The Vascular Flora of the Carrotoman River Watershed, Lancaster County, Virginia

Troy W. Weldy

College of William & Mary - Arts & Sciences

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The Vascular Flora of
the Corrotoman River Watershed,
Lancaster County, Virginia

A Thesis
Presented to
The Faculty of the Department of Biology
The College of William and Mary in Virginia

In Partial Fulfillment
Of the Requirements for the Degree of
Master of Arts

by
Troy W. Weldy
1995
APPROVAL SHEET

This thesis is submitted in partial fulfillment of
the requirement for the degree of

Master of Arts

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Author

Approved, September 1995

[Signature]  
Donna M.E. Ware, Ph.D.

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Martha A. Case, Ph.D.

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Stewart A. Ware, Ph.D.
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Dedicated to my Grandparents and Uncle for showing me the wonders of the natural world and inspiration to reach for the stars
ACKNOWLEDGMENTS

I wish to express deep and sincere thanks to all those who were involved in the assistance and support during this study. I am especially indebted to Dr. Donna M.E. Ware who worked countless hours on specimen verification, assistance in the field, guidance through various keying exercises, and general advise. Dr. Ware (DMEW) was not only a thesis advisor, instructor, mentor, and fellow botanist, she has also become a great friend. I also wish to thank Dr. C. Rick Berquist for assistance with matters pertaining to geology, Dr. Martha Case for her expertise in orchids and systematics, and Dr. Stewart Ware for his assistance with the vegetational analysis and overall wisdom.

A study such as this would not be possible without the assistance and company of field companions. The most active and enduring of these companions was Jane Showacre. Anne Messick accompanied me on many field days and provided contacts of various landowners throughout the study area. Other field companions include Andrea Albertin, Lara Ackermann, Joel Bunn, Kathy Huffman, Gwen Hudgins, Henry Mlodozeniec, Mark Mort, Shannon Sommer, Mark Stoetzer, Ellis Squire, and Kurt Stromberg.

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This floristic study focused on the Corrotoman River watershed which constitutes over eighty-five square miles and more than half of Lancaster Co., Virginia. Located on the Northern Neck peninsula, Lancaster County is bounded by the Chesapeake Bay to the east, Northumberland County to the north, Richmond County to the west, and the Rappahannock River to the south. The entire study area lies west of the Suffolk Scarp and within the Atlantic Coastal Plain. Five geologic formations previously have been mapped in the area, although the Yorktown Formation with its typical shell deposits was never observed.

Fifty-nine field trips were made to the study area from 21 March 1994 to 20 September 1995. Many habitats were examined including pine forests, upland mixed hardwoods, millponds, swamps, brackish and freshwater marshes and various disturbed habitats. In eight stands which typified the forested areas of the study area, vegetational analysis was done using the Bitterlich method of sampling. Soil analysis of areas with mountain-coastal plain disjuncts revealed that some of the disjunct species are in high calcium soils, while others are not.

Phytogeographic analysis showed that over 40% of the species documented during the study are native to North America and have an overall range that extends west beyond the Mississippi River but fails to reach the Pacific Coast. Another twenty percent are non-native. The geographic northern limits of species in the coastal plain were re-assessed and only four species (Aster grandiflorus, Crataegus viridis, Cyperus haspan, and Decumaria barbara) will be given northern range extensions and that the Middle Neck still serves as the northern limit for a significant number of southern species.

Eight hundred twenty-four species representing 829 taxa, 431 genera of 122 families were documented during the course of this study. Two hundred-forty of these are new records for Lancaster County, including sixty-two Northern Neck records, two coastal plain records, and one state record. Eleven species have been previously determined by the Virginia Department of Natural Heritage as being uncommon or rare in Virginia, nine newly reported from Lancaster Co. for the first time. A yellow lady's slipper orchid, Cypripedium kentuckiense, is reported for the state and Atlantic Coastal Plain for the first time.
The Vascular Flora of the Corrotoman River Watershed, Lancaster County, Virginia
INTRODUCTION

The Corrotoman River watershed lies in the northern Coastal Plain of Virginia, on that strip of land between the Potomac and Rappahannock Rivers known as the Northern Neck. An investigation of the flora of the Corrotoman River watershed, Lancaster County, Virginia, began 21 March 1994 after a rigorous review of the Atlas of the Virginia Flora III (Harvill et al. 1992) yielded results that suggested that the flora of Lancaster Co. has received relatively little attention. Only a single published study by Ted Bradley et al. (1976) focused on the flora of this county, and King George is the only county on the Northern Neck to have an in-depth floristic study performed (Simmons, Ware, & Hayden 1995). My initial investigations of Lancaster county strengthened the hypothesis that its flora was under-represented by the most recent edition of the Atlas. These initial investigations included observations that my proposed study area included a variety of habitats, including fresh and brackish waterways, a lower proportion of recently timbered land in comparison to other nearby counties, low incidence of disturbance, and several old mill ponds. Although the area still has a large proportion of its area devoted to forest, a number of areas were clear cut and/or prepared for housing development during the study period.

The goal of this study is not only to grasp a greater understanding of the occurrence and distribution of the flora of Lancaster County, but also to complement the previous studies of the flora on the Northern Neck and to add to our overall knowledge of plant distribution in Virginia. New distributional records as a result of this study will be included in the next edition of the Atlas of the Virginia Flora.

To gain insight into the distribution and relative importance of the different woody species, quantitative vegetational analysis to rank species importance was done
for forest stands characteristic of the study area. A phytogeographic analysis of all species collected was also done. To begin this analysis, species collected in this study were categorized according to their total known world-wide distribution. Next, those species which North (1983) and Harvill (1966) determined as reaching their northern limit on the Middle Peninsula were compared with the checklist compiled in this study. This is a particularly pertinent comparison because Lancaster County is the next county north of the most northern county of the Middle Peninsula (Middlesex County) where North (1983) did her work. The geographical northernmost limits of the species in this study were then re-assessed. Finally, to determine if the mountain-coastal plain disjunct plants were associated with high calcium soils as in other areas of the Virginia Coastal Plain, a geo-floristic component studied the soil composition within the study area where these plants were found.

Study Site:

Lancaster County is the southeasternmost county on the Northern Neck of the Virginia Coastal Plain. It is bordered on the north by Northumberland County, on the east by the Chesapeake Bay, on the south by the Rappahannock River, and on the west by Richmond County. The Northern Neck is hereby defined as those counties lying between the tidal portions of Potomac and the Rappahannock rivers in the Virginia coastal plain (Fig. 1). In addition to Lancaster Co., the counties included on the Northern Neck of Virginia are King George, Westmoreland, Richmond, and Northumberland counties. Before the construction of bridges across the Rappahannock at Tappahannock and White Stone, the entire Northern Neck was secluded from the remainder of Virginia. This was especially true for Lancaster County since it is the southeasternmost part of the region and would have taken more time to either travel to it by land or slow ferry rides before the bridge was built.
Fig. 1a. Physiographic Provinces of Virginia (taken from Woodward and Hoffman 1991)

Fig. 1b. Detail of Virginia Coastal Plain with dashed line representing the fall zone, the western boundary of the coastal plain (taken from Harvill et al.)
A map of the Corrotoman River watershed was digitized and the computed watershed area was recorded as 226.3 +/- 9.1 square kilometers (ca. 87 sq. mi.). The north, east, and west portions of the study area were defined by roadways constructed on watershed divides and the south boundary was defined by the Rappahannock River. The following series of state roads were used to define the study area: Route 222 north from Weems to Christ Church, Route 200 north to Route 615, Route 615 west to Beanes Corner, Route 602 northwest to Route 600, Route 600 south to Alfonso, Route 617 south to Route 3, Route 622 west to Nuttsville, Route 618 south to Route 354, Route 354 south to Route 626, and Route 626 southeast to Towles Point (Fig. 2).

The Corrotoman River is a wide waterway which experiences diurnal tidal fluctuations its entire length, as do the more southern portions of the tributaries into both the Eastern Branch and Western Branch of the Corrotoman River. Tidal fluctuations were observed as far inland as roughly one kilometer north of the Route 3 bridge over Bellwood Swamp on the Western Branch. The Western Branch is the larger branch of the two and, and consequently, has a more extensive drainage area. It also has a number of inlets created by its various tributaries and is further subdivided into two additional branches. The smaller branch (Little Branch) has one millpond and a few tributaries. The larger branch retains the name Western Branch and has one existing millpond, four abandoned/drained millponds, broad brackish/freshwater marshland, and extensive swamp habitats. The Eastern Branch provides drainage for the southeastern third of the study area where it has a number of small tributaries, one existing millpond, one abandoned/drained millpond, and three other ponds of which the historic uses are unknown.

With the possible exception of a few pocket marshes (small marshes in coves which probably have a higher salt content than the entering diurnal tidal waters and generally have a small stream entering at the backside) scattered along shorelines
Figure 2: Map outlining study area with major roads and waterways
throughout the tidal portion of the study area, the tributaries of the Western Branch are the most pristine and richest from a floristic standpoint. Most of the older growth forests and sphagnum-rich areas are also located in this portion of the study area. Every effort should be made to protect these areas from future destruction or any sort of development. Development along the shore lines of navigable waterways and timber harvesting have led to the diminution of the flora in other parts of the study area, as well.
General History:

Lancaster County was established in 1651 from portions of Northumberland and York counties. At the time of initial establishment, Lancaster included land which now constitutes Middlesex and portions of Essex Counties (Jones 1983). In the 1630's, it was unclear whether Lancaster and other portions of the Northern Neck would become part of Virginia or Maryland. Virginia's claim to the Northern Neck was secured with the formation of Northumberland County in 1648 (Wheeler 1972).

Captain John Smith was the first Englishman to visit the area when he traveled there in 1608. He was very impressed with the area and his words still hold true today.

The mildness of the aire (coole breeses asswage the vehemencie of the heat), the fertilitie soile, and the situation of the rivers are so propitious to the nature and use of man as no place is more convenient for pleasure, profit, and mans sustenance.

quoted by Lancaster County Woman's Club 1975

The current citizens of Lancaster and I could not agree more with the Captain.

The Rappahannock basin was home to many Indian tribes, particularly the Cottatawoman, Moraughtacund, and Rappahannock tribes. These tribes were loyal to the Powhatan Confederacy, but some have speculated that this was more out of fear than by choice (McCary 1950, in Wheeler 1972). McCary claimed it was the presence of these Indians which delayed the settlement of Lancaster County. A peace treaty with the Powhatans in 1646 stated that the Indians would cede all rights to land which constitutes The Peninsula of Virginia in exchange for both peninsulas north of the York River (Hening 1823, in Wheeler 1972). This halted settlement of the Northern Neck for a few years but the treaty had no bearing on those settlers already inhabiting the area.
In 1653, Towezen, King of the Rappahannocks (the most powerful tribe in the area at the time) signed a treaty which basically restricted the Indians to a reservation system. The treaty stated that all Englishman committing a crime against Indians would be punished by the court with Indian chiefs present. Towezen also received an English style house in return for the peace promise (Wheeler 1972).

Settlement into the area increased after pacification with the Indians was achieved. During the early 1650's, abundant tobacco harvests created a boom economy which prompted more to settle in the area (Wheeler 1972). One of the first and most influential people to move to the area was John Carter I of Corotoman. Mr. Carter was granted 1300 acres of land located on the Rappahannock River near Carters Creek in 1642. His homesite was named Corotoman. For more information on John Carter, a detailed sketch of his life is provided by Christine Jones (1977a).

Carter children were also very influential during the colonial history of Lancaster County. Mr. Carter had three sons, John II, Robert, and Charles (Jones 1977b). Information indicates that John II went on to become Lt. Col. John Carter II, Robert became Colonel Robert (King) Carter, and no additional information was provided on Charles. Colonel Robert (King) Carter was born in Lancaster County in 1662 and died there in 1732. At the time of his death, he was claimed to be "...the richest man in America and perhaps the only millionaire. He owned 1,000 slaves and 300,000 acres of land. The inventory of his estate showed that he had in cash 10,000 British pounds sterling and the largest library in America. Among his descendants are (three) Presidents of the United States, three signers of the Declaration of Independence, many governors of Virginia, numerous members of Congress, and Robert E. Lee" (Chesapeake National Bank 1975).

Lancaster County’s most famous citizen is Mary Ball, mother of George Washington. The birth home of Mary Ball, Epping Forest, has remained in her family for over 285 years and the historic plantation is still a working farm (Lancaster County
During the summer months, Epping Forest becomes one of the favored tourist stops of visitors to the area. Washington's birthplace (Westmoreland County) is also on the Northern Neck, not far from Lancaster County.

The coming of the American Revolution brought the enlistment of the people of Lancaster to uphold the Declaration of Independence. The county established the Lancaster County Militia and it was re-established during the War of 1812 as the Ninety-second Regiment of the Virginia Militia, Lancaster County (Nottingham 1930). Although no fighting or bloodshed occurred within Lancaster County, the muster roles indicate that many Lancaster citizens gave their lives so that later generations could enjoy the freedom so desired during the Revolution. A complete list of Lancaster citizens qualified to serve as officers, a record of their qualifications, certification of the heirs of the deceased, and movement of troops during the American Revolution and War of 1812 were compiled by Nottingham (1930).

Generally, the American Revolution did not disrupt the normal way of life in Lancaster County and the War of 1812 only brought the sighting of British ships along Lancaster's shoreline (Lancaster Co. Women's Club 1975). The Civil War did bring poverty to the area but no military destruction occurred; Lancaster County was much more fortunate than nearby counties. Even during the depression, "nobody went hungry in a land that nourished its own" (Lancaster Co. Women's Club 1975).

Today, the county is experiencing a boom in population, especially among retirees. According to the 1990 census, the county is home to 10,896 people. The greatest number of people are 65 years and over (25.9%), and the lowest demographic age groups are under 5 years of age (5.0%) and 18-24 years of age (5.9%) (U.S. Dept. Commerce 1992).

