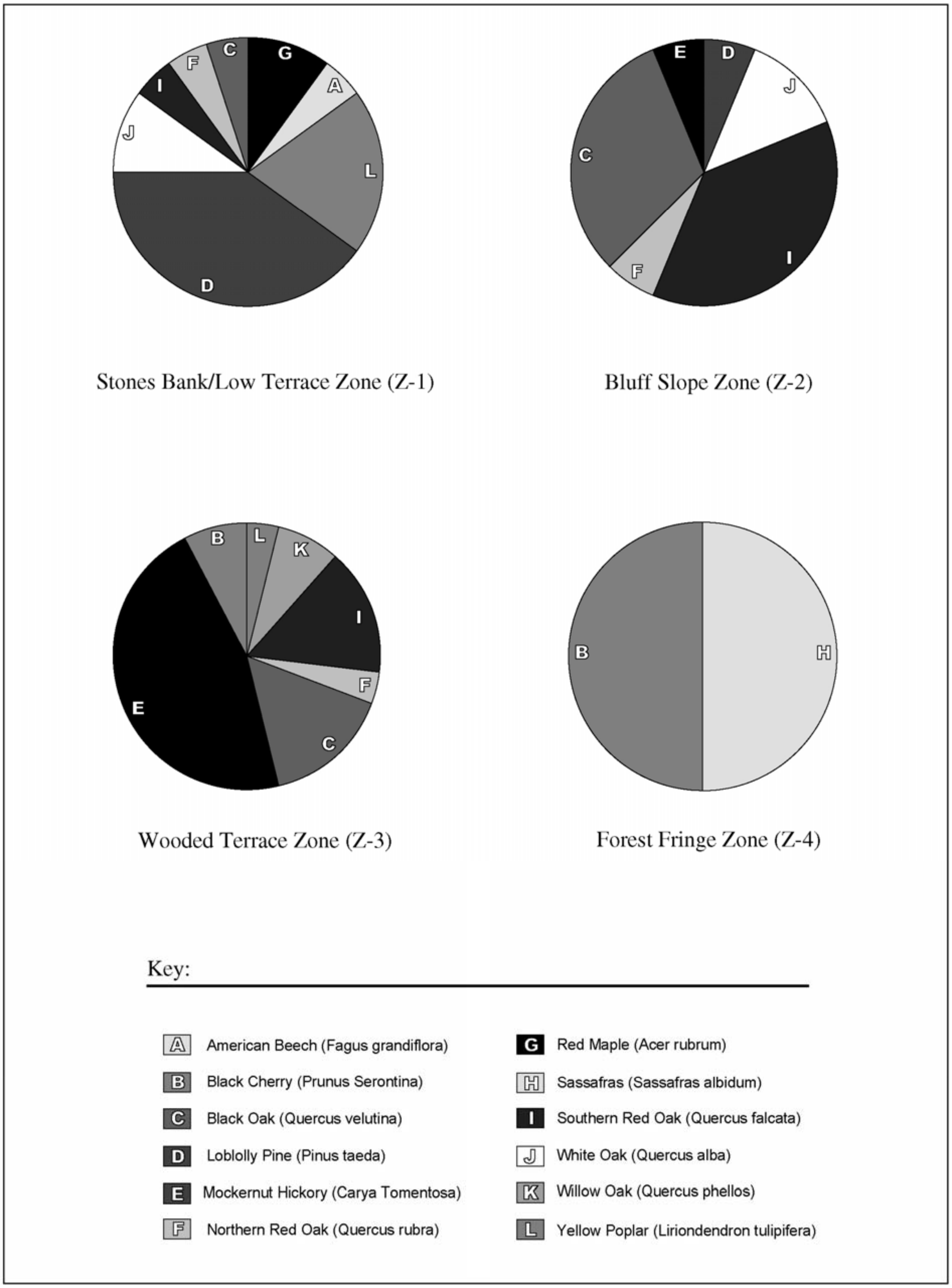

Figure 8.3 Amplified Gradient Showing Dominant Tree Species by Zone

The most salient observation is the preponderance of edible mast bearing trees. Certain hickory species are widely recognized as having been a Native American food source. Mockernut hickory, which dominated the Wooded Terrace (Z-3), yields a relatively large nut with a sweet edible meat (Sutton and Sutton 1985:430). Acorns of the white oaks would have been an important food source. In contrast to the fruits of the Red Oak Group which are bitter, white oak acorns are sweet (Neelands 1968:92), allowing them to be consumed with minimum processing. New and intermediate growth white oaks were present in numbers along the lower-lying zones, suggesting that this species was poised to become the dominant hardwood as this part of the forest moved toward a climax state.

In addition to the mast bearing trees, a number of edible fleshy fruit yielding species were prevalent in the study area. Black cherry in particular, occurred in large numbers and mature black cherry dominated the Forest Fringe (Z-4). Also present along the Fallow Field (Z-5) were dense growths of blackberry. Arrow-arrum and cattail are the dominant emergent wetland species along the St. Jones River bank.

Other species present on-site may have had important raw material value. Baldcypress, in particular, may have comprised a valuable resource. Wood of the baldcypress is exceptionally resistant to decay (Neelands 1968:8) and would therefore have been ideally suited for the construction of dugout canoes, fish weirs or for other uses that required extensive ground and/or water contact. While baldcypress is extremely durable, yellow poplar bends readily (Neelands 1968:58), making it well suited for the construction of temporary tensioned-domed shelters.

Several inferences concerning the subsistence potential of the local environment can be made from the present-day tree and plant communities. First, conditions along the Wooded Terrace (Z-3) and Bluff Slope (Z-2) seem to strongly favor the growth of mockernut hickory and white oak respectively; both of which produce sweet nut meat and are widely recognized as having contributed to Native American diets. Second, the Fallow Field (Z-5) seems to favor the natural propagation of at least two edible fleshy fruit bearing species. Areas bordering the site may have hosted similar populations and been open environments, resulting from natural storms and fires or by cultural action.

This study demonstrated a marked fertility of the Hickory Bluff environs as reflected in forest growth. This is seen not only in the progressed climax state of Hickory Bluff woods, but also the apparent rapid rate at which this condition was achieved. Tree ring counts on the mature hardwoods on the Wooded Terrace (Z-3) registered 75-80 years. In one exceptional example, a trunk circumference of 112 inches was recorded on a black oak, despite this specimen being only 52 years of age.

What is perhaps most striking about the Hickory Bluff environment is the sheer diversity of tree and plant species present within such a limited area. These not only include species that yield edible fruits but also those that could have provided useful raw materials. In a broad sense, the co-occurrence of such a wide range of potentially economically important tree and plant species could very well have been a contributing factor in the site being repeatedly selected for occupation during prehistoric times.

Another observation is that, although central Delaware is generally thought of as part of the geographic North, the Hickory Bluff environment exhibits a distinctively southern ecological character. Prevalent on Hickory Bluff were numerous tree species common to southeastern forests. Of these species present on Hickory Bluff, the willow oaks, southern red oaks and in particular, the loblolly pines, occur very near the northernmost limits of their natural ranges (Neelands 1968:100; Sutton and Sutton 1985:358, 414). The occurrence of baldcypress, just north of its generally recognized range (Neelands 1968:8), only reinforces this southern ecological character of the Hickory Bluff setting.

MACROBOTANICAL STUDY

Twenty-eight soil samples from a variety of cultural features at Hickory Bluff were selected for preliminary flotation processing and analysis to assess the degree of organic preservation and recover potential of macrofloral remains. Flotation samples from 12 basin features (Features 2, 90, 118, 120, 137, 169, 202, 232/236, 253, 298, 310, and 414), 15 stone or thermally altered stone (TAS) features (Features 46, 87, 98, 99, 165, 166, 174, 175, 176, 227, 230, 249, 281, 289, and 296), and one control sample (Feature 240) were submitted for macrobotanical analysis.

Methodology

Two-liter soil samples were routinely collected during feature excavation. Samples were obtained from unscreened fill secured from across the base of stratigraphic levels. Soil samples were thoroughly dried, then packed for storage in vinyl bags.

Soil samples were individually processed using a Flote-Tech machine-assisted flotation system equipped with 0.325 millimeter (mm) fine fraction (light) and 1.0 mm coarse fraction (heavy) screens. The Flote-Tech system is a multi-modal flotation system that facilitates the separation and recovery of plant remains from the soil matrix via agitation in water combined with forced air delivered through submerged pipes. Flotation processing was conducted indoors using tap water and electricity from a 110-volt outlet. Resulting floted fractions were air dried.

All carbonized plant remains recovered through flotation were combined and passed through a 2 mm geological sieve, yielding fractions of 2 different sizes for analysis. Weights and sample descriptions of the resulting greater than or equal to 2 mm and less than 2 mm fractions were recorded. The greater than or equal to 2 mm charcoal specimens were examined under low magnification (10x to 30x), sorted into general categories of material (i.e., wood, nutshell, seeds, amorphous charcoal, etc.), and each category was described, counted and weighed. The less than 2 mm size fractions were examined under low magnification, their general composition recorded, and any seed remains were removed for identification.

Identifications were routinely attempted on all seed and miscellaneous plant remains recovered, 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 1989). Identifications of all classes of botanical remains were made to the genus level when possible, to the family level when limited diagnostic morphology 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 was used to reflect the degree of identification possible. General wood categories within the analyzed assemblages included “ring porous”, where specimens exhibited differences between early and late wood growth, “diffuse porous” where no difference between early and late wood growth was apparent, “deciduous taxa” where specimens could be identified as having a porous vessel arrangement reflecting deciduous trees rather than a trachid arrangement indicative of coniferous taxa, and “unidentifiable” where specimens were so minute or eroded that identification was impossible. The category “amorphous carbon” was used to classify carbonized remains that lacked any suitable characteristics whatsoever upon which to base identification.

All identifications were made under low magnification (10x to 30x) with the aid of standard texts (Martin and Barkely 1961; Panshin and deZeeuw 1970), and were checked against plant specimens from a modern reference collection representative of the flora of Kent County, Delaware. Specimens were weighed using an electronic balance accurate to 0.01 grams.

Results

The macrobotanical assemblage from Hickory Bluff contained small quantities of carbonized plant remains and a moderate quantity and diversity of non-carbonized woody and herbaceous seeds. Flotation processing of 56 liters of soil resulted in the recovery of 6.17 grams of charcoal, or an average density of 0.11 grams of charcoal per liter of feature fill. Recovered plant remains included native deciduous wood, hickory and walnut family nutshell, non-carbonized seeds indicative of disturbed open-field and forest edge environments, unidentifiable amorphous charcoal and unidentifiable rind-like fragments.

Wood charcoal was the most ubiquitous class of plant remain recovered, occurring in 79 percent of the samples analyzed. A total of 580 carbonized wood fragments weighing 4.87 grams was recovered. The identified wood sub-sample was overwhelmingly dominated by hickory *(Carya sp.)* (101 fragments) with a lesser component of white oak *(Quercus sp.)* *(Leucobalanus* group*)* (38 fragments) (Table 8.2). Other species identified included (in order of abundance) unspecified oak *(Quercus sp.)* (6 fragments), black walnut *(Juglans nigra*) (5 fragments), maple *(Acer sp.)* (4 fragments), American chestnut *(Castanea dentata)* (4 fragments), maple or birch *(Acer/Betula)* (4 fragments), cherry *(Prunus serotina)* (1 fragment), and red oak *(Quercus sp.) (Erythrobalanus group)* (1 fragment). The wood assemblage from Hickory Bluff suggests the selection of high-caloric woods for fuel. All wood species identified would have been common to the mixed hardwood forest native to Delaware’s Coastal Plain (Eyre 1980; Tatnall 1946). Forty-six thick-walled hickory *(Carya sp.)* and two walnut-family *(Juglandaceae)* nutshell fragments were identified (Table 8.3).

Both carbonized and non-carbonized seeds were encountered within the Hickory Bluff flotation assemblage. The presence of non-carbonized seed remains within prehistoric flotation samples from open-site environments is usually considered evidence of modern seed contamination (Keepax 1977; Minnis 1981; Smith 1985). Non-carbonized seeds are a common constituent of macrobotanical assemblages from prehistoric sites across Delaware

Table 8.2 Species Identification for Wood Charcoal Recovered From Selected Hickory Bluff Features