The history of the name, Corrotoman, is in itself a long, interesting story. Originally, the name was taken from a tribe of Indians that inhabited the area. Sources disagree as to the tribe from which the name was taken, however. Wharton (1983) states
that John Smith transcribed the name of the tribe of Indians he met on the Northern Neck as the Cuttatawoman. The Northern Neck of Virginia Historical Magazine (1967) states that the Cottatawoman tribe was from King George County, while another tribe, the Corotomans resided along the banks of the Corrotoman River. Some explain this difference by stating that the Cottatawoman tribe's name changed along with that of the River (A. Burrows, pers. comm. 1995). Governor Berkeley is accredited with changing the spelling to "Cotowoman." The county clerks in the 19th century spelled it as Currottoman (Wharton 1983). Even today, people tend to spell it one of three ways: either Corotoman, Corottoman, Corrotoman. I have chosen to follow the name I most encountered, Corrotoman, which is pronounced, however, as though it were spelled "Currottoman" (Kur-o-t[-man).

**Botanical History:**

Little botanical history is known. Colonial botanists, such as John Clayton, may have visited the area, but no definite record of it has been found. The first documented people known to botanize the area were Mrs. Winfred Harley and her husband of Merry Point and J.T. Baldwin of the College of William and Mary. They botanized both together and individually in the county from the 1950's to the 1970's. For the most part, the Harley and Baldwin specimens are the only records from Lancaster Co. in the Herbarium of the College of William and Mary (WILLI). Based upon these specimens, it appears that the Harleys restricted their efforts to the vicinity of Merry Point, with their most notable documentation being *Stewartia ovata* (Harley 1969), which was only the second report of this species on the Coastal Plain of Virginia.

In the early 1970's, the Virginia Institute of Marine Science conducted an inventory of tidal marsh plants (Silberhorn 1982), but in this type of study voucher specimens often are not collected. Most of the present day records are attributed to the single study by Bradley *et al.* (1976). Bradley and others from George Mason University
are also responsible for a number of other records they collected while visiting, touring, or camping in the area (T. Bradley, pers. comm. 1995). Work also continues today with the efforts of Jane Showacre, Anne Messick, and other interested amateur botanists. Recently, the John Clayton Chapter of the Virginia Native Plant Society recognized the botanical value of the area and expanded their chapter to include the Northern Neck. They are assisting in a floristic inventory of the newest Virginia State Park, Belle Isle State Park, in western Lancaster Co.
PHYSICAL DESCRIPTION

Climate:

The climate of Lancaster County is considered by a number of retirees from Virginia and northward to be quite comfortable. Only during occasional years does the temperature fall below zero or rise above 100 degrees. The gentle breeze near the Rappahannock and Corrotoman Rivers can be quite pleasant, especially during the summer seasons. This warm breeze also provides ideal conditions for sailing and other recreational activities.

All climatological data (Table 1) was collected from the Kilmarnock weather station, which is located on the eastern boundary of the study area. Data from this weather station were available from 1979 to present (U.S. Dept. of Commerce 1979-1994). The mean annual temperature for the period of 1979-1994 was 57.08°, ranging from 55.3° to 59.6°. For the same period, the mean high temperature was 99°, ranging from 94° to 102°; while the mean low temperature was 3°, ranging from -6° to 14°. An average of 184 consecutive frost free days were recorded for each year, with a range of 155 to 228. Woodard and Hoffman (1991) list the growing season for this area as 210 days, but when one compares the average number of consecutive days without frost in Lancaster to those counties south, there is actually a striking difference. In comparison to Lancaster County's recorded average of 184 consecutive days without frost, Middlesex averages 181 (North 1983), Ft. Eustis on The Peninsula averages 236 (Applier 1974), and Isle of Wight on the southside of the James averages 192 (Plunkett 1990).

Data from the Soil Conservation Survey of Lancaster County (1963) indicate that precipitation was fairly evenly distributed throughout the year, but on average, slightly more rainfall was recorded during the months of June and July (Fig. 3). The higher
Table 1: CLIMATOLOGICAL DATA FROM THE KILMARNOCK STATION, KILMARNOCK, VIRGINIA FROM 1979-1994 (Adapted from the U.S. Dept. of Commerce, Weather Bureau, Climatological Data, vols. 84-99)

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<th>TEMPERATURE (°F) MEAN</th>
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<th>LOW</th>
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<td>*</td>
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<td>1992</td>
<td>56.9</td>
<td>99</td>
<td>13</td>
<td>52.87</td>
<td>4/14</td>
<td>10/20</td>
<td>189</td>
</tr>
<tr>
<td>1993</td>
<td>*</td>
<td>102</td>
<td>6</td>
<td>39.40</td>
<td>*</td>
<td>10/24</td>
<td>*</td>
</tr>
<tr>
<td>1994</td>
<td>*</td>
<td>99</td>
<td>*</td>
<td>*</td>
<td>4/9</td>
<td>10/28</td>
<td>202</td>
</tr>
</tbody>
</table>

Mean: 57.08 99 3 46.25 4/21 10/21 184

* Data not available
Fig. 3. Precipitation (dotted line) and Evaporation (solid line) Recorded within Lancaster Co. (taken from Soil Conservation Service 1963)
amounts of rainfall during these months are typical in the Virginia Coastal Plain (Jim Perry, pers. comm.). The mean annual precipitation was 46.25 inches, ranging from 33.35 to 65.16 inches.

**Physiography, Geology, and Soils**

Lancaster County lies entirely within the Atlantic Coastal Plain (Fenneman 1938). Massey (1961) classifies it as a member of the Chesapeake counties along with the cities of Norfolk and Hampton, and York, Gloucester, Mathews, Middlesex, and Northumberland counties. Physiographically, the terrain of Lancaster county is similar to that of other counties within the coastal plain. This terrain was formed by erosion of sediments deposited during the Tertiary period. The Suffolk Scarp marks the boundary between the Inner Coastal Plain (yellow) and the Outer Coastal Plain (white) (Fig. 4). The entire study area lies west of the Suffolk Scarp.

Lancaster County is located upon the southern edge of the Salisbury Embayment (Farrell 1979) and near the northern edge of the Fort Monroe High (Richards 1974). The Salisbury Embayment is defined by Farrell as a dominant west to northwest trending depression in the basement rocks (consisting of igneous rocks, metamorphic rocks, and semi-consolidated 'red beds') beneath the Atlantic Coastal Plain of southern New Jersey, Delaware, Maryland, and northern Virginia. Across the range of the Salisbury Embayment, Cretaceous and younger strata overlie these basement rocks.

Five geologic formations are mapped within the study area (Fig. 5). Deposition of unconsolidated sediments of each formation was controlled by various positions of sea level. The youngest deposit is a small area of recent alluvium (Qal) near Millenbeck (Fig. 5) and occurs from 0-10 meters above sea level. It consists of a fine to coarse gravelly sand and sandy gravel, silt, and clay. Most of this deposition is thought to have occurred during the Holocene but it is probably mixed with sediments from local Pleistocene deposits (Mixon et al. 1989).
Figure 4. Geologic Structure and Period of Formation for Virginia
Figure 5: Detail of Exposed Geologic Strata for Lancaster County and Surrounding Areas (taken from Mixon et al. 1989)

Legend: Qal (alluvium), Qtpl (Lynnhaven and Poquoson Members), Qts (Sedgefield Member), QTw (Windsor Formation), Tc (Chesapeake group)
The next two lowest and youngest mapped sediments are from the Tabb Formation. The Lynnhaven-Poquoson Member (Qtlp) of this formation occurs along the shorelines of the deep water portions of Corrotoman River and consists of an undifferentiated fine to pebbly sand, silt, and clay from 0-6 meters above sea level. The Sedgefield Member (Qts) dominates the southern portions of the study area between the elevations of 7-11 meters above sea level. It consists of pebbly to bouldery, clayey sand and fine to medium, shelly (mollusks and coralline origin) sand grading upward to sand and clayey silt (Mixon et al. 1989).

The Windsor Formation is the next oldest group of sediments and constitutes the majority of the surface area of the study area and entirely dominates the uplands north of the mouths of the Western and Eastern Branches of the Corrotoman River. It occurs from 17-30 meters above sea level and is characterized by its gray and yellowish to reddish brown sand, gravel, silt, and clay (Mixon et al. 1989). The terrain ranges from flat uplands and rolling landscape to steep ravine systems.

Farrell (1979) also reported that two deposits, Windsor and Bacons Castle, overlie the Yorktown Formation in eastern Lancaster Co. The top of the Bacons Castle was marked by a solid iron oxide precipitate (ferricrete) horizon several centimeters thick. The Windsor Formation, which lies above this Bacons Castle, was described by Farrell as consisting of interbedded gray mud and very fine medium grained white sand with orange mottling. Hand auguring in early March 1995 was performed at five sites in the study area with the assistance of Dr. C.R. Berquist. A similar ferricrete horizon, as described by Farrell, was found at about 15 meters above sea level near Davis Millpond. A soil consistent with Farrell's description of the Windsor Formation was found at about 25 meters above sea level near Davis Millpond.

The oldest exposed sediments are of the Yorktown Formation, a part of the Chesapeake group. This group normally consists of fine to coarse, quartzose sand, silt, and clay and diatomaceous earth. The mapping of Mixon et al. (1989) records this group
from a number of the ravine bottoms of the small streams feeding into either branch of the Corrotoman (Fig. 5). However, this may not be an accurate description of the area (C.R. Berquist, pers. comm.) because of very limited detailed geologic drilling in Lancaster County.

In a recent geologic study of eastern Lancaster Co., which included the southeast portion of the study area, Farrell (1979) states that the top of the Yorktown Formation dips southward towards the Rappahannock River and also dips toward the east. This formation, which was formed during the lower Pliocene, is the oldest stratum overlying Cretaceous strata. Within the Irvington Scarp (which follows Rt. 200 from Weems north to Kilmarnock and marks the eastern border of the study area), the Yorktown was found near 10 meters above sea level (Fig. 6) by drilling. Farrell documented the presence of an exposed portion of the Yorktown Formation of the Chesapeake group, with its characteristic fossil scallop, *Chesapecten jeffersonius*, and calcium-rich soil, in locally exposed bluffs between Mosquito Point and Carter Creek at elevations of less than 1 meter. These exposures lie outside of the bounds of the study area. A future study will focus on these localities in search of the Yorktown Formation and its associated flora.

Never was even a single fossil shell found during this study. In fact, local deposits of oyster shuckings were the only evidence of any type of shelly deposit. However, the absence of Pliocene shells does not necessarily mean the Chesapeake group is absent, as the shell may have been deposited and subsequently dissolved within the formation (C.R. Berquist, pers. comm.). All wooded ravine systems in the study area which had the potential for Yorktown Formation were closely observed for obvious ancient shell exposures, but none were found. This formation may lie slightly buried by sediments, hidden by slumping, or the shells may have dissolved within the formation. In the latter instance, it is difficult to detect the presence of the Yorktown without performing a soil analysis or drilling. The composition of the Yorktown Formation and Chesapeake Group sediments changes across the Coastal Plain. The areas labeled as Chesapeake Group in
Fig. 6. Geologic Cross Section and Well Locations of Southeastern Lancaster County (taken from Farrell 1989)
Lancaster Co. were found to have a higher amount of glauconite than in non-Chesapeake group sediments during hand auguring. Detailed geologic mapping has not been done in and around the study area and an accurate description of these sediments is lacking. Shell abundance in the Yorktown Formation is apparently low, however.

A soil description of Lancaster County (Soil Conservation Survey of Lancaster 1959) lists all those areas labeled as Yorktown by Mixon et al. (1989) as either mixed alluvial earth (Mx) or steep sandy earth (StE). Neither of these is reported in the soil survey report as having high calcium. The soil survey indicates that calcium is found within the soil of Lancaster County, but only in trace amounts. The $A_o$ soil (0-1 inches below the surface) of the Fallsington fine sandy loam, which constitutes only 1.9% of the total land of the county, was found to have 7.80 meq. of calcium per 100 grams of soil, but immediately below this layer, the calcium concentration drops to 0.11 meq. per 100 grams soil. The Bladen silt loam, which constitutes less than 0.1% of the total land, has a soil chemistry more consistent with a Yorktown soil tested by North (1983). The calcium levels of Bladen soil range from 6.1-15.9 meq. per 100 grams of soil and pH ranges from 5.3-6.9. This soil constitutes less than 0.1 percent of the soil in Lancaster and therefore was not mapped.