Feature No.	**Provenience**	**Level**	**Feature Type**	**Wood Charcoal**															
				***Acer sp.* (maple)**	***Acer/Betula* (maple or birch)**	***Carya sp.* (hickory)**	***Castanea dentata* (american chesnut)**	***Juglans nigra* (black walnut)**	***Prunus serotina* (cherry)**	***Quercus sp.* (white group)**	***Quercus sp.* (red group)**	***Quercus sp.* (unspec)**	**diffuse porous**	**ring porous**	**deciduous taxa**	**unident**	**Total Count**	**Total weight (in grams)**
2	N371 E656		B1-a							6							6	0.07
46	N360 E642	1	A1-b							11				2	5	2	46	0.26
87	N370 E631	1	A1-b		2	5		2					1		5	5	63	0.5
90	N402 E624	7	B1-a	1						3					4		8	0.05
98	N314 E658	1	A1-a/B3									1				5	6	0.05
99	N312 E659		A1-a	1		9									4		14	0.12
118	N301 E734	6	B1-a														0	0
120	N308 E659	1	B3-a			15		1						2		2	212	1.63
137	N315 E659-660		B2			17									3		30	0.42
165	N381 E632-633		A1-a		2	5		1		5					4	1	18	0.19
166	N380 E632-633		A1-a	1		2									8		11	0.1
169	N369 E630	4	B1-a													2	2	0.01
174	N378 E636		A1-a			2			1	6		1			10		26	0.23
175	N402 E627-628		A1-a													3	3	0.01
176	N352 E648	1	A1-b				1	1		7		1			10		20	0.15
202	N374.5 E660.2		B3-a														0	0
227	N385-386 E626		A1-a				1							1	2		4	0.11
230	N373 E645		A1-a			1								5	7		13	0.07

Table 8.2 Species Identification for Wood Charcoal Recovered From Selected Hickory Bluff Features (Continued)

Feature No.	**Provenience**	**Level**	**Feature Type**	**Wood Charcoal**														
				***Acer sp.* (maple)**	***Acer/Betula* (maple or birch)**	***Carya sp.* (hickory)**	***Castanea dentata* (american chesnut)**	***Juglans nigra* (black walnut)**	***Prunus serotina* (cherry)**	***Quercus sp.* (white group)**	***Quercus sp.* (red group)**	***Quercus sp.* (unspec)**	**diffuse porous**	**ring porous**	**deciduous taxa**	**unident**	**Total Count**	**Total weight (in grams)**
232/ 236	N366-368 E646-647		B1-c/D3														0	0
240	N379 E708		E3												4		4	0.02
249	N372 E641		A1-a	1		3									8		12	0.14
253	N379.8 E665.5		B1/D3			10									1		11	0.12
281	N354-356 E647-648		A1-c			15									5		20	0.14
289	N356 E647		A1-a								1				3		4	0.02
296	N372 E635		A1-a			3									7		10	0.08
298	N370 E635		B2			13	2								5		26	0.31
310	N369 E635		B2			1									4	3	8	0.05
414	N314 E671.75		B3-a									3					3	0.02
Total				4	4	101	4	5	1	38	1	6	1	10	99	23	580	4.87

Table 8.3 Species Identification for Nut Remains and Carbonized Seed Recovered From Selected Hickory Bluff Features

Feature No.	Provenience	Level	Feature Type	Nut Remains				Carbonized Seed	
				Carya sp. (hickory, thick-walled)	*Juglandaceae* (walnut family)	Total Count	Total weight (in grams)	Total Count	Total weight (in grams)
2	N371 E656		B1-a	4		4	0.04		
46	N360 E642	1	A1-b	2		2	0.01		
87	N370 E631	1	A1-b			0	0		
90	N402 E624	7	B1-a	2		2	0.02		
98	N314 E658	1	A1-a/ B3	3	2	5	0.04		
99	N312 E659		A1-a	8		8	0.12		
118	N301 E734	6	B1-a			0	0		
120	N308 E659	1	B3-a			0	0	1	< 0.01
137	N315 E659-660		B2	2		2	0.02		
165	N381 E632-633		A1-a	2		2	0.04		
166	N380 E632-633		A1-a			0	0		
169	N369 E630	4	B1-a			0	0		
174	N378 E636		A1-a	2		2	0.23		
175	N402 E627-628		A1-a			0	0		
176	N352 E648	1	A1-b	4		4	0.02		
202	N374.5 E660.2		B3-a						
227	N385-386 E626		A1-a			0	0		
230	N373 E645		A1-a	1		1	0.02		
232/ 236	N366-368 E646-647		B1-c/ D3			0	0		
240	N379 E708		E3						
249	N372 E641		A1-a	8		8	0.13		
253	N379.8 E665.5		B1/D3			0	0		
281	N354-356 E647-648		A1-c			0	0		
289	N356 E647		A1-a	4		4	0.03		
296	N372 E635		A1-a			0	0		
298	N370 E635		B2			0	0		
310	N369 E635		B2	4		4	0.02		
414	N314 E671.75		B3-a			0	0		
Total				46	2	48	0.74	1	< 0.01

(e.g., Custer et al. 1995b, 1996; LeeDecker et al. 1998) and the data from Hickory Bluff concur with this pattern. All identified seeds represented plants common to disturbed environments and moist floodplain or forest edge settings (Table 8.4). Pigweed *(Amaranthus sp.)*, rattlebox (*Crotolaria sp*.), spurge *(Euphorbia sp.)*, tulip poplar *(Liriodendron tulipifera)*, panic grass *(Panicum sp.)*, poke *(Phytolacca americana)*, raspberry or blackberry *(Rubus sp.)*, cherry (*Prunus serotina*), elderberry (*Sambucus canadensis*), knotweed *(Polygonum sp.)*, clover *(Trifolium sp.)*, and fox grape *(Vitis labrusca)* were identified. A single unidentified carbonized seed was encountered within this assemblage (Table 8.3). The eroded condition of the seed precluded taxonomic classification.

Miscellaneous plant-related materials included 8 fragments of rind-like material and 76 pieces of amorphous carbon (Table 8.5). In addition, unidentifiable spherical carbon residue (a material produced during the burning of plant material high in silica) was common throughout all samples analyzed.

Floral/Feature Type Comparisons

One topic of interest at Hickory Bluff was the relationship between functional areas as defined by feature type, particularly TAS features and basin features. The macrobotanical data reveal some patterns.

Frequencies of wood charcoal species are similar for both TAS features and basin features (Figure 8.4). Only two species indicate differences between the feature types. Specifically, the presence of hickory wood is slightly higher in basin features than in the TAS features. Higher frequencies of the white oak group wood charcoal occur in the TAS features than in the basin features and may suggest a preference for specific types of fuel for these type of features.

Two species of nut remains were recovered: thick-walled hickory nutshells and walnut shells. Hickory nutshells were identified in both feature types; however, the frequency of hickory nutshells is 2.8 times higher in TAS features than in basin features (Figure 8.5). This pattern may suggest that the TAS features were associated with wild plant food processing and consumption, and/or the intentional use of high-oil hickory nutshell to produce hot, smokeless fire. This pattern may also represent simple discard of food remains in TAS features and, as a result of the burning processes, preservation of higher frequencies of carbonized nutshells in the archaeological record. Overall, the frequency of nutshells (both hickory and walnut) is 3 times higher in TAS features than basin features (Figure 8.5).

Non-carbonized and non-indigenous seeds occurred in 88.5 percent of the sampled features. Their presence is a problematic because very few plant remains not preserved by burning would be expected to preserve in archaeological contexts. The species recovered are indicative of disturbed open-field, forest edge, and wooded wetland environments. It is probable that the recovered seeds are modern in origin and intrusive into archaeological deposits. Their presence may be explained by a number of factors, first and foremost by the stratigraphic complexity of the site, where loosely compacted sediments permitted the transport of organic materials through soil strata. Rodent activity, fluvial processes or the action of root growth and

Table 8.4 Species Identification for Non-Carbonized Seed Remains Recovered from Selected Hickory Bluff Features

Feature No.	**Provenience**	**Level**	**Feature Type**	**Non Carbonized Seed Remains**																		
				***Amaranthus sp.* (pigweed)**	***Crotolaria sp.* (rattlebox)**	***Euphorbia sp.* (spurge)**	***Liriodendron tulipifera* (tulip poplar)**	***Panicum sp.* (panic grass)**	***Phytolacca americana* (poke)**	***Polygonum pensylvanicum* (knotweed)**	***Polygonum sp.* (knotweed)**	***Prunus serotina* (cherry)**	***Rubus sp.* (raspberry/blackberry)**	***Sambucus canadensis* (elderberry)**	***Trifolium sp.* (clover)**	***Vitis labrusca* (fox grape)**	***Polygonaceae* (knotweed family)**	**unident**	**Total Count**
2	N371 E656		B1-a																0
46	N360 E642	1	A1-b			19							1		1				21
87	N370 E631	1	A1-b			13	3		1				2			1			20
90	N402 E624	7	B1-a																0
98	N314 E658	1	A1-a/B3	1		4	1						4			1			11
99	N312 E659		A1-a		7		1				1	9	5	1	1				25
118	N301 E734	6	B1-a			1												1	2
120	N308 E659	1	B3-a			1					3								4
137	N315 E659-660		B2				1						4						5
165	N381 E632-633		A1-a			1													1
166	N380 E632-633		A1-a			5				1							1		7
169	N369 E630	4	B1-a			1												1	
174	N378 E636		A1-a			9						1							10
175	N402 E627-628		A1-a			2													2
176	N352 E648	1	A1-b			7	3						3						13
202	N374.5 E660.2		B3-a	3		1													4
227	N385-386 E626		A1-a			4					3		3		2				12

Table 8.4 Species Identification for Non-Carbonized Seed Remains Recovered from Selected Hickory Bluff Features (Continued)

Feature No.	**Provenience**	**Level**	**Feature Type**	**Non Carbonized Seed Remains**															
				***Amaranthus sp.* (pigweed)**	***Crotolaria sp.* (rattlebox)**	***Euphorbia sp.* (spurge)**	***Liriodendron tulipifera* (tulip poplar)**	***Panicum sp.* (panic grass)**	***Phytolacca americana* (poke)**	***Polygonum pensylvanicum* (knotweed)**	***Polygonum sp.* (knotweed)**	***Prunus serotina* (cherry)**	***Rubus sp.* (raspberry/blackberry)**	***Sambucus canadensis* (elderberry)**	***Trifolium sp.* (clover)**	***Vitis labrusca* (fox grape)**	***Polygonaceae* (knotweed family)**	**unident**	**Total Count**
230	N373 E645		A1-a	1									2		1				4
232/236	N366-368 E646-647		B1-c/D3																0
240	N379 E708		E3																
249	N372 E641		A1-a			4													4
253	N379.8 E665.5		B1/D3									2						1	3
281	N354-356 E647-648		A1-c			12	1					3	3		1	2			22
289	N356 E647		A1-a																0
296	N372 E635		A1-a			2		1											3
298	N370 E635		B2		1	8					1								10
310	N369 E635		B2			2									1				3
414	N314 E671.75		B3-a	1		2													3
Total				6	8	98	10	1	1	1	8	15	27	1	7	4	1	3	189

Table 8.5 Other Plant Remains Recovered from Selected Hickory Bluff Features

Feature No.	Provenience	Level	Feature Type	Other Plant Remains			
				amorphous carbon	rind fragment	Total Count	Total weight (in grams)
2	N371 E656		B1-a	0		0	0
46	N360 E642	1	A1-b	4		4	0.01
87	N370 E631	1	A1-b	4	6	10	0.05
90	N402 E624	7	B1-a	3		3	0.02
98	N314 E658	1	A1-a/B3	2		2	0.02
99	N312 E659		A1-a	2		2	0.01
118	N301 E734	6	B1-a			0	0
120	N308 E659	1	B3-a	16		16	0.19
137	N315 E659-660		B2	6		6	0.02
165	N381 E632-633		A1-a			0	0
166	N380 E632-633		A1-a	2		2	0.01
169	N369 E630	4	B1-a			0	0
174	N378 E636		A1-a	2		2	0.01
175	N402 E627-628		A1-a	4		4	0.01
176	N352 E648	1	A1-b	6	1	7	0.05
202	N374.5 E660.2		B3-a			0	0
227	N385-386 E626		A1-a			0	0
230	N373 E645		A1-a	2		2	0.02
232/236	N366-368 E646-647		B1-c/D3			0	0
240	N379 E708		E3	1		1	0.01
249	N372 E641		A1-a	3		3	0.04
253	N379.8 E665.5		B1/D3	1		1	0.01
281	N354-356 E647-648		A1-c	3	1	4	0.01
289	N356 E647		A1-a	1		1	0.01
296	N372 E635		A1-a	7		7	0.05
298	N370 E635		B2	4		4	0.02
310	N369 E635		B2	2	0	2	0.01
414	N314 E671.75		B3-a	1		1	0.01
Total				76	8	84	0.59

decay may also explain the introduction of these specimens into archaeological contexts. The presence of non-carbonized European, Asian and tropical American seed species at Hickory Bluff is similar to the pattern observed at other Delaware sites, including Puncheon Run, Carey Farm, Leipsic and Pollack. Non-carbonized seeds are more abundant in TAS features, approximately 4.3 times higher in frequency than in basin features (Figure 8.6). This pattern would suggest that the basin features exhibit more physical integrity and intrusive disturbance than the TAS features.