The majority of soils in Lancaster County are sandy, sandy loam, or silt loam soils. Over twenty percent is classified as a steep sandy area (StE), 18.3% is Sassafras fine sandy loam, gently sloping (SfB), and 10% is Sassafras fine sandy loam, nearly level (SfA) (Soil Conservation Survey of Lancaster 1963). Thus, these three groups account for nearly 50% of the land area in the county. Those soil types which constitute between 3-10 percent include the following: Metapeake silt loam, gently sloping (MaB) 5.9%, sloping sandy land (SsD) 5.8%, Othello silt loam 5.6%, Mattapex silt loam (Mt) 4.4%, mixed alluvial land (Mx) 3.9%, Woodstown fine sandy loam (Wo) 3.8%, and Bertie silt loam (Br) 3.1%. All remaining soil types constitute less than 3% of the soil types present.
Table 2 provides results of a laboratory analysis of soil samples taken from ten sites within the study area. The soils were collected from the first six inches of soil within a one meter radius and placed in a plastic bag. The soil thoroughly mixed in the bag and taken back to the lab and allowed to dry. Upon drying, the soils were mixed again and decaying and living material was removed. The soils were then shipped to Virginia Tech for analysis.
Table 2: Soil Analysis of the Corrotoman River Watershed. Samples were collected May 11, 1995 and testing was performed by the Virginia Polytechnic Institute and State University, Soil Analysis Lab, Blacksburg. (P, K, Ca, Mg reported in lb/ac; Zn, Mn, Cu, Fe, B reported in ppm)

<table>
<thead>
<tr>
<th>Location</th>
<th>pH</th>
<th>P</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Zn</th>
<th>Mn</th>
<th>Cu</th>
<th>Fe</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slopes of John's Creek with <em>Stewartia ovata</em></td>
<td>4.0</td>
<td>3</td>
<td>31</td>
<td>72</td>
<td>17</td>
<td>0.6</td>
<td>0.1</td>
<td>0.3</td>
<td>65.7</td>
<td>0.1</td>
</tr>
<tr>
<td>Typical Hardwood Slope</td>
<td>4.4</td>
<td>4</td>
<td>37</td>
<td>120</td>
<td>29</td>
<td>1.1</td>
<td>1.1</td>
<td>0.7</td>
<td>33.8</td>
<td>0.1</td>
</tr>
<tr>
<td>High Dry Ridge with <em>Aralia nudicaulis</em></td>
<td>4.6</td>
<td>2</td>
<td>19</td>
<td>.72</td>
<td>12</td>
<td>0.4</td>
<td>0.1</td>
<td>0.3</td>
<td>27.8</td>
<td>0.1</td>
</tr>
<tr>
<td>Sphagnous Swamp</td>
<td>4.8</td>
<td>1</td>
<td>62</td>
<td>264</td>
<td>134</td>
<td>1.7</td>
<td>6.6</td>
<td>0.6</td>
<td>159.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Cabin Swamp with <em>Caltha palustris</em></td>
<td>5.5</td>
<td>6</td>
<td>31</td>
<td>1080</td>
<td>55</td>
<td>2.6</td>
<td>6.7</td>
<td>0.4</td>
<td>272.7</td>
<td>0.2</td>
</tr>
<tr>
<td>Rich Ravine, Iberis</td>
<td>5.6</td>
<td>4</td>
<td>37</td>
<td>384</td>
<td>58</td>
<td>2.1</td>
<td>14.2</td>
<td>0.6</td>
<td>23.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Hardwood slope with <em>Cornus alternifolia</em></td>
<td>5.8</td>
<td>1</td>
<td>72</td>
<td>768</td>
<td>127</td>
<td>1.0</td>
<td>11.7</td>
<td>0.4</td>
<td>17.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Hickory Hollow Slopes</td>
<td>5.9</td>
<td>15</td>
<td>59</td>
<td>1680</td>
<td>62</td>
<td>2.2</td>
<td>11.1</td>
<td>0.2</td>
<td>18.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Rich Ravine, Bellwood</td>
<td>6.2</td>
<td>2</td>
<td>88</td>
<td>1200</td>
<td>149</td>
<td>1.5</td>
<td>11.1</td>
<td>0.3</td>
<td>5.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Salt Marsh</td>
<td>6.3</td>
<td>6</td>
<td>75</td>
<td>312</td>
<td>240</td>
<td>0.6</td>
<td>1.3</td>
<td>0.6</td>
<td>20.1</td>
<td>1.8</td>
</tr>
</tbody>
</table>
METHODS

Site Selection:

During the fall of 1993, I tallied the number of known species previously recorded from each county of Virginia using the *Atlas of the Virginia Flora* (Harvill *et al.* 1992). After this review, five counties (Charles City, Essex, King William, Lancaster, and Northumberland) were chosen as possible study areas due to their relatively low number of recorded species (Table 3) and proximity to Williamsburg. During late February and early March of 1994, each of the five counties was visited and evaluated. Charles City and King William counties were eliminated after an assessment by car indicated there was a high level of disturbance (i.e., some sort of development, timbering, and/or *Smilax* infestation). The elimination of Charles City was also dictated by the difficulty of finding a watershed of suitable location and size. Each of the three remaining counties were deemed worthy of a floristic study based upon their higher proportion of non-timbered land, variety of habitat types, low incidence of disturbance, and high geologic diversity as determined by Mixon *et al.* (1989). Lancaster County was chosen because fewer species had been documented, significantly less land is devoted to agriculture (27.3% vs. Northumberland's 47.5%; US Dept. of Commerce 1963), and because of its closer proximity to Williamsburg. The Corrotoman River watershed was also an ideal study location because of its large size, diverse habitats, and its inclusion entirely within Lancaster County.

Floristic Methods:

Fifty-nine collecting trips were made from March 21 to November 8, 1994 and January 13 to September 20, 1995, at a rate of approximately twice per week through the
Table 3: Floristic Data Representing Species Reported from Counties within 65 miles of The College of William and Mary, Williamsburg, VA. Based upon Atlas of the Virginia Flora ed. III (Harvill et al., 1992) Counties which are believed to need floristic work are in boldface print.

<table>
<thead>
<tr>
<th>County</th>
<th>County size (Sq. miles)</th>
<th>Pteridophytes &amp; Gymnosperms</th>
<th>Liliopsida</th>
<th>Magnoliopsida</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northumberland</td>
<td>223.00</td>
<td>28</td>
<td>188</td>
<td>441</td>
<td>657</td>
</tr>
<tr>
<td>Lancaster</td>
<td>153.00</td>
<td>30</td>
<td>185</td>
<td>519</td>
<td>734</td>
</tr>
<tr>
<td>Mathews</td>
<td>105.00</td>
<td>27</td>
<td>178</td>
<td>536</td>
<td>741</td>
</tr>
<tr>
<td>Essex</td>
<td>264.00</td>
<td>34</td>
<td>218</td>
<td>498</td>
<td>750</td>
</tr>
<tr>
<td>King William</td>
<td>286.00</td>
<td>32</td>
<td>206</td>
<td>574</td>
<td>786</td>
</tr>
<tr>
<td>Charles City</td>
<td>204.00</td>
<td>37</td>
<td>259</td>
<td>549</td>
<td>845</td>
</tr>
<tr>
<td>King and Queen</td>
<td>327.00</td>
<td>29</td>
<td>248</td>
<td>574</td>
<td>851</td>
</tr>
<tr>
<td>Middlesex</td>
<td>138.00</td>
<td>34</td>
<td>267</td>
<td>627</td>
<td>928</td>
</tr>
<tr>
<td>York</td>
<td>144.56</td>
<td>33</td>
<td>250</td>
<td>647</td>
<td>930</td>
</tr>
<tr>
<td>New Kent</td>
<td>221.00</td>
<td>40</td>
<td>260</td>
<td>654</td>
<td>954</td>
</tr>
<tr>
<td>Gloucester</td>
<td>257.00</td>
<td>34</td>
<td>294</td>
<td>692</td>
<td>1020</td>
</tr>
<tr>
<td>Chesapeake</td>
<td>723.02</td>
<td>34</td>
<td>317</td>
<td>691</td>
<td>1042</td>
</tr>
<tr>
<td>Suffolk</td>
<td>430.00</td>
<td>34</td>
<td>311</td>
<td>711</td>
<td>1056</td>
</tr>
<tr>
<td>Surry</td>
<td>306.00</td>
<td>38</td>
<td>316</td>
<td>705</td>
<td>1059</td>
</tr>
<tr>
<td>Isle of Wight</td>
<td>360.00</td>
<td>34</td>
<td>321</td>
<td>764</td>
<td>1119</td>
</tr>
<tr>
<td>Southampton</td>
<td>606.00</td>
<td>37</td>
<td>323</td>
<td>767</td>
<td>1127</td>
</tr>
<tr>
<td>Prince George</td>
<td>315.72</td>
<td>25</td>
<td>310</td>
<td>655</td>
<td>1157*</td>
</tr>
<tr>
<td>James City</td>
<td>186.28</td>
<td>40</td>
<td>362</td>
<td>840</td>
<td>1242</td>
</tr>
</tbody>
</table>

*A floristic study by Mark Mort (1994) has added 167 new records to this figure.
first growing season and once per week during the second. Field work was designed to permit collecting at numerous sites from each habitat type each season. These habitats were chosen from throughout the range of the study area by consulting topography maps which were gridded into 0.5 square mile grid units. Every attempt was made to visit each plot, assuming permission was given by the landowner. National Wetland Inventory (NWI) maps were also consulted to be certain that each vegetational type characterized by the NWI was visited. In an attempt to relocate those species previously documented from Lancaster County by Bradley et al. (1976) and which had not been found yet in the current study, locality notes were obtained from Bradley's specimens on file at the Herbarium of George Mason University. To ensure complete documentation of marsh and aquatic plants, the Tidal Marsh Inventory of Lancaster County (Silberhorn 1982) and the Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Tributaries and Chinoteague Bay-1993 (Orth et al. 1994) were consulted.

Specimens were collected in triplicate when possible. In cases where the population was deemed too small for triplicate collection, fewer were taken. Photographs were used as vouchers for those herbaceous specimens considered too rare to collect. In order to maximize the final checklist for the study area, the following were done: 1) "shopping lists" of all species documented from all or a fraction of the counties surrounding Lancaster County, but not Lancaster County, were produced using a computer program based upon the Atlas of the Virginia Flora III; 2) "shopping lists" of species previously documented from Lancaster but not yet collected during this study were produced using the above software; 3) herbarium specimens were studied in order to develop a search image for certain species; 4) if, when encountering a given species in the field, I was not quite certain whether I had already made a voucher specimen for it, I collected another voucher; and 5) for any particular species, those plants which exhibited significant variation in flower color, leaf shape, etc. were collected. In addition, in many instances both flowering and fruiting stages of the life cycle were documented. Field
notes include location, habitat, notable morphological characteristics, and relative abundance. Upon return to campus, each specimen was assigned with the appropriate collection number, identified, pressed, and dried. Specimens which could be keyed quickly were usually keyed before pressing.

The majority of specimens were identified by consulting one or more of the following manuals: Manual of the Vascular Flora of the Carolinas (Radford et al. 1968), Manual of Vascular Plants of Northeastern United States (Gleason & Cronquist 1991), and Gray's Manual of Botany (Fernald 1950). Along with the previously mentioned manuals, Brown (1979), Gould & Shaw (1968), and Hitchcock (1950) were used to assist in the identification of the Poaceae. For the purposes of identify long-persisting ornamentals and other cultivated plants, Bailey (1949) and Rehder (1940) were consulted. In specialized circumstances, Uttal (1987) was consulted for assistance with Vaccinium, Russell (1965) for violets, Kral (1966) for Xyris, Kral and Bostick (1969) for Rhexia, and Johnson (1972) for the Eupatoriaceae which include Ageratina, Conoclinium, Eupatoriadelphus, and Fleischmannia. Occasionally, to facilitate quick identification, Newcomb (1977) was used for preliminary keying while in the field. To ensure correct identification, each specimen was compared with corresponding specimens on file in the College of William and Mary Herbarium (WILLI), and towards the completion of the study the Vassar College Herbarium (VAS) was consulted.

A complete set of voucher specimens will be added to WILLI; duplicate vouchers will be deposited at the University of North Carolina Herbarium (NCU), the herbarium of Southern Methodist University (SMU), the Freisner Herbarium of Butler University (BUT), and the herbarium of Clemson University (CLEM).

Vegetational Analysis Methods:

To augment the floristic study, vegetational sampling was undertaken to better characterize the various forest types found within the study area. Eight stands were
chosen which were representative of different major forest types or of ecological interest, such as an area with a large number of scrubby post oaks (*Quercus margaretta*), were sampled (see chapter seven, Habitat Description and Vegetational Analysis, for a listing of these stands). Every effort was made to ensure that the sites were distributed throughout the study area. Sampling was done during the last week of October, 1995.

Sampling methods followed those of Diggs and Hall (1981), Plunkett (1990), and Mort (1994), all of whom used the standard combined Bitterlich rangefinder-circular quadrat method (Beers and Miller 1964 in Diggs and Hall 1981; Levy and Walker 1971). All stands were sampled using the two band on a Speigel relaskop. To ensure an adequate sampling within each stand, sampling was continued within each stand until no (or very few) new species were encountered. This usually required between three and six sampling points.

Relative dominance for each species was calculated with respect to all species present and expressed in terms of the percentage. Density (trees/ha) was determined for large (>4” or 10cm DBH (diameter at breast height)) and small (1 to 4” or 2.5 to 10 cm DBH) trees by counting the number of stems per species within each 10 meter radius plot. Relative density for each species was also calculated and expressed as a percentage of all species present. For each species represented by large trees, a relative importance value (I.V.) was calculated as the mean of the relative dominance and relative density. Species were first arranged within each table based on this importance value, then by relative percent density of small trees, then alphabetically.
PHYTOGEOGRAPHICAL ANALYSIS

In order to determine the broader distribution patterns of the flora present in the Corrotoman River watershed, a phytogeographical analysis has been performed. This study will complement the phytogeographic studies of Virginia flora done by Corcoran (1977, 1981), Greaves (1982), Harvill (1969, 1972, 1973a, 1973a, 1975), and North (1983).

To facilitate phytogeographic comparisons with the previous studies, a similar classification system was used by this study (Table 4). This system was originally used by Harvill (1973) and adapted by Corcoran (1977, 1981). All categories are equivalent to Corcoran's, except for re-wording Range 4 from "species ranging south beyond the United States" to "species ranging south to the New World Tropics". This modification was for clarification purposes only and should not affect the species included within that range. For Ranges 5b and 6b, the southern border of North Carolina and points west were used as the southern boundary. The northern boundary for Ranges 5c and 6c was set as northern boundary of Delaware, Maryland, and points westward. These boundaries follow those used by North (1983).

The assignment of ranges to the documented species was determined by consulting several flora manuals and books pertaining to phytogeography: Gleason and Cronquist (1963, 1991), Fernald (1950), Stuckey (1993), Deam (1940), Steyermark (1963), Li (1971), Hulten (1958, 1962), Good (1961), and Takhtajan (1986). As each manual gives a slightly different range, no one manual was solely used. For each species, the range assigned was the broadest range given by the summation of the ranges in all consulted manuals.
**TABLE 4: RANGE CATEGORIES FOR PHYTOGEOGRAPHIC ANALYSIS**

**Range 1:** Circumboreal (totally circumboreal or interruptedly) or amphi-Atlantic

**Range 2:** Native to North America and Eastern Asia

**Range 3:** Ranging west to the Pacific Coast

- **Range 3a:** Uninterrupted distribution from eastern North America to the Pacific Coast
- **Range 3b:** Ranging from eastern North America west beyond the Mississippi River, and found on the Pacific Coast, interrupted distribution

**Range 4:** Ranging south to the New World Tropics

**Range 5:** Ranging from eastern North America west beyond the Mississippi River, but not to the Pacific Coast

- **Range 5a:** Generally distributed north and south
- **Range 5b:** Generally northern in distribution
- **Range 5c:** Generally southern in distribution
- **Range 5d:** Generally distributed along the Atlantic Coastal Plain and Mississippi Valley, extending westward beyond the Mississippi in the north
- **Range 5e:** Generally distributed along the Atlantic Coastal Plain and Mississippi Valley, extending westward beyond the Mississippi in the south

**Range 6:** Ranges limited to eastern North America east of the Mississippi River

- **Range 6a:** Generally distributed north and south
  - **Range 6a1:** Extending widely beyond the Atlantic Coastal Plain
  - **Range 6a2:** Mostly limited to the Atlantic Coastal Plain
- **Range 6b:** Generally northern in distribution
- **Range 6c:** Generally southern in distribution

**Range 7:** Introduced species

**Range 8:** Cosmopolitan and nearly cosmopolitan species
General Analysis of Species Distribution

Of the 824 plant species collected in Lancaster County, 192 (23.3%) have been introduced. Similar percentages were found for other floristic studies within Virginia: Fluvanna, 20.2% (Diggs 1976); Ft. Eustis, 20.5% (Appier 1973); Isle of Wight, 16.75% (Plunkett and Hall 1995); King George County, 21% (Simmons, Ware, and Hayden 1995), Middlesex County, 21.76% (North 1983); Powhatan County, 21.4% (Corcoran 1977); Prince George County, 25% (Mort 1994); and Rockingham County, 19.2% (Roe 1977). Alien status was taken from Harvill et al. (1992). Included in this category are naturalized and long-persisting plants that have displaced a number of our native species. The scientific names of introduced species are denoted in the checklist by regular typeface type, in contrast to the bold face type denoting native species.

Only fifteen species (1.88%) are of circumboreal or amphi-atlantic distribution (Range 1, Table 5). Of these, *Atriplex patula* is restricted to salt marshes, *Ceratophyllum demersum* is restricted to slow-moving or still freshwater, and *Caltha palustris* is limited to swamp habitats. The remaining species are less restricted in habitat.

The species in Range 1 and Range 2 (Table 5) are long established, generally ancient taxa (North 1983), and those documented in this study are all herbaceous. Nine of these ancient species have North American and Eastern Asian affinities (Range 2). Some consider the Asian *Penthorum sedoides* to be two distinct species (*P. chinese* and *P. humile*) while others recognize the two as varieties of *P. sedoides* (Li 1977). The Arcto-Tertiary flora concept (Chaney 1940 in Takhtajan 1986) postulates that during this time period many species were shared between these two regions. Global climate change later resulted in the isolation or extinction of a number of these species. As a result of isolation and the passage of time, many of these taxa have evolved into distinct species, and as a result only a few shared species remain. For example, if this analysis had been performed at the generic level, however, a far greater number of shared taxa would be observed. Li (1977) provides a detailed list of these shared taxa.
Table 5: Phytogeographic Analysis for Species in Range 1 and 2

**RANGE 1: CIRCUMBOREAL SPECIES**

<table>
<thead>
<tr>
<th>Species</th>
<th>Species</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atriplex patula</td>
<td>Circaea lutetiana</td>
<td>Myosotis laxa</td>
</tr>
<tr>
<td>Botrychium virginianum</td>
<td>Eleocharis obtusa</td>
<td>Ophioglossum vulgatum</td>
</tr>
<tr>
<td>Caltha palustris</td>
<td>Galium aparine</td>
<td>Osmunda regalis</td>
</tr>
<tr>
<td>Calystegia sepium</td>
<td>Galium triflorum</td>
<td>Pteridium aquilinum</td>
</tr>
<tr>
<td>Ceratophyllum demersum</td>
<td>Leersia oryzoides</td>
<td>Satureja vulgaris</td>
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</tbody>
</table>

**RANGE 2: NATIVE TO NORTH AMERICA AND EASTERN ASIA**

<table>
<thead>
<tr>
<th>Species</th>
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</thead>
<tbody>
<tr>
<td>Adiantum pedatum</td>
<td>Lycopodium obscurum</td>
<td>Penthorum sedoides</td>
</tr>
<tr>
<td>Liparis lilifolia</td>
<td>Monotropa uniflora</td>
<td>Phryma leptostachya</td>
</tr>
<tr>
<td>Lycopodium lucidulum</td>
<td>Onoclea sensibilis</td>
<td>Symplocarpus foetidus</td>
</tr>
</tbody>
</table>
Range 3 consists of thirty-three species that range from eastern North America to the Pacific Coast (Table 6). Of these, 28 species have an uninterrupted distribution. Many of these species are commonly found throughout the prairie region, and all are herbaceous.

Those species in Range 4 (Table 7) illustrate the relationship of the flora of Lancaster County to that of Mexico, Central America, the West Indies, and South America. Some of these species may range north to Canada; others are at or near their northern limit in Lancaster County.

Nearly half of the species (47.05%) range from eastern North America, west beyond the Mississippi River but fail to reach the Pacific Coast (Range 5). Those in Range 5a (Table 8) are broadly adapted to a variety of edaphic and climatologic conditions, as they are generally distributed north and south. They constitute the majority (37.52% of the 47.05% total) of the species listed within the range. The remaining sub-groups within Range 5 are more limited. In the watershed of the Corrotoman River, species which have a southern distribution pattern within Range 5 represented 23 species or 2.89% (Table 9), while there were only 16 species with northern affinities. North's study (1983) of Middlesex county found a somewhat higher percent of species within Range 5c (southern species; 2.3%) than Range 5b (northern species; 1.1%). Corcoran (1977) found the reverse in Powhatan County, which is in the piedmont, with 1.0% of the flora in Range 5c and 2.1% in Range 5b. Lancaster Co. seems to continue the trend in the Virginia Coastal Plain by having more species with southern affinities.

No species were found which fit into Range 5d. The last sub-group, Range 5e, contains those with a general distribution along the Coastal Plain from Nova Scotia to Florida and in the Mississippi Embayment, with extensions westward beyond the Mississippi in the south. This subgroup contains 37 species or 4.64% of the total.

Seventy-five species (9.41%) are restricted to eastern North America, east of the Mississippi (Range 6, Table 10). Sixty-one of these species are generally distributed north and south and forty-four of these are widely distributed beyond the coastal plain.
Table 6: Phytogeographic Analysis for Species in Range 3

RANGE 3: SPECIES RANGING WEST TO THE PACIFIC COAST

Range 3a: **Uninterrupted Distribution**

<table>
<thead>
<tr>
<th>Species 1</th>
<th>Species 2</th>
<th>Species 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apocynum cannabinum</td>
<td>Erigeron strigosus</td>
<td>Oenothera biennis</td>
</tr>
<tr>
<td>Bidens frondosa</td>
<td>Festuca octoflora</td>
<td>Plantago aristata</td>
</tr>
<tr>
<td>Cardamine pensylvanica</td>
<td>Fragaria virginiana</td>
<td>Plantago virginica</td>
</tr>
<tr>
<td>Carex comosa</td>
<td>Galium tinctorium</td>
<td>Potamogeton epihydrus</td>
</tr>
<tr>
<td>Carex leptalea</td>
<td>Geranium carolinianum</td>
<td>Ranunculus abortivus</td>
</tr>
<tr>
<td>Carex vulpinoidea</td>
<td>Gratiola neglecta</td>
<td>Schoenoplectus validus</td>
</tr>
<tr>
<td>Cyperus erythrorhizos</td>
<td>Juncus tenuis</td>
<td>Scutellaria lateriflora</td>
</tr>
<tr>
<td>Dulichium arundinaceum</td>
<td>Lactuca canadensis</td>
<td>Setaria geniculata</td>
</tr>
<tr>
<td>Elymus virginicus</td>
<td>Lepidium virginicum</td>
<td>Teucrium canadense</td>
</tr>
<tr>
<td>Erigeron annuus</td>
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<td></td>
</tr>
</tbody>
</table>

Range 3b: **Interrupted Distribution**

<table>
<thead>
<tr>
<th>Species 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cakile edentula</td>
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<tr>
<td>Cyperus strigosus</td>
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<tr>
<td>Sium suave</td>
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<tr>
<td>Carex comosa</td>
</tr>
<tr>
<td>Rhynchospora capitellata</td>
</tr>
<tr>
<td>Species</td>
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<tr>
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</tr>
<tr>
<td>Agalinis maritima</td>
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<tr>
<td>Agalinis purpurea</td>
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<tr>
<td>Agrostis hyemalis</td>
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<tr>
<td>Alisma subcordatum</td>
</tr>
<tr>
<td>Ambrosia artemisiifolia</td>
</tr>
<tr>
<td>Andropogon glomeratus</td>
</tr>
<tr>
<td>Andropogon scoparius</td>
</tr>
<tr>
<td>Asclepias tuberosa</td>
</tr>
<tr>
<td>Baccharis halimifolia</td>
</tr>
<tr>
<td>Bidens bipinnata</td>
</tr>
<tr>
<td>Bidens laevis</td>
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<td>Boehmeria cylindrica</td>
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<td>Callicarpa americana</td>
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<td>Callitriche heterophylla</td>
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<tr>
<td>Carex albolutescens</td>
</tr>
<tr>
<td>Carex bromoides</td>
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<td>Carex lurida</td>
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<tr>
<td>Cephalanthus occidentalis</td>
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<tr>
<td>Cercis canadensis</td>
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<tr>
<td>Cicuta maculata</td>
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<td>Cornus florida</td>
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<td>Cuscuta campestris</td>
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<tr>
<td>Cyperus filicinus</td>
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<tr>
<td>Cyperus pseudovegetus</td>
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Table 8: Phytogeographic Analysis for Species of Range 5a

RANGE 5a: **GENERALLY DISTRIBUTED NORTH AND SOUTH, WEST OF THE MISSISSIPPI BUT NOT TO THE PACIFIC COAST**

<table>
<thead>
<tr>
<th>Species 1</th>
<th>Species 2</th>
<th>Species 3</th>
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</thead>
<tbody>
<tr>
<td>Acalypha gracilens</td>
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<td>Carex blanda</td>
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<td>Acalypha rhomboidea</td>
<td>Asclepias incarnata</td>
<td>Carex cephalophora</td>
</tr>
<tr>
<td>Acer negundo</td>
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<tr>
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<td>Asclepias variegata</td>
<td>Carex debilis</td>
</tr>
<tr>
<td>Acer saccharinum</td>
<td>Asclepias verticillata</td>
<td>Carex digitalis</td>
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<td>Asimina triloba</td>
<td>Carex festuacea</td>
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<tr>
<td>Agrimonia pubescens</td>
<td>Asplenium platyneuron</td>
<td>Carex granularis</td>
</tr>
<tr>
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<td>Aster dumosus</td>
<td>Carex intumescens</td>
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<tr>
<td>Amelanchier arborea</td>
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<tr>
<td>Amelanchier canadensis</td>
<td>Aster puniceus</td>
<td>Carex laxiculmis</td>
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<tr>
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<tr>
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<td>Aster undulatus</td>
<td>Carex tribuloides</td>
</tr>
<tr>
<td>Anemone virginiana</td>
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<td>Carpinus caroliniana</td>
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<td>Angelica venenosa</td>
<td>Athyrium pycnocarpon</td>
<td>Carya cordiformis</td>
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<td>Antennaria plantaginifolia</td>
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<td>Apios americana</td>
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<td>Carya tomentosa</td>
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<td>Aquilegia canadensis</td>
<td>Bidens discoidea</td>
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<td>Bidens polylepis</td>
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<td>Asarum canadense</td>
<td>Carex amphibula var. turgida</td>
<td>Chelone glabra</td>
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Table 8 cont.

<table>
<thead>
<tr>
<th>Species</th>
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<tbody>
<tr>
<td>Chionanthus virginicus</td>
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<td>Desmodium rotundifolium</td>
<td>Eupatorium capillifolium</td>
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<td>Eupatorium perfoliatum</td>
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<td>Eupatorium rotundifolium</td>
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<td>Dichanthelium clandestinum</td>
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<td>Festuca obtusa</td>
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<td>Fraxinus americana</td>
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<tr>
<td>Corylus americana</td>
<td>Dichanthelium linearifolium</td>
<td>Fraxinus pennsylvanica</td>
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Table 8 cont.