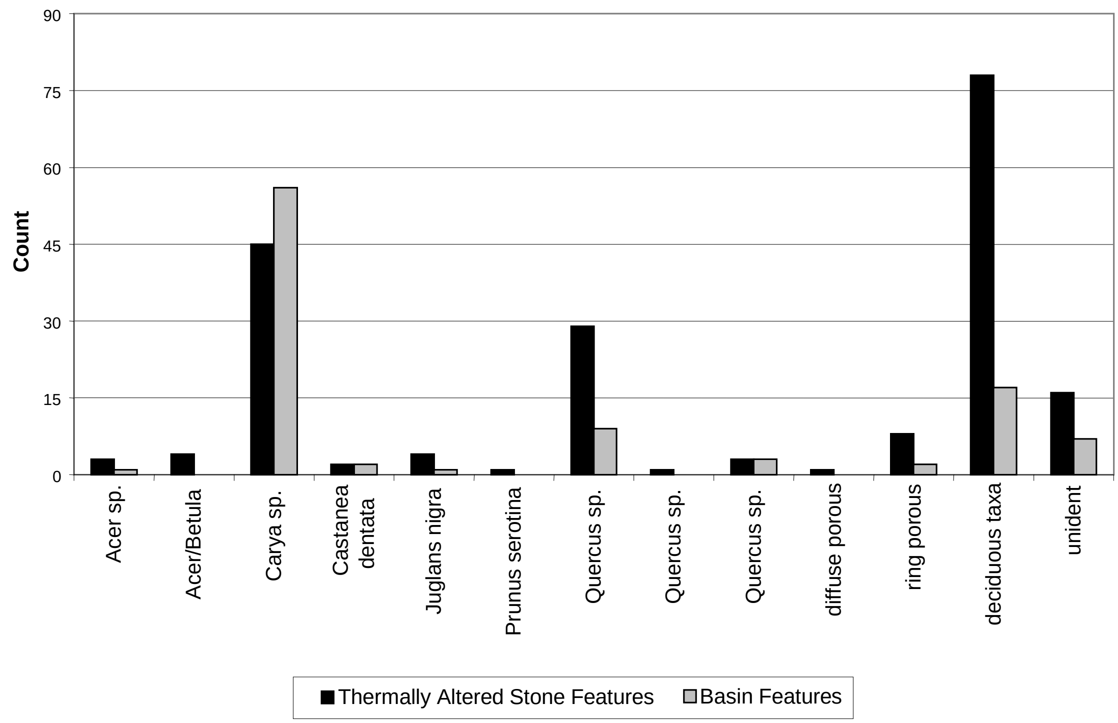

Figure 8.4 Comparison of Wood Charcoal Between TAS and Basin Features

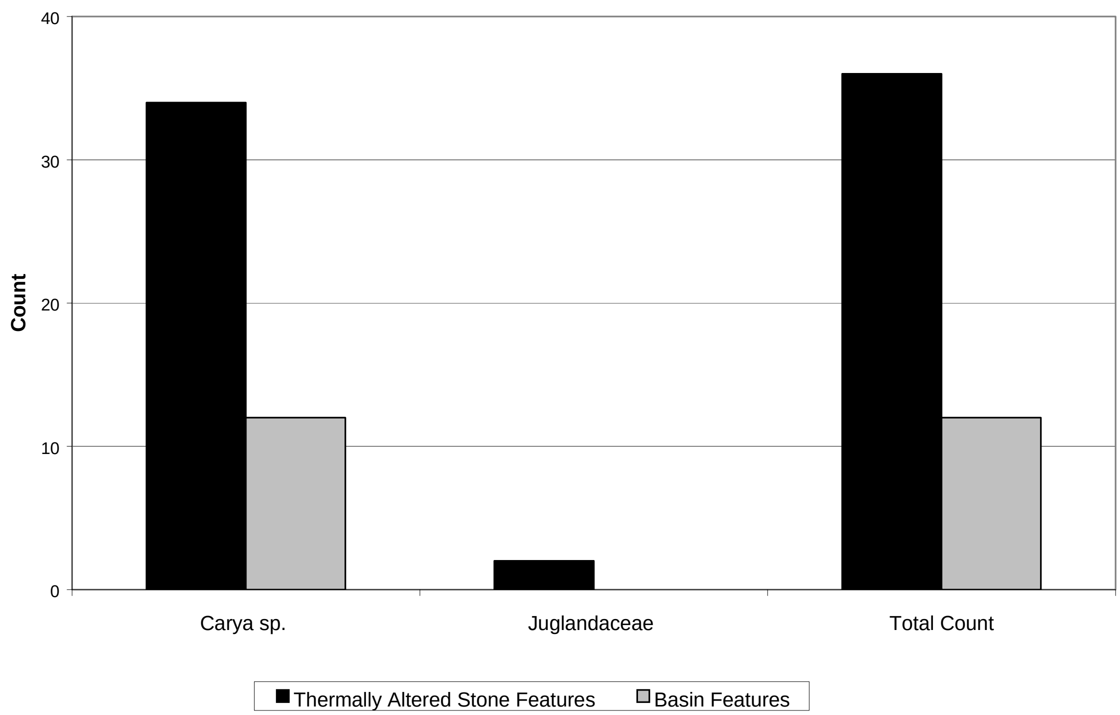

Figure 8.5 Comparison of Nut Remains Between TAS and Basin Features

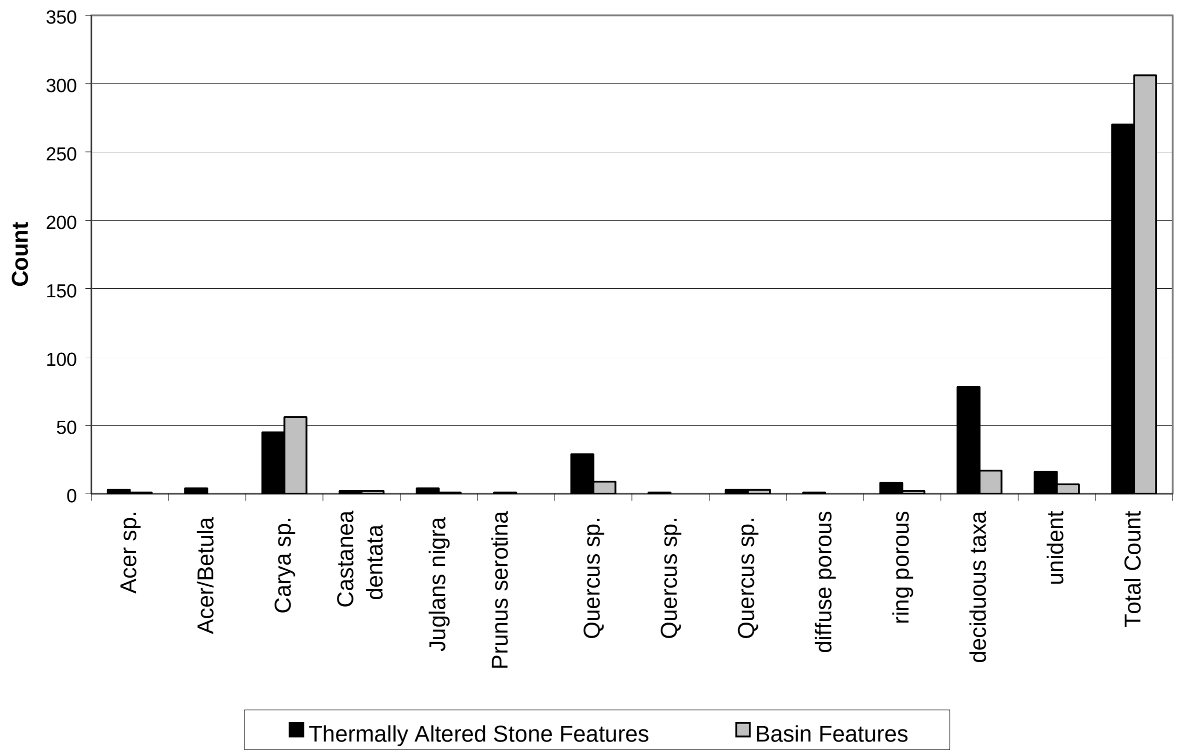

Figure 8.6 Comparison of Non-Carbonized Seeds Between TAS and Basin Features

A greater diversity of wood taxa was recovered from the TAS features, with nine distinct taxa being identified (five taxa identified from the basin features); nut remains were more ubiquitous within the TAS feature samples (60 percent presence versus 36 percent presence in the basin features).

Conclusions

The analysis of flotation samples from Hickory Bluff documented the persistence of economically important wild plant resources within the archaeological record and partially revealed the composition of local forests. These data confirmed the basic patterns of woodland resource utilization of the Coastal Plain, evidencing a reliance on high-calorie fuel resources, and a dearth of evidence for reliance on cultivated plants. Carbonized plant macro-remains were extremely scarce, and their condition was highly fragmented and eroded. Edible plant remains were confined to a low number of nutshells.

FAUNAL STUDY

Archaeofaunal specimens recovered through archaeological excavations at Hickory Bluff included 273 pieces of vertebrate bone. These specimens were recovered from 3 shovel tests, 66 excavation units and 22 features. Most (82 percent) were calcined, severely weathered, and less than 2 cm in maximum dimension.

Methodology

Each specimen was examined for morphological and structural characteristics indicative of specific vertebrate taxa and identified with reference to the Comparative Osteological Collection of the Appalachian State University Department of Anthropology. This collection has proven to be sufficiently comprehensive for the Holocene fauna of the Mid-Atlantic region of North America. Additional observations recorded included the skeletal element and side represented by each specimen, and evidence of taphonomic processes.

Results

The Hickory Bluff assemblage was particularly challenging because of poor preservation. Although extra effort was taken in attempts to identify specimens, only 19 percent were identified to the level of species, genus, or family of vertebrate represented (Table 8.6). Uncalcined specimens included remains of turtle (family *Kinosternidae* or *Emydidae*), eastern box turtle (*Terrapene carolina*), robin (*Turdus migratorius*), opossum (*Didelphis virginianus*), domestic pig (*Sus scrofa*), and domestic cattle (*Bos taurus*) (Table 8.7). Remains of unidentified birds and mammals were also recovered. These uncalcined specimens, mostly recovered from disturbed, near-surface deposits, clearly represented modern deposition, probably dating to the last century. Three of the four domestic cattle specimens and a single pig specimen were sawn. The remains of the opossum represented most of the skeleton of a single individual that died on the site. The only archaeological features yielding uncalcined faunal remains (Features 1 and 273) exhibited disturbances by tree roots and fossorial animals. These unburned remains, representing modern human activities and natural death, warrant no further discussion.

Only 6 percent of the weathered, calcined fragments were identifiable beyond the level of vertebrate class (Table 8.8). The calcined specimens (n=225) included bones of turtle, box/pond turtle, eastern box turtle, and white-tailed deer (*Odocoileus virginianus*). Calcined remains of unidentified mammals also were included (Table 8.8). With few exceptions, these calcined specimens were recovered from buried horizons and 17 feature contexts and were probably the only remaining archaeofaunal evidence of prehistoric human subsistence on the site. There was no evidence to indicate that any of the calcined bones recovered were the result of human cremation.

Taphonomic Considerations

The recovery of calcined bones at Hickory Bluff is not unusual as calcined bones are commonly preserved on archaeological sites (e.g., De Jong 1926; Gilchrist and Mytum 1986; Mays 1998; Whyte 1997). This is especially true in moist temperate and tropical environments where animal remains seldom remain preserved because of biogenic decomposition. The calcination of bone results in shrinkage, the loss of collagen, and sometimes deformation, leaving only the stable mineral structure intact. These fragmentary, shrunken, and warped remains are extremely difficult to identify as to the species of vertebrate they represent, yet they may be the only extant direct evidence of human food or human anatomy on a site. This was the case for the prehistoric archaeofaunal remains from Hickory Bluff.