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<td>Morus rubra</td>
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<td>Smilacina racemosa</td>
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<td><em>Poa autumnalis</em></td>
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<td>Rosa palustris</td>
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<td>Solidago nemoralis</td>
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<td><em>Prunus angustifolia</em></td>
<td>Salvia lyra</td>
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<td>Scirpus atrovirens</td>
<td>Strophostyles helvula</td>
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<td>Stylosanthes biflora</td>
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<tr>
<td><em>Ranunculus hispidus</em></td>
<td>Scutellaria elliptica</td>
<td>Tephrosia virginiana</td>
</tr>
<tr>
<td><em>Ranunculus recurvatus</em></td>
<td>Senecio aureus</td>
<td>Thelypteris noveboracensis</td>
</tr>
<tr>
<td><em>Rhexia virginica</em></td>
<td>Sericocarpus linifolius</td>
<td>Tilia americana</td>
</tr>
<tr>
<td><em>Rhus copallina</em></td>
<td>Silene stellata</td>
<td>Tipularia discolor</td>
</tr>
<tr>
<td>Species</td>
<td>Species</td>
<td>Species</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Trichostema dichotomum</td>
<td>Veratrum viride</td>
<td>Viola primulifolia</td>
</tr>
<tr>
<td>Tridens flavus</td>
<td>Verbena hastata</td>
<td>Viola rafinesquii</td>
</tr>
<tr>
<td>Ulmus americana</td>
<td>Verbena urticifolia</td>
<td>Viola sagittata</td>
</tr>
<tr>
<td>Uvularia perfoliata</td>
<td>Viburnum acerifolium</td>
<td>Vitis aestivalis</td>
</tr>
<tr>
<td>Uvularia sessilifolia</td>
<td>Viburnum prunifolium</td>
<td>Vitis vulpina</td>
</tr>
<tr>
<td>Vaccinium pallidum</td>
<td>Viola conspersa</td>
<td>Wolffia borealis</td>
</tr>
<tr>
<td>Vaccinium stamineum</td>
<td>Viola cucullata</td>
<td>Xyris torta</td>
</tr>
<tr>
<td>Valerianella radiata</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 9: Phytogeographic Analysis of Species of Range 5b, 5c, and 5e

**RANGES 5b, 5c, 5e: SPECIES EXTENDING WEST BEYOND THE MISSISSIPPI RIVER BUT NOT TO THE PACIFIC COAST**

**Range 5b: Species Generally Northern in Distribution**

- *Aralia nudicaulis*
- *Carex crinita*
- *Carex normalis*
- *Carex swanii*
- *Cirsium discolor*
- *Croton glandulosus*
- *Dioscorea villosa*
- *Erechtites hieracifolia*
- *Habenaria peramoena*
- *Helianthemum canadense*
- *Iris versicolor*
- *Juncus secundus*
- *Populus grandidentata*
- *Rubus flagellaris*
- *Solidago bicolor*
- *Symphoricarpos orbiculatus*

**Range 5c: Species Generally Southern in Distribution**

- *Andropogon temarius*
- *Arnica acaulis*
- *Catalpa speciosa*
- *Chaerophyllum tainturieri*
- *Cornus foemina*
- *Cyperus echinatus*
- *Cypripedium kentuckiense*
- *Desmodium fernaldii*
- *Elephantopus tomentosus*
- *Fleischmannia incarnata*
- *Hypericum walteri*
- *Ilex opaca*
- *Juncus roemerianus*
- *Matelea carolinensis*
- *Melothria pendula*
- *Passiflora incarnata*
- *Pyrrhopappus carolinianus*
- *Quercus margaretta*
- *Sanicula smallii*
- *Tephrosia spicata*
- *Verbesina occidentalis*
- *Vitis rotundifolia*
Table 9 cont.

Range 5e: **Species Generally Distributed Along the Atlantic Coastal Plain and Mississippi Embayment, Extending West Beyond the Mississippi River in the South**

<table>
<thead>
<tr>
<th>Species 1</th>
<th>Species 2</th>
<th>Species 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clethra alnifolia</td>
<td>Iva frutescens</td>
<td>Quercus falcata</td>
</tr>
<tr>
<td>Dichanthelium acuminatum</td>
<td>Juncus coriaceus</td>
<td>Quercus michauxii</td>
</tr>
<tr>
<td>Dichanthelium scoparium</td>
<td>Leucothoe racemosa</td>
<td>Quercus nigra</td>
</tr>
<tr>
<td>Eleocharis tortilis</td>
<td>Lyonia mariana</td>
<td>Quercus phellos</td>
</tr>
<tr>
<td>Eragrostis hirsuta</td>
<td>Magnolia virginiana</td>
<td>Rhexia mariana</td>
</tr>
<tr>
<td>Eryngium aquaticum</td>
<td>Monarda punctata</td>
<td>Rhododendron atlanticum</td>
</tr>
<tr>
<td>Fimbristylis castanea</td>
<td>Myrica heterophylla</td>
<td>Scutellaria integrifolia</td>
</tr>
<tr>
<td>Galium obtusum</td>
<td>Oxypolis rigidior</td>
<td>Setaria magna</td>
</tr>
<tr>
<td>Galium pilosum</td>
<td>Pinus taeda</td>
<td>Spartina cynosuroides</td>
</tr>
<tr>
<td>Gratiola pilosa</td>
<td>Pluchea purpurascens</td>
<td>Spartina patens</td>
</tr>
<tr>
<td>Hypericum gymnanthum</td>
<td>Polygala mariana</td>
<td>Utricularia biflora</td>
</tr>
<tr>
<td>Hypericum stans</td>
<td>Ptilimnium capillaceum</td>
<td>Viburnum nudum</td>
</tr>
<tr>
<td>Itea virginica</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 10: Phytogeographic Analysis for Species in Range 6

RANGE 6: SPECIES LIMITED TO THE EASTERN UNITED STATES

Range 6a1: Species Generally Distributed North and South, Extending Widely Beyond the Coastal Plain

<table>
<thead>
<tr>
<th>Species</th>
<th>Range 6a2 Species</th>
<th>Range 6a3 Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ageratina aromatica</td>
<td>Eupatorium hyssopifolium</td>
<td>Prenanthes serpentaria</td>
</tr>
<tr>
<td>Antennaria solitaria</td>
<td>Eupatorium pilosum</td>
<td>Quercus prinus</td>
</tr>
<tr>
<td>Aster gracilis</td>
<td>Hieracium venosum</td>
<td>Rhododendron periclymenoides</td>
</tr>
<tr>
<td>Aster infirmus</td>
<td>Hypericum virginicum</td>
<td>Rhododendron viscosum</td>
</tr>
<tr>
<td>Aster subulatus</td>
<td>Ilex glabra</td>
<td>Schoenoplectus pungens</td>
</tr>
<tr>
<td>Aureolaria virginica</td>
<td>Ilex laevigata</td>
<td>Senecio anonymus</td>
</tr>
<tr>
<td>Carex albicans</td>
<td>Linum virginianum</td>
<td>Sericocarpus asteroides</td>
</tr>
<tr>
<td>Carex atlantica</td>
<td>Lobelia nuttallii</td>
<td>Solidago erecta</td>
</tr>
<tr>
<td>Carex collinsii</td>
<td>Lupinus perennis</td>
<td>Solidago tenuifolia</td>
</tr>
<tr>
<td>Carex prasina</td>
<td>Luzula echinata</td>
<td>Thalictrum pubescens</td>
</tr>
<tr>
<td>Carex seorsa</td>
<td>Lycopodium digitatum</td>
<td>Vaccinium corybosum</td>
</tr>
<tr>
<td>Carex atlantica</td>
<td>Lysimachia quadrifolia</td>
<td>Vaccinium fuscatum</td>
</tr>
<tr>
<td>Ceanothus americanus</td>
<td>Melanthium virginicum</td>
<td>Vernonia glauca</td>
</tr>
<tr>
<td>Chimaphila maculata</td>
<td>Oxalis florid a</td>
<td>Viburnum dentatum</td>
</tr>
<tr>
<td>Cornus amomum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eupatoriadelphus dubius</td>
<td>Pinus virginiana</td>
<td></td>
</tr>
</tbody>
</table>

Range 6a2: Species Generally Distributed North and South, Mostly limited to the Coastal Plain

<table>
<thead>
<tr>
<th>Species</th>
<th>Range 6a2 Species</th>
<th>Range 6a3 Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrostis perennans</td>
<td>Liatris graminifolia</td>
<td>Rhynchospora gracilenta</td>
</tr>
<tr>
<td>Amaranthus cannabinus</td>
<td>Limonium carolinianum</td>
<td>Rhynchospora microcephala</td>
</tr>
<tr>
<td>Aster tenuifolius</td>
<td>Lythrum lineare</td>
<td>Sabatia dodecandra</td>
</tr>
<tr>
<td>Carya pallida</td>
<td>Oronium aquaticum</td>
<td>Sabatia stellata</td>
</tr>
<tr>
<td>Danthonia sericea</td>
<td>Polygala lutea</td>
<td>Zizania aquatica</td>
</tr>
<tr>
<td>Gaylussacia frondosa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 10 cont.

Range 6b: **Species Generally Northern in Distribution**

*Anemone quinquefolia*  *Carex folliculata*  *Eupatorium godfreyanum*

Range 6c: **Species Generally Southern in Distribution**

*Aster grandiflorus*  *Heterotheca aspera*  *Sagittaria falcata*

*Galax urceolata*  *Hexastylis virginica*  *Stewartia ovata*

*Galium obtusum var. filifolium*  *Hibiscus moscheutos*  *Yucca filamentosa*

*Helianthus atrorubens*  *Iris virginica*
The other seventeen are restricted to the Coastal Plain. Of these, twelve (*Amaranthus cannabinus, Aster tenuifolius, Lythrum lineare, Sabatia dodecandra, and S. stellaris*) are restricted to brackish and/or salt marshes. Only three species, *Anemone quinquefolia, Carex folliculata, and Eupatorium godfreyanum* are generally northern in their distribution. The remaining 11 species in the group are southern in their distribution.

Lastly, seventeen species (2.13%) fall within Range 8, which is composed of species which are cosmopolitan or nearly so in their distribution (Table 11). Although this group is widely distributed, all except *Cyperus esculentus* and *Equisetum arvense* are restricted to some type of aquatic habitat. *Cyperus odoratus* and *Typha angustifolia* are normally found in marshes. *Ruppia maritima* is commonly found growing in or washed upon tidal mud flats, while *Triglochin striata* is restricted to margins of marshes.

In summary, nearly one-half of the flora in Lancaster County can be found west of the Mississippi but not to the Pacific Coast. One-tenth of the flora extends south to the New World Tropics and another tenth is restricted to eastern North America, east of the Mississippi River. More than two-tenths of the Lancaster County's flora is non-native, either of Old World origin, native to other areas of North America, or long persisting cultivars. The remaining elements of the flora are either circumboreal, part of the North America-east Asian disjuncts, or cosmopolitan. A summary of the phytogeographic analysis is given in Table 12.

**Analysis of Southern Species at their Northern Limit:**

North (1983) performed an analysis on southern species that reach their northern limit in the Virginia Coastal Plain and found 152 species fit within this category. Eighty (52.6%) of these reach their northern limit in southeastern Virginia, south of the James River. Of the remaining 72 species, 29 (40.3%) species reached their northern limit on The Peninsula, 34 (47.2%) on the Middle Peninsula, and 9 (12.5%) on the Northern Neck (Fig. 1a). Of those listed by North (1983) that reach their northern limit on the Middle
Table 11: Phytogeographic Analysis of Species in Range 8

RANGE 8: COSMOPOLITAN AND NEARLY COSMOPOLITAN SPECIES

<table>
<thead>
<tr>
<th>Species</th>
<th>Species</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyperus esculentus</td>
<td>Myosotis laxa</td>
<td>Spirodea polyrhiza</td>
</tr>
<tr>
<td>Cyperus odoratus</td>
<td>Osmunda cinnamomea</td>
<td>Theleyteris palustris</td>
</tr>
<tr>
<td>Equisetum arvense</td>
<td>Phragmites australis</td>
<td>Triglochin striata</td>
</tr>
<tr>
<td>Juncus effusus</td>
<td>Polygonum lapthifolium</td>
<td>Typha angustifolia</td>
</tr>
<tr>
<td>Lemna minor</td>
<td>Potamogeton nodosus</td>
<td>Typha latifolia</td>
</tr>
<tr>
<td>Ludwigia palustris</td>
<td>Ruppia maritima</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 12: Summary of Phylogenetically Analysed Species Documented Within the Corrotoman River Watershed, Lancaster Co., Lancaster Co., Powhatan Co., and Middlesex Co., Virginia, and comparisons with Powhatan County (Corrotoman 1977) and Middlesex County (North 1983).

<table>
<thead>
<tr>
<th>Range</th>
<th>Cosmopolitan Species</th>
<th>Introduced Species</th>
<th>Generally Southern in Distribution</th>
<th>Generally Northern in Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.20</td>
<td>0.10</td>
<td>2.13</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>2.17</td>
<td>0.10</td>
<td>2.40</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>0.08</td>
<td>1.39</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>0.37</td>
<td>0.07</td>
<td>0.39</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>0.13</td>
<td>0.07</td>
<td>0.13</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>0.72</td>
<td>5.52</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>2.38</td>
<td>0.72</td>
<td>2.13</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>0.20</td>
<td>0.13</td>
<td>0.13</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>0.20</td>
<td>2.20</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>0.20</td>
<td>0.44</td>
<td>0.64</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>0.49</td>
<td>0.64</td>
<td>2.20</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>0.09</td>
<td>0.64</td>
<td>2.20</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>0.09</td>
<td>0.13</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>0.36</td>
<td>0.13</td>
<td>0.13</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>0.98</td>
<td>0.13</td>
<td>1.13</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>0.13</td>
<td>1.88</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

**Range 8**: Cosmopolitan species
**Range 7**: Introduced species
**Range 6a2**: Limited to Coastal Plain
**Range 6b**: Generally southern in distribution
**Range 6c**: Generally northern in distribution
**Range 6**: East of Mississippi but not to Pacific Coast
**Range 5**: West of Mississippi but not to Pacific Coast
**Range 4**: South of the New World Tropics
**Range 3**: Introduced distribution
**Range 2**: West of the Pacific Coast
**Range 1**: Circumboreal Species
Peninsula, only two, *Desmodium fernaldii* and *Rhynchospora inexpansa*, are documented on the Northern Neck (Harvill et al. 1992). Only seven species (*Axonopus furcatus*, *Bumelia lycioides*, *Cyperus haspan*, *Drosera leucantha*, *Stylisma humistrata*, *Styrax americana*, and *Wisteria frutescens*) recorded by North to be at their northern limit on The Peninsula are listed by Harvill et al. (1992) as now being documented on the Middle Peninsula. Two, *Cyperus haspan* and *Desmodium tenuifolium*, which North states reach their northern limit on The Peninsula are now known from the Northern Neck.

Given that Lancaster is the next county north of Middlesex county, the latter being the most northern county of the Middle Peninsula, I expected to find a number of species in the Corrotoman which previously were documented to reach their northern limit on the Middle Peninsula. Contrary to this expectation, only two such species were found, *Aster grandiflorus* and *Crataegus viridis*. As more floristic studies are undertaken on the Northern Neck, the ranges of more species may be extended northward to this peninsula through the discovery and documentation of previously overlooked species and through the possible northern migration of some plants. Nevertheless, North (1983) and Harvill's (1966) hypothesis that the Middle Peninsula is the northern limit for a significant number of southern species is strongly supported by findings brought forth in this phytogeographic analysis of the flora of the Corrotoman River watershed, Lancaster County.
In Virginia, recent attention has been given to plant species which are commonly found within the Valley and Ridge and Blue Ridge regions (Fig. 1) and which are absent or rare in the Piedmont but occur in restricted areas within Coastal Plain (Ware and Ware 1992, Mort 1994, and Crouch 1990). These species are referred to as 'Mountain-Coastal Plain disjuncts'. A number of these disjuncts are found in calcium-rich soil (Harvill 1972), especially in ravines with *Chesapectan jeffersonia* and other Pliocene shells characteristic of the Yorktown Formation, and behave as calciphiles within the Virginia Coastal Plain (Ware and Ware 1992). Currently, it is not known why these plants are restricted to calcareous ravines in the Coastal Plain, but Harvill (1965) speculated that these species retreated into refugia present in the mountains and Coastal Plain during the climatic stress of the Pleistocene. After the Pleistocene, the representatives of these species in the mountains moved out and competed well with other species in the mountain climate, while the representatives of these species in the Coastal Plain apparently failed to compete successfully outside these calcareous ravines (S. Ware, pers. comm. 1995).

Lancaster County, like certain other Coastal Plain counties, has a number of mountain-Coastal Plain disjuncts. A list was compiled of previously documented disjunct species (Harvill *et al.* 1977, Crouch 1990, Ware & Ware 1992, and Mort 1994) which also were documented during this study (Table 13). In addition, any additional species which appeared to have a disjunct distribution pattern based upon the Atlas (Harvill *et al.* 1992) and which were found during this study were added to this list. Soil samples were taken at selected sites of occurrence of these species in the Corrotoman...
Table 13: Mountain-Coastal Plain Disjuncts and Other Species Thought to be Indicative of Calcareous Soils within the Coastal Plain of Virginia that were Documented During this Study

<table>
<thead>
<tr>
<th>Species</th>
<th>Yorktown Fm.a</th>
<th>Calcium presence in soil(^{b})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asarum canadense</td>
<td>Yes</td>
<td>High(^{\ast}) (1680 lb./ac)</td>
</tr>
<tr>
<td>Veratrum viride</td>
<td>Yes/No</td>
<td>Medium (1080 lb./ac)</td>
</tr>
<tr>
<td>Adiantum pedatum</td>
<td>No</td>
<td>Medium (1200 lb./ac)</td>
</tr>
<tr>
<td>Athyrium pycnocarpon (^3)</td>
<td>No</td>
<td>Medium (1200 lb./ac)</td>
</tr>
<tr>
<td>Caltha palustris (^{1,2,3})</td>
<td>Yes/No</td>
<td>Medium (1080 lb./ac)</td>
</tr>
<tr>
<td>Cornus alternifolia (^{1,2,3,4})</td>
<td>No</td>
<td>Medium(^{\ast}) (768 lb./ac)</td>
</tr>
<tr>
<td>Aralia nudicaulis (^{1,2,3})</td>
<td>No</td>
<td>Low(^{\ast}) 72 lb./ac</td>
</tr>
<tr>
<td>Stewartia ovata (^3)</td>
<td>No</td>
<td>Low(^{\ast}) 72 lb./ac</td>
</tr>
<tr>
<td>Cypripedium kentuckiense</td>
<td>No</td>
<td>Medium (1080 lb./ac)</td>
</tr>
<tr>
<td>Carex bromoides</td>
<td>No</td>
<td>data not available</td>
</tr>
<tr>
<td>Cryptotaenia canadensis</td>
<td>No</td>
<td>data not available</td>
</tr>
<tr>
<td>Juglans cinerea (^3)</td>
<td>No</td>
<td>data not available</td>
</tr>
<tr>
<td>Tilia americana (^3)</td>
<td>No</td>
<td>data not available</td>
</tr>
<tr>
<td>Vernonia glauca</td>
<td>No</td>
<td>data not available</td>
</tr>
<tr>
<td>Viola conspersa</td>
<td>No</td>
<td>data not available</td>
</tr>
</tbody>
</table>

\(^{a}\) As indicated by Mixon et al. 1989
\(^{b}\) Soil data from VPI Soil Labs; Low, Medium, and High, as well as plus and minus factors as assigned by VPI
\(^{1}\) Barans (1974), \(^2\) Crouch (1990), \(^3\) Ware & Ware (1992), \(^4\) Mort (1994). Disjuncts without a reference were chosen through pers. comm. with D. Ware (1995)
watershed and sent to Virginia Tech for testing and/or hand auguring was done to look for the presence of Pliocene shells within the Yorktown Formation. Unlike other studies of these disjuncts within the Coastal Plain, the disjuncts within Lancaster County do not appear to be associated consistently with calcareous soils.

A calcareous ravine in Middlesex County (North 1983) had a calcium concentration of 1200 lb/ac with a pH of 7.9. Although soils analyzed from the Corrotoman River watershed (Table 2) have a calcium concentration which approaches or exceeds this amount, the pH is never recorded higher than 6.3. Since VPI Soil Analysis Lab reports 1080 and 1200 lb. calcium/acre as a medium concentration, I will consider these soils as calcium rich. Virginia Tech ranks the fertility of the soils they test as a public service to farmers, gardeners, landscapers, and others who often use fertilizers to enhance the soil. These soils they test may not be of the original chemistry due to the addition of these fertilizers; therefore, their ranking as high, medium, or low may be more indicative of enhanced soils than those in their natural condition. Soil samples taken from a typical hardwood slope in the Corrotoman River watershed (Table 2) indicate that the calcium concentration is only 120 lb./ac. Similar values have been documented for hardwood slopes by others (Dewitt and Ware 1979). This, coupled with the contrasting high figure for North's analysis of the calcareous ravine in Middlesex county (1983), indicates that unadulterated soils which have a concentration near 1200 lb./ac should be considered rich in calcium. The soils analyzed in this study fall within three calcium concentration classes: poor (72-312 lb./ac), medium (768 lb./ac), and rich (greater than 1080 lb./ac).

A total of 15 species documented within the Corrotoman River watershed were designated as usually being found in calcium rich soil within the Coastal Plain of Virginia; eight of these have a notably disjunct distribution. Unlike other studies, few of these species were found to occur as an assemblage within the Corrotoman River watershed; instead they usually occur singly, with the following exceptions. *Adiantum pedatum* and *Athyrium pycnocarpon* occurred together at the only location at which either
was found. At times, *Caltha palustris*, *Veratrum viride* and *Cypripedium kentuckiense* were all found to be growing very close together; in other instances, one member of the trio was absent, or species occurred singly. This pattern may be explained on the basis of the variety of soil moisture levels available at a given site, however. *Cypripedium kentuckiense* occurs in a few small colonies within Cabin Swamp and as one extensive population along a feeder ravine. These yellow lady's slippers were located above the watertable either on hummocks or on well-drained flood plains. In adjacent areas that are more hydric, *Veratrum viride* was found; sometimes in areas with open sun this species occurred in great abundance. *Caltha palustris* grew within the wettest areas and thrived best under shaded conditions.

*Aralia nudicaulis*, which is strongly disjunct from locations further west in Virginia, is documented from a single locality in Lancaster County with low nutrient soil. *Stewartia ovata*, although not a calciphilic coastal species, is also disjunct from western counties. Although these species are found at considerable distances from one another, the chemistry of the soils in which they occur is similar. Both are atop high, dry, sandy bluffs very low in calcium (72 lb./ac), as well as low-very low in phosphorus, potassium, and magnesium. *Cornus alternifolia* also was located on low nutrient soil. However, even in the College Woods of the College of William and Mary, Williamsburg, VA, *Cornus alternifolia* is occasionally encountered out of the calcium-rich Yorktown Formation, but near it (S. Ware, pers. comm. 1995).

This new information on mountain-Coastal Plain disjuncts does not necessarily discredit the previous notion that many of these disjuncts are restricted or at least usually restricted to calcium rich soil in the Virginia Coastal Plain. These mountain-Coastal Plain species may not compete well with acidophilic Coastal Plain species that migrated in from the south when the glaciers retreated (S. Ware, pers. comm. 1995). The species that could not compete were survived only where these southern species were not better
adapted. In most cases in the Coastal Plain, those species that are considered disjuncts remained only in the calcium-rich, shell-laden ravine soils.

The fact that these disjunct species are not found in areas rich with shell deposits in Lancaster County makes this phenomenon that much more interesting. Possibly, there is a common factor among the Coastal Plain localities such as trace minerals, humidity, hydrology, etc. I suspect that no single common factor exists and that more of these anomalies will be found as species migrate and more floristic studies are done. This is best expressed by Delzie Demaree who stated that "plants grow where you find them" (S. Ware, pers. comm. 1993).

In conclusion, on the Northern Neck of Virginia some mountain-Coastal Plain disjunct species are not restricted to calcium rich soil (Aralia nudicaulis, Cornus alternifolia, and Stewartia ovata) while others do appear to be restricted to these soils (Adiantum pedatum, Asarum canadense, Athyrium pycnocarpon, Caltha palustris, Cypripedium kentuckiense and Veratrum viride). With the exception of the latter three, none of these species occur in large numbers. Although these results may not clarify the mountain-Coastal Plain disjunction phenomenon, they do signify the need for an in-depth study comparing the soils in which mountain-Coastal Plain disjunct species occur, both among localities throughout the Coastal Plain and among localities in the mountains. In addition to an assessment of ordinary nutrient levels, these soils should be checked for an anomalously high abundance of "trace" minerals, such as glauconite, that might be present in all soils where these species occur across all areas. Also, more areas across Virginia should receive floristic studies to document the presence or absence and the relative abundance of these species on both calcareous and non-calcareous soils.
HABITAT DESCRIPTIONS AND VEGETATIONAL ANALYSIS

As an augmentation to the floristic study, this portion of the study was done to characterize the various habitats encountered within this study area. The descriptions given do not necessarily represent any single example of any habitat type; instead, they represent the synthesis of information from numerous visits to different locations of a given habitat type. Where applicable, quantitative data for the various forest types are included.

Lowlands

Salt Meadows:

At the mouth of the Corrotoman River, a salt meadow dominates the sandy alluvial lowlands near Towles Point. Along the river margin, there are extensive tidal flats with *Ruppia maritima* and *Spartina alterniflora*. *Ruppia maritima* is much easier to locate when the tide is out since it is rooted in the intertidal zone. More inland, a high sandy berm with *Cakile edentula*, *Spartina cynosuroides*, *Baccharis halimifolia*, and *Solidago sempervirens* quickly drops off into a flat, wet meadow dominated by an extensive stand of *Distichlis spicata* and *Spartina patens*. *Pluchea purpurascens* is mixed in this stand and occasionally *Typha angustifolia*. The fastland margin is dominated by *Pinus taeda*. Additional vegetation around the perimeter of the meadow includes *Solidago sempervirens*, *Myrica cerifera*, *Baccharis halimifolia*, *Smilax bonanox*, *Typha angustifolia*, and *Eupatorium rotundifolium*. 
**Brackish Pocket Marshes:**

Most of the pocket marshes have little diversity, being dominated by *Schoenoplectus robustus* and/or *Typha angustifolia*. However, a few of them shelter species of special interest. In one such marsh near Merry Point all three *Spartina* species inhabit the beach area, and *Distichlis spicata* dominates the flats behind the beach. Mixed with the *Distichlis* is *Sabatia stellaries* (a white color morph), *Kosteletzkya virginica*, *Juniperus virginiana*, and *Rhus radicans*. Along the back side of the marsh, there is an extensive colony of *Juncus roemerianus*. *Triglochin striatum* sprawls on mud flats scattered around the edge of the marsh.

A second pocket marsh supports a mixture of *Sagittaria falcata*, *S. longirostra*, *Sabatia dodecandra*, *Eryngium aquaticum*, and *Polygonum* spp. *Typha angustifolia* grows nearer the river banks as one moves from the marsh towards the bank. Behind the cattails, *Hydrocotyle verticillata* forms large colonies. *Myrica cerifera*, *Smilax bona-nox*, *Itea virginica*, and various species of upland trees occur around the perimeter of all these marshes.

**Brackish/Freshwater Marshes:**

Extensive brackish to freshwater marshes occur near the northern tidal limits of the Eastern and Western Branches of the Corrotoman River between the transition from deep water environment to the swamps. Along the river margins of these marshes are extensive stands of *Pontederia cordata* and *Peltandra virginica*, along with *Spartina cynosuroides*, *Amaranthus cannabinus*, *Echinochloa walteri*, *Schoenoplectus pungens* and several species of *Polygonum*. Occasionally, *Lobelia cardinalis*, *Myosotis laxa*, *Mimulus alatus* and *Hibiscus moscheutos* are present. *Samolus parviflorus* occurs along the interface of the marsh and riverbank. The greatest number of species are in flower mid to late summer.
Upstream in the river system, *Nuphar lutea* and *Peltandra virginica* become more common, which is an indication of the freshwater conditions. In addition, *Rudbeckia laciniata*, *Eupatorium perfoliatum*, *Rosa palustris*, and *Cicuta maculata* are encountered for the first time. *Alnus serrulata*, *Nyssa sylvatica* var. *biflora*, *Acer rubrum*, various species of *Bidens*, and *Zizania aquatica* occur on the river margins here.