Table 8.6 Vertebrate Taxa Represented by Archaeofaunal Remains from Hickory Bluff

Scientific Name	Common Name	Total NISP*	Frequency Burned	Percent Burned
Fm. Kinosternidae/Emydidae	Mud/box/pond turtle	10	10	100
Fm. Emydidae	Box/pond turtle	1	1	100
Terrapene carolina	Eastern box turtle	2	1	50
Class Aves **(large)**	Large bird	1	0	0
Turdus migratorius	Robin	1	0	0
Didelphis virginianus	Opossum	30	0	0
Bos taurus	Domestic cattle	4	0	0
Odocoileus virginianus	White-tailed deer	3	3	100
Sus scrofa	Domestic pig	1	0	0
Class Mammalia (large)	Large mammal	10	9	90
Class Mammalia (medium)	Medium mammal	2	1	50
Class Mammalia	Mammal	127	126	99
Subphylum Vertebrata	Vertebrate	81	74	91
TOTAL		273	225	

*NISP = the number of identified specimens per taxon

Bones of animals were commonly burned when food was cooked or when food refuse was burned as fuel (Payne 1983) or as a means of disposal (Brooks and Yellen 1987; Hayden and Cannon 1983:130; Speck 1977:104; Swanton 1979:314; Walters 1988; Whyte 1989:239-241). Burned animal remains have sometimes been found as offerings or part of the burial attire of cremated humans (Bond 1996; Kuhl 1984; Whyte 1998). Animals were occasionally sacrificed by burning (Haskell 1891). The Iroquois, for example, in historic times, cremated one or more white dogs as part of their New Year's celebration (Tooker 1965). Bones of various vertebrates were also burned in shamanistic or divinatory rituals such as scapulamancy (Andree 1906; Speck 1977). Among some cultures, it was customary to dispose of animal remains by means of burning so that the spirits of the animals would be appeased (Hayden 1985; Speck 1977:104; Swanton 1979:314). It has also been shown that animal remains may become burned accidentally by natural or human-caused fires (Bennett 1999; Coy 1975; Grayson 1988:27-29; Spenneman and Colley 1989; Walters 1988). Buried bones, however, are not likely to become calcined unless they are within a few centimeters beneath a very hot sustained fire (Bennett 1999).

Prior to the burning of bones, they may have been fresh ("green"), baked, boiled, wet, dry, or weathered to some extent. Bones become baked and their fat content reduced in the process of cooking meats in fires or coals (Chaplin 1971: Coy 1975). Bones were often boiled in stews and soups or reduced in size and boiled to obtain collagen for extra nutrition (Binford 1978; Leechman 1951; Oliver 1993; Vehik 1977). Bone refuse resulting from any behavior may have been used as fuel (Payne 1983) or tossed in fires along with other refuse for the sake of good housekeeping (Brooks and Yellen 1987; Jones 1980; Walters 1988) or to prevent them from becoming dog food (Speck 1977:104; Swanton 1979:314).

Table 8.7 Species Identification of Non-Calcined Bone from Hickory Bluff

Type	**Number**	**Provenience**	***Terrapene carolina***		**Aves**		***Turdus migratorius***		***Didelphis virginianus***		***Bos taurus***		***Sus scrofa***		**Large Mammal**		**Medium Mammal**		**Mammal**		**Vertebrate**	
			Total Count	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**
Unit		N281 E681									1	81.6										
Unit		N282 E681									1	22.3										
Unit		N350 E648							8	2.1												
Unit		N350 E649							3	9.8												
Unit		N351 E648							11	14.7												
Unit		N351 E649							5	7.2												
Unit		N351 E650											1	3.1								
Unit		N352 E648							3	3.5												
Unit		N354 E651															1	2.2				
Unit		N368 E645																	1	0.2		
Unit		N368 E646					1	0.1														
Unit		N370 E645									1	10.1										
Unit		N371 E645													1	0.7						
STP	601	N300 E683.5																			3	0.1
STP	606	N300 E671			1	0.7																
Unit		N309 E660																			2	0.1
STP	515	N375 E650									1	16.8										
Feature	1	N368-373 E644	1	0.8																		
Feature	273	N374 E646																			2	0.2
Total			1	0.8	1	0.7	1	0.1	30	37.3	4	130.8	1	3.1	1	0.7	1	2.2	1	0.2	7	0.4

Table 8.8 Species Identification of Calcined Bone from Hickory Bluff

	Number	Provenience	*Kinosternidae Emydidae*		*Emydidae*		*Terrapene carolina*		*Odocoileus virginianus*		Large mammal		Medium mammal		Mammal		Vertebrate	
			Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight
Unit		N305 E698													1	0.4		
Unit		N305 E700															1	0.1
Unit		N310 E659									1	0.6						
Unit		N312 E674															1	0.2
Unit		N314 E659	1	0.1											2	0.8		
Unit		N314 E661													1	0.2		
Unit		N315 E658													1	0.1	1	0.1
Unit		N315 E659													3	1.0		
Unit		N315 E661													1	0.3	10	0.8
Unit		N316 E658													1	0.1		
Unit		N316 E660	1	0.1														
Unit		N316 E661													1	0.3	3	0.3
Unit		N317 E660									1	0.6					1	0.2
Unit		N336 E683													1	0.3		
Unit		N350 E648									1	0.4			1	0.2		
Unit		N350 E649													6	2.4	3	2.7
Unit		N350 E650													2	0.4		
Unit		N351 E649													4	1.6		
Unit		N351 E650													6	1.4		
Unit		N352 E648															4	0.1
Unit		N352 E650													1	0.1		
Unit		N353 E648													1	0.2		
Unit		N353 E649													1	0.3		
Unit		N354 E647											1	0.3	10	2.7		
Unit		N354 E648													1	0.2		
Unit		N354 E649							1	0.4					1	0.1		
Unit		N355 E647													2	0.6	2	0.3
Unit		N355 E648													1	0.3		

Table 8.8 Species Identification of Calcined Bone from Hickory Bluff (Continued)

	Number	Provenience	*Kinosternidae Emydidae*		*Emydidae*		*Terrapene carolina*		*Odocoileus virginianus*		Large mammal		Medium mammal		Mammal		Vertebrate	
			Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight	Total Count	Total Weight
Unit		N355 E649	1	0.1														
Unit		N356 E647															1	0.1
Unit		N356 E648													2	0.6		
Unit		N358 E650									1	0.4						
Unit		N359 E641									1	1.0						
Unit		N360 E642													2	0.4		
Unit		N360 E643													1	0.3		
Unit		N361 E641													2	0.7		
Unit		N366 E641													2	0.6		
Unit		N367 E636													1	0.3		
Unit		N369 E640													1	0.6		
Unit		N370 E636															1	0.2
Unit		N370 E640													1	0.4		
Unit		N371 E631													1	0.4	2	1.9
Unit		N371 E636													7	1.5	3	0.4
Unit		N371 E638													1	0.3		
Unit		N371 E640			1	0.3									6	1.3		
Unit		N372 E636															2	0.5
Unit		N372 E641															1	0.1
Unit		N372 E643															1	0.1
Unit		N373 E641													1	0.3		
Unit		N379 E636	1	0.4											1	0.2		
Unit		N380 E636									2	1.1			1	0.2	1	0.1
Unit		N399 E627													1	1.1		
Unit		N351 E652	1	0.1													1	0.1
Unit		N371 E641													2	0.8		
Feature	1	N371 E642															2	0.1