**Pond surfaces:**

Viewed from the road, the most obvious of the aquatic species are *Nuphar lutea* and *Nymphaea odorata*. Upon closer examination, *Lemna valdiviana*, *Spirodela polyrhiza*, and *Wolffia columbiana* are quite common on the water surface. Occasionally, *Utricularia biflora* forms large stands. *Callitriche heterophylla* was observed once.

**Abandoned Millponds:**

Along the drainage system of the Western Branch, there are four abandoned millponds. Abandoned millponds are defined here as depressions which once served as functioning millponds, but when the dam last broke, it was not repaired. Most of the dams are made of earthen material, and after long periods of use the stress of a heavy rainfall may cause a break in the dam. These drained ponds are generally dominated by herbaceous plants, including a large number of species of *Carex*, especially *C. crinita*, *C. comosa*, and *C. lurida*, and many members of the Poaceae, including *Dicanthelium clandestinum*, *Leersia oryzoides*, and *Zizania aquatica*. In addition, *Asclepias incarnata*, *Epilobium coloratum*, and *Eupatoriaradelphus spp.* are common. Shrubs present include *Rosa palustris*, *Clethra alnifolia*, *Cephalanthus occidentalis*, *Leucothoe racemosa*, *Itea virginica*, *Salix nigra*, and *Alnus serrulata.*
Permanently Wet Swamps:

This habitat is encountered upriver of the extensive marshes and constitutes the majority of the lowland areas in the Corrotoman watershed. The water table is located about six inches below the surface for most of the year, and through capillary action, the soil above the watertable is permanently wet. For the majority of these areas, the canopy is predominately *Acer rubrum* (Table 14) with *Fraxinus pennsylvanica* as an occasional co-dominant. Other species encountered are *Ulmus americana, Platanus occidentalis, Quercus michauxii, Liquidambar styraciflua, and Nyssa sylvatica*, but with one exception, a black-gum dominated headwater swamp, these species were not recorded at an importance value higher than six in this habitat. The presence of *Platanus occidentalis* suggests previous disturbance (S. Ware pers. comm., 1993). Often present in varying levels of importance are *Carpinus caroliniana, Ilex verticillata, Asimina triloba*, and *Lindera benzoin*. Some of the older growth swamps are edged by large stands of *Viburnum prunifolium*.

The herbaceous component is tremendously varied in composition. The following species often occur in great abundance: *Saururus cernuus*, several species in the genus *Carex*, and a number of ferns including *Lorinseria areolata, Thelypteris noveboracensis*, and *Osmunda cinnamonea*. A few additional examples of herbaceous members include *Ranunculus abortivus, Orontium aquaticum, Thalictrum palustris* and *Cardamine pensylvanica* and *C. bulbosa*. Several orchid species grow in isolated localities, including *Habenaria lacera, H. peramoena*, and *Cypripedium kentuckiense Caltha palustris* and *Veratrum viride* formed extensive colonies within the Cabin Swamp system, where there are also scattered populations of *Viola cucullata* and *V. conspersa*.

Generally, the flowering diversity in swamps is highest during the spring season. Skunk cabbage and violets were among the earliest to flower. These are followed by bittercresses, marsh marigold, and *Carex spp.*, with *Bidens spp., Chelone glabra*, and *Polygonum spp.* concluding the growing season.
Table 14: **Permanently Wet Stand** below beaver pond in the Cabin Swamp system along Route 604

<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td><em>Acer rubrum</em></td>
<td>48.94</td>
<td>50.00</td>
<td>13.79</td>
</tr>
<tr>
<td><em>Fraxinus pensylvanica</em></td>
<td>36.17</td>
<td>28.57</td>
<td>27.59</td>
</tr>
<tr>
<td><em>Ulmus americana</em></td>
<td>2.13</td>
<td>8.93</td>
<td>20.69</td>
</tr>
<tr>
<td><em>Liriodendron tulipifera</em></td>
<td>4.26</td>
<td>1.79</td>
<td>- -</td>
</tr>
<tr>
<td><em>Platanus occidentalis</em></td>
<td>4.26</td>
<td>1.79</td>
<td>- -</td>
</tr>
<tr>
<td><em>Carpinus caroliniana</em></td>
<td>- -</td>
<td>5.36</td>
<td>20.69</td>
</tr>
<tr>
<td><em>Fagus grandifolia</em></td>
<td>2.13</td>
<td>1.79</td>
<td>- -</td>
</tr>
<tr>
<td><em>Quercus michauxii</em></td>
<td>2.13</td>
<td>1.79</td>
<td>- -</td>
</tr>
<tr>
<td><em>Asimina triloba</em></td>
<td>- -</td>
<td>- -</td>
<td>10.34</td>
</tr>
<tr>
<td><em>Diospyros virginiana</em></td>
<td>- -</td>
<td>- -</td>
<td>3.44</td>
</tr>
<tr>
<td><em>Viburnum prunifolium</em></td>
<td>- -</td>
<td>- -</td>
<td>3.44</td>
</tr>
</tbody>
</table>

**Total Density:**
- Large Tree: 594.17 stems/ha
- Small Tree: 307.69 stems/ha

**Total Basal Area:** 31.33 m²/ha
Seasonally Flooded Swamps:

These areas bear a resemblance to permanently wet swamps, especially during the spring season when they are the wettest. As the growing season progresses, species adapted to drier conditions begin to flower. Within the woody flora, beech (*Fagus grandifolia*), white oak (*Quercus alba*) and holly (*Ilex opaca*) are often present in this lowland. During the spring, many species are shared with the permanently wet swamps. Some of these include violets (*Viola spp.*), and *Carex spp.* By the time the fall season approaches, many asters, hog peanut (*Amphicarpa bracteata*), and goldenrods (*Solidago spp.*) begin to flower.

Sphagnous headwaters:

The undisturbed headwater areas generally are rich in sphagnum and floristic diversity, but most of these areas have been or are in the process of being clear-cut. The few uncut areas proved quite rich, however. The sphagnous streamheads varied greatly, with some having a vegetation structure similar to that of some of the swamps described above, (i.e., dominated by *Nyssa sylvatica*, or dominated by *Fraxinus pensylvanica* with few *Acer rubrum* present). An area dominated by *Nyssa sylvatica* (Table 15) also has *Magnolia virginiana* and *Chionanthus virginicus* in the shrub/sapling layer along with red maple. Within the sampled stand, a number of loblolly pines (*Pinus taeda*) are recorded, but some of these are actually at the base of the upland. The narrow width of this ravine forced the inclusion of these trees, given the sampling method employed. In addition, *Ilex laevigata* and *Myrica heterophylla* are rare constituents of this understory/shrub layer. These sphagnous systems share a number of violets, species of *Carex*, and other species with the bottomland systems.
Table 15: Black Gum Dominated Stand at Sphagnous Headwaters along Route 602 near the north boundary of the study area.

<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Nyssa sylvatica</td>
<td>58.70</td>
<td>57.89</td>
<td>6.67</td>
</tr>
<tr>
<td>Acer rubrum</td>
<td>19.57</td>
<td>30.26</td>
<td>35.24</td>
</tr>
<tr>
<td>Pinus taeda</td>
<td>19.57</td>
<td>6.58</td>
<td>-</td>
</tr>
<tr>
<td>Ilex opaca</td>
<td>-</td>
<td>5.26</td>
<td>24.76</td>
</tr>
<tr>
<td>Magnolia virginiana</td>
<td>2.17</td>
<td>-</td>
<td>21.90</td>
</tr>
<tr>
<td>Chionanthus virginicus</td>
<td>-</td>
<td>-</td>
<td>9.52</td>
</tr>
<tr>
<td>Juniperus virginiana</td>
<td>-</td>
<td>-</td>
<td>0.95</td>
</tr>
<tr>
<td>Leucothoe racemosa</td>
<td>-</td>
<td>-</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Total Density:
- Large Tree: 806.38 stems/ha
- Small Tree: 1114.08 stems/ha

Total Basal Area: 30.67 m²/ha
Ravine Bottoms:

Each ravine has its own unique flora; therefore it is difficult to describe a "typical" ravine. A few ravines were dominated by tulip tree (*Liriodendron tulipifera*) with varying numbers of black walnut (*Juglans nigra*) (Table 16). The shrub component of such stands is predominately paw paw (*Asimina triloba*) and spicebush (*Lindera benzoin*). Within the ravines dominated by tulip tree and black walnut, very little herbaceous vegetation was observed, probably due to the allelopathic qualities of the walnut.

A number of ravine bottoms yielded plants of interesting geographic distribution, including *Fleischmannia incarnata*, *Cypripedium kentuckiense*, *Decumaria barbara*, and *Athyrium pycnocarpon*. These ravines are denoted as "rich" (based on soils) ravines in the annotated checklist. Other species which occur here include *Adiantum pedatum*, *Athyrium pycnocarpon*, *Sanguinaria canadensis*, *Ophioglossum vulgatum*, *Asarum canadense*, *Oxalis violacea*, and *Phegopteris hexagonoptera*.

The canopy of these ravines varied also. In the older growth areas, beech and white oak appear to be the dominant members. Under more hydric conditions, *Fraxinus pensylvanica* and other swamp species become more prevalent.

Uplands

Pine Forests:

The 1963 Agriculture Census states that nearly 28% of the total land area was devoted to farming; the most recent Census (1992) indicates that this number has fallen to 23%. As the once common smaller farms disappear, the fields are often left to the successional process. Among the first trees to invade are *Pinus taeda* with *Pinus virginiana* along the margins (Table 17). As a result of the combination of heavy shade and the high soil acidity derived from the large number of fallen pine needles, little herbaceous vegetation can survive under this canopy. About the only herbaceous species
Table 16: Ravine Bottom Stand near old Baylor farm along Route 614 south of Lancaster Courthouse

<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Liriodendron tulipifera</td>
<td>57.38</td>
<td>53.49</td>
<td>10.00</td>
</tr>
<tr>
<td>Liquidambar styraciflua</td>
<td>24.59</td>
<td>27.91</td>
<td>-</td>
</tr>
<tr>
<td>Juglans nigra</td>
<td>9.84</td>
<td>9.30</td>
<td>-</td>
</tr>
<tr>
<td>Asimina triloba</td>
<td>4.92</td>
<td>4.65</td>
<td>62.50</td>
</tr>
<tr>
<td>Ilex opaca</td>
<td>1.64</td>
<td>4.65</td>
<td>3.75</td>
</tr>
<tr>
<td>Acer rubrum</td>
<td>1.64</td>
<td>-</td>
<td>1.25</td>
</tr>
<tr>
<td>Lindera benzoin</td>
<td>-</td>
<td>-</td>
<td>16.25</td>
</tr>
<tr>
<td>Cornus florida</td>
<td>-</td>
<td>-</td>
<td>5.00</td>
</tr>
<tr>
<td>Carpinus caroliniana</td>
<td>-</td>
<td>-</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Total Density:
- Large Tree: 456.24 stems/ha
- Small Tree: 848.82 stems/ha

Total Basal Area: 40.65 m²/ha
Table 17: Early Pine Successional Forest along Route 604 south of Merry Point

<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large</td>
<td>Small</td>
<td></td>
</tr>
<tr>
<td><em>Pinus taeda</em></td>
<td>62.90</td>
<td>57.33</td>
<td>-</td>
</tr>
<tr>
<td><em>Pinus virginiana</em></td>
<td>20.97</td>
<td>22.67</td>
<td>-</td>
</tr>
<tr>
<td><em>Liriodendron tulipifera</em></td>
<td>8.06</td>
<td>10.67</td>
<td>3.20</td>
</tr>
<tr>
<td><em>Acer rubrum</em></td>
<td>1.61</td>
<td>4.00</td>
<td>14.40</td>
</tr>
<tr>
<td><em>Nyssa sylvatica</em></td>
<td>1.61</td>
<td>2.67</td>
<td>4.00</td>
</tr>
<tr>
<td><em>Ilex opaca</em></td>
<td>1.61</td>
<td>1.33</td>
<td>33.60</td>
</tr>
<tr>
<td><em>Juniperus virginiana</em></td>
<td>1.61</td>
<td>-</td>
<td>18.40</td>
</tr>
<tr>
<td><em>Prunus serotina</em></td>
<td>1.61</td>
<td>-</td>
<td>4.80</td>
</tr>
<tr>
<td><em>Liquidambar styraciflua</em></td>
<td>-</td>
<td>1.33</td>
<td>1.60</td>
</tr>
<tr>
<td><em>Myrica cerifera</em></td>
<td>-</td>
<td>-</td>
<td>19.20</td>
</tr>
<tr>
<td><em>Cornus florida</em></td>
<td>-</td>
<td>-</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Total Density:
- Large Tree: 795.77 stems/ha
- Small Tree: 1326.29 stems/ha

Total Basal Area: 41.33 m²/ha
found here were *Smilax rotundifolia* and *Rhus radicans*. Although not encountered in the sampling, seedlings of *Quercus falcata* were observed occasionally. Stands dominated strictly by pine are uncommon in the study area, and in most cases, are situated near farm fields.

**Pine-Mixed Hardwoods Forests:**

Most of the wooded areas are either pine-mixed hardwoods or mixed hardwoods. Generally, all woods contain some pine. The pine-mixed hardwood stands tend to have pine with a high importance value. There are many fallen pines within several of the pine-mixed hardwoods stands, and in these stands, the transition from pine-mixed hardwoods to hardwoods forest is beginning. These stands have a high diversity of woody species. Nearly every woody species documented in the Corrotoman River watershed was encountered at least once in at least one stand of this forest type. Usually, one of the oaks was the dominant or co-dominant member of such a woodland, usually *Quercus falcata* or *Q. alba* (Table 18), with *Carya pallida* often present. The understory consists of *Ilex opaca*, *Kalmia latifolia*, *Vaccinium corymbosum*, *Myrica cerifera*, and *Lyonia ligustrina*. Often, *Smilax rotundifolia* is prolific in these disturbed woodlands, along with *Rhus radicans*.

**Mixed Hardwoods Forests:**

The mixed hardwoods stands have either had the pines removed by cutting or succession, or they are restricted to the edge habitat. A number of examples of mixed hardwoods forests are present throughout the study area. Generally, these forests consist of high proportions of white oak (*Quercus alba*), hickories (*Carya spp.*), American beech (*Fagus grandifolia*), tulip tree (*Liriodendron tulipifera*), and other species of oak. In addition, sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), American
Table 18: Pine Mixed-Hardwood Stand along the entrance to White Creek Estates near Millenbeck

<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Quercus alba</td>
<td>47.76</td>
<td>40.63</td>
<td>1.83</td>
</tr>
<tr>
<td>Pinus taeda</td>
<td>37.31</td>
<td>39.06</td>
<td>1.22</td>
</tr>
<tr>
<td>Acer rubrum</td>
<td>5.97</td>
<td>7.81</td>
<td>26.83</td>
</tr>
<tr>
<td>Quercus falcata</td>
<td>1.49</td>
<td>4.69</td>
<td>1.83</td>
</tr>
<tr>
<td>Carya pallida</td>
<td>2.99</td>
<td>3.13</td>
<td>1.83</td>
</tr>
<tr>
<td>Quercus prinus</td>
<td>1.49</td>
<td>3.13</td>
<td>1.22</td>
</tr>
<tr>
<td>Carya glabra</td>
<td>- -</td>
<td>1.56</td>
<td>1.22</td>
</tr>
<tr>
<td>Liquidambar styraciflua</td>
<td>1.49</td>
<td>- -</td>
<td>29.27</td>
</tr>
<tr>
<td>Nyssa sylvatica</td>
<td>1.49</td>
<td>- -</td>
<td>1.83</td>
</tr>
<tr>
<td>Ilex opaca</td>
<td>- -</td>
<td>- -</td>
<td>20.12</td>
</tr>
<tr>
<td>Vaccinium corymbosum</td>
<td>- -</td>
<td>- -</td>
<td>4.27</td>
</tr>
<tr>
<td>Quercus nigra</td>
<td>- -</td>
<td>- -</td>
<td>3.05</td>
</tr>
<tr>
<td>Liriodendron tulipifera</td>
<td>- -</td>
<td>- -</td>
<td>1.83</td>
</tr>
<tr>
<td>Cornus florida</td>
<td>- -</td>
<td>- -</td>
<td>1.22</td>
</tr>
<tr>
<td>Carpinus caroliniana</td>
<td>- -</td>
<td>- -</td>
<td>0.61</td>
</tr>
<tr>
<td>Fagus grandifolia</td>
<td>- -</td>
<td>- -</td>
<td>0.61</td>
</tr>
<tr>
<td>Juniperus virginiana</td>
<td>- -</td>
<td>- -</td>
<td>0.61</td>
</tr>
<tr>
<td>Platanus occidentalis</td>
<td>- -</td>
<td>- -</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Total Density:
- Large Tree: 509.29 stems/ha
- Small Tree: 1305.07 stems/ha

Total Basal Area: 33.50 m²/ha
holly (*Ilex opaca*), dogwood (*Cornus florida*) and black gum (*Nyssa sylvatica*) often occur in the canopy. This type of forest surrounds the three existing millponds in the county and is generally on sloping terrain, rather than on the level uplands where the pine stands, pine-mixed hardwood stands and agricultural fields prevail.

Quantitative data were collected from three typical mixed hardwoods which had varying compositions of the above listed species. The first stand is located on the old Baylor farm on Route 614, south of Lancaster Courthouse. This stand is characterized by a high level of importance of *Liriodendron tulipifera* and *Fagus grandifolia* (Table 19). It appeared that the hickories and most of the oaks were removed from this stand (S. Ware, pers. comm., 1995). Generally, sand hickory (*Carya pallida*) is very common in these mixed hardwoods. A stand between the feeder streams of Camp's Millpond along Route 3 outside of Kilmarnock is a good example. Sand hickory, followed by white oak (*Quercus alba*), dominated the canopy at this location (Table 20). The third example is similar to the previous except that the trees are slightly larger and the stand is possibly older in age. Based upon the sampled composition, the tulip tree does not appear to be reproducing well under its own canopy and American beech (*Fagus grandifolia*) is becoming the dominant canopy member (Table 21). Within the sampled area, the red maple saplings are quite common and based upon the data, it appears that they will become the dominant member. This, however, is unlikely since the older red maples appear to be susceptible to windfall and therefore die before achieving dominance.

**River Bluffs:**

Steep river bluffs, consisting of almost pure sand, rise high above the deep waters of the Corrotoman River. The view from these bluffs is extraordinary; hence the presence atop them of homes worth over a half million dollars. The natural vegetation has been removed by many of the homeowners. In areas where homes are not located, the vegetation can be classified into two categories. The first is dominated by *Pinus*
Table 19: Mixed Hardwood Stand of Tulip Tree and Beech along slopes of old Baylor farm along Route 614 south of Lancaster Courthouse.

<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large</td>
<td>Small</td>
<td></td>
</tr>
<tr>
<td><em>Liriodendron tulipifera</em></td>
<td>39.74</td>
<td>31.25</td>
<td>1.38</td>
</tr>
<tr>
<td><em>Fagus grandifolia</em></td>
<td>32.05</td>
<td>31.25</td>
<td>14.48</td>
</tr>
<tr>
<td><em>Acer rubrum</em></td>
<td>6.41</td>
<td>10.00</td>
<td>21.38</td>
</tr>
<tr>
<td><em>Quercus alba</em></td>
<td>8.97</td>
<td>6.25</td>
<td>4.14</td>
</tr>
<tr>
<td><em>Liquidambar styraciflua</em></td>
<td>6.41</td>
<td>8.75</td>
<td>8.28</td>
</tr>
<tr>
<td><em>Quercus rubra</em></td>
<td>2.56</td>
<td>3.75</td>
<td>2.07</td>
</tr>
<tr>
<td><em>Ilex opaca</em></td>
<td>- -</td>
<td>5.00</td>
<td>17.24</td>
</tr>
<tr>
<td><em>Carya glabra</em></td>
<td>1.28</td>
<td>1.25</td>
<td>8.97</td>
</tr>
<tr>
<td><em>Pinus virginiana</em></td>
<td>1.28</td>
<td>1.25</td>
<td>- -</td>
</tr>
<tr>
<td><em>Quercus falcata</em></td>
<td>1.28</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td><em>Cornus florida</em></td>
<td>- -</td>
<td>1.25</td>
<td>13.79</td>
</tr>
<tr>
<td><em>Carpinus caroliniana</em></td>
<td>- -</td>
<td>- -</td>
<td>2.07</td>
</tr>
<tr>
<td><em>Prunus serotina</em></td>
<td>- -</td>
<td>- -</td>
<td>2.07</td>
</tr>
<tr>
<td><em>Juniperus virginiana</em></td>
<td>- -</td>
<td>- -</td>
<td>1.38</td>
</tr>
<tr>
<td><em>Quercus velutina</em></td>
<td>- -</td>
<td>- -</td>
<td>1.38</td>
</tr>
<tr>
<td><em>Platanus occidentalis</em></td>
<td>- -</td>
<td>- -</td>
<td>0.69</td>
</tr>
<tr>
<td><em>Quercus michauxii</em></td>
<td>- -</td>
<td>- -</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Total Density:
- Large Tree: 509.29 stems/ha
- Small Tree: 923.10 stems/ha

Total Basal Area: 31.20m²/ha
Table 20: Hickory Dominated Mixed Hardwood Stand along slopes of Camp's Millpond between feeder streams

<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Carya pallida</td>
<td>37.29</td>
<td>29.79</td>
<td>-</td>
</tr>
<tr>
<td>Quercus alba</td>
<td>25.42</td>
<td>23.40</td>
<td>1.20</td>
</tr>
<tr>
<td>Liriodendron tulipifera</td>
<td>15.25</td>
<td>19.15</td>
<td>-</td>
</tr>
<tr>
<td>Quercus rubra</td>
<td>10.17</td>
<td>10.64</td>
<td>1.20</td>
</tr>
<tr>
<td>Acer rubrum</td>
<td>-</td>
<td>4.26</td>
<td>21.69</td>
</tr>
<tr>
<td>Ilex opaca</td>
<td>-</td>
<td>4.26</td>
<td>3.61</td>
</tr>
<tr>
<td>Carya glabra</td>
<td>1.69</td>
<td>2.13</td>
<td>-</td>
</tr>
<tr>
<td>Fagus grandifolia</td>
<td>1.69</td>
<td>2.13</td>
<td>-</td>
</tr>
<tr>
<td>Quercus velutina</td>
<td>3.39</td>
<td>-</td>
<td>2.41</td>
</tr>
<tr>
<td>Carya tomentosa</td>
<td>3.39</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nyssa sylvatica</td>
<td>-</td>
<td>2.13</td>
<td>7.23</td>
</tr>
<tr>
<td>Kalmia latifolia</td>
<td>-</td>
<td>2.13</td>
<td>-</td>
</tr>
<tr>
<td>Quercus coccinea</td>
<td>1.69</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Carpinus caroliniana</td>
<td>-</td>
<td>-</td>
<td>32.53</td>
</tr>
<tr>
<td>Cornus florida</td>
<td>-</td>
<td>-</td>
<td>28.92</td>
</tr>
<tr>
<td>Vaccinium corymbosum</td>
<td>-</td>
<td>-</td>
<td>1.20</td>
</tr>
</tbody>
</table>

Total Density:
- Large Tree: 374.04 stems/ha
- Small Tree: 660.51 stems/ha

Total Basal Area: 29.50 m²/ha
### Table 21: Older Mixed Hardwood Stand with beech saplings in understory along upland slopes of Beane Swamp off Route 604, north of Cabin Swamp

<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Quercus alba</td>
<td>35.00</td>
<td>23.08</td>
<td>1.37</td>
</tr>
<tr>
<td>Acer rubrum</td>
<td>11.67</td>
<td>30.77</td>
<td>26.03</td>
</tr>
<tr>
<td>Liriodendron tulipifera</td>
<td>20.00</td>
<td>18.46</td>
<td>2.74</td>
</tr>
<tr>
<td>Carya pallida</td>
<td>10.00</td>
<td>9.23</td>
<td>1.37</td>
</tr>
<tr>
<td>Fagus grandifolia</td>
<td>8.33</td>
<td>7.69</td>
<td>19.18</td>
</tr>
<tr>
<td>Quercus coccinea</td>
<td>3.33</td>
<td>1.54</td>
<td>-</td>
</tr>
<tr>
<td>Quercus rubra</td>
<td>3.33</td>
<td>1.54</td>
<td>-</td>
</tr>
<tr>
<td>Quercus velutina</td>
<td>3.33</td>
<td>1.54</td>
<td>-</td>
</tr>
<tr>
<td>Nyssa sylvatica</td>
<td>1.67</td>
<td>1.54</td>
<td>1.37</td>
</tr>
<tr>
<td>Pinus taeda</td>
<td>1.67</td>
<td>1.54</td>
<td>-</td>
</tr>
<tr>
<td>Quercus falcata</td>
<td>1.67</td>
<td>1.54</td>
<td>-</td>
</tr>
<tr>
<td>Carpinus caroliniana</td>
<td>-</td>
<td>1.54</td>
<td>15.07</td>
</tr>
<tr>
<td>Cornus florida</td>
<td>-</td>
<td>-</td>
<td>23.29</td>
</tr>
<tr>
<td>Ilex opaca</td>
<td>-</td>
<td>-</td>
<td>4.11</td>
</tr>
<tr>
<td>Liquidambar styraciflua</td>
<td>-</td>
<td>-</td>
<td>4.11</td>
</tr>
<tr>
<td>Juniperus virginiana</td>
<td>-</td>
<td>-</td>
<td>1.37</td>
</tr>
</tbody>
</table>

**Total Density:**

- Large Tree: 517.27 stems/ha
- Small Tree: 580.92 stems/ha

**Total Basal Area:** 30.00 m²/ha
taeda and its associates as described in the section on pine stands. This succession is due to the remission of agricultural lands and plantings after clear cuts. The second type, an older growth forest, is dominated by chestnut oak (Quercus prinus), along with other species of oak (Quercus spp.). The shrub layer on these slopes is often dominated by a thicket of mountain laurel (Kalmia latifolia). A continuing forest of this type extends along the west facing slope from Merry Point to the headwaters of John's Creek (Table 22). Along the southern portion of this slope, shrubby post oak (Quercus margaretta) is also an important member.

**Disturbed Habitats**

**Roadsides:**

Roadsides were visited often throughout the study period. Frequent disturbance due to mowing make them ideal habitat for a number of weedy herbaceous plants. Most of the roadsides have a wide variety of plants, and since the Virginia Department of Transportation has planted few invasive species within this county, much of the diversity along these roadsides should continue long into the future. This may change, though, as roadsides are repaved. Along the northern boundary of the study area, Routes 619 and 615 were reconstructed during the study period. After the construction was complete, monotypic stands of Secale cereale were planted. Since this is not a persisting species, the native vegetation should return.

The most common plants along the roadsides in the spring are Ranunculus bulbosus and R. sardous, Apocynum cannabinum, Narcissus spp., Sysyrinchium angustifolium, Cerastium spp., and Erigeron spp.. During the summer, typical examples include Bidens polylepis, Allium vineale