Table 8.8 Species Identification of Calcined Bone from Hickory Bluff (Continued)

	Number	Provenience	*Kinosternidae Emydidae*		*Emydidae*		*Terrapene carolina*		*Odocoileus virginianus*		Large mammal		Medium mammal		Mammal		Vertebrate	
			Total Count	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**	**Total Count**	**Total Weight**
Feature	1	N368-373 E644	2	0.4											1	0.4		
Feature	1	N373 E642															1	0.1
Feature	19	N311 E674															3	0.1
Feature	37	N351 E652															1	0.1
Feature	60	N361 E647															1	0.1
Feature	67	N313 E659-660													1	0.2	1	0.1
Feature	77	N374 E635													1	0.3		
Feature	106	N314-315 E659															2	0.2
Feature	120	N308 E659															1	0.1
Feature	127	N317 E660															1	0.2
Feature	129	N377-381 E632-635	2	0.2			1	0.2			1	0.6			14	3.4	6	0.8
Feature	137	N315 E660													8	2.2	4	0.4
Feature	139	N359 E642													1	0.2	1	0.1
Feature	232	N367 E648															6	0.1
Feature	249	N372 E641													5	0.5	1	0.2
Feature	257	N379 E636	1	0.1											8	2.3	1	0.1
Feature	265	N366 E645													1	0.4		
Feature	275	N364 E638							1	0.2	1	0.5			2	0.6	1	0.2
Feature	279	N367 E638													1	0.4		
Feature	288	N374 E634							1	0.7					1	0.2		
Feature	310	N369 E635															2	0.3
Total			10	1.5	1	0.3	1	0.2	3	1.3	9	5.2	1	0.3	126	35.1	74	11.6

Preservation and Identification Bias

Archaeological assemblages of calcined animal remains, like that of Hickory Bluff, rarely produced identifications of more than a few species. Frequently for sites in eastern North America, the only groups identifiable among the remains were turtles and large mammals such as the white-tailed deer (e.g., McAvoy et al. 2000; Whyte 1997). Turtle remains were often identifiable among the small calcined fragments because of the distinctive bone structure of the shell. If a specimen exhibited a dense pattern of small spherical pores between parallel cortical walls, it was likely a fragment of the carapace or plastron of a turtle in the family Kinosternidae (mud turtles) or Emydidae (box and pond turtles). Moreover, even the smallest fragments will often retain evidence of the distinctive sulcus where scutes were attached. Calcined bone fragments of large mammals, by way of their thickness and density, also have a better chance of retaining some diagnostic feature. Furthermore, because the bones of white-tailed deer usually outnumber the remains of other vertebrates in well-preserved faunal assemblages from prehistoric sites in the region, there is a probability that remains of deer, versus other animals, will be identified among the calcined fragments of poorly preserved bone assemblages.

Recognizing this bias in favor of the identification of remains of turtles and deer, it must be emphasized that Hickory Bluff, at any one time during or immediately following its prehistoric human occupation, was probably littered with the remains of multiple individuals of numerous invertebrate and vertebrate species. Only some of the bones which became calcined have remained preserved for archaeological recovery, and only a small sample of the calcined specimens recovered (6 percent) were identifiable beyond the class level. White-tailed deer and several species of turtle undoubtedly played important roles in local prehistoric human diets, as did many other animals whose remains were not preserved or identified.

A significant proportion of the assemblage was identifiable only as large mammal (4 percent) or mammal bone (47 percent) based upon cortical bone thickness and texture. Considering that white-tailed deer remains were identified and that their remains typically dominate better preserved prehistoric vertebrate assemblages in the region, most of these mammal remains were probably from deer. Because their edges were rounded from weathering subsequent to burning, it cannot be determined if the fragments resulted from perimortem fracturing (e.g., marrow procurement). One mammal bone fragment (Unit N367 E636) exhibited evidence of transverse fracturing characteristic of the burning of fresh bone. Most specimens, however, were too fragmentary and weathered to determine the condition of the bone prior to burning.

Summary and Conclusions

Among the assemblage of 225 calcined, fragmentary, vertebrate specimens from the prehistoric component at Hickory Bluff, remains of eastern box turtle (*Terrapene carolina*), indeterminate mud/box/pone turtle (fm. Kinosternidae/Emydidae), white-tailed deer (*Odocoileus virginianus*), and indeterminate mammal were identified. These identifications were biased due to the fact that only extremely burned (calcined) bones survived through time, and turtles and large mammal remains were more readily identifiable among small, calcined fragments. These remains were recovered from horizontal strata and from archaeological features of varying functions and ages. Most features containing bone also were associated with a temporal mix of ceramic and lithic artifacts. It was impossible, therefore, to define the specific ages of archaeofaunal remains.

The white-tailed deer was a focus of the subsistence economies of Native American populations residing on the Delmarva Peninsula (Custer 1989). Deer not only provided meat, but also hide, antler, bone, and tissues for technological needs. Although deer may have been obtained by various means throughout the year, they were historically targeted most heavily in the late fall and early winter when they provide more fat, antlers, and better hides (Swanton 1979).

Several species of aquatic turtles including snapping turtle (*Chelydra serpentina*), stinkpot (*Sternotherus odoratus*), mud turtle (*Kinosternon subrubrum*), spotted turtle (*Clemmys guttata*), painted turtle (*Chrysemys picta*), and red-bellied turtle (*Chrysemys rubriventris*) are common in still waters adjacent to the site. The diamondback terrapin (*Malaclemys terrapin*), common to the brackish waters of the St. Jones River, may have been trapped or netted along the river margin near the site. The eastern box turtle is locally abundant, preferring woodland habitats. Box and mud turtles are also well represented on sites with better-preserved assemblages and were probably trapped or collected when encountered during the warmer months. They were consumed as food and the shells of box turtles were often fashioned into cups or rattles (Swanton 1979). Because the shells were put to many uses, their representation in the assemblage cannot serve as an indication of site seasonality.

SUMMARY

Hickory Bluff did not contain an overabundance of visible organic remains. As a consequence, several studies were employed to gather as much information as possible about the ecological setting and potential subsistence strategies employed. The results of the modern and macrobotanical studies merged nicely, providing information which indicated that a hickory and oak environment typified the period of site occupation. The botanical studies indicated that the setting of Hickory Bluff was probably always a productive natural environment, which would have supplied an abundance of wood and plant species for subsistence and technological needs, including fuel for fires. The recovery of nutshells, together with the remains of turtle and deer, indicated the importance of both terrestrial and marine resources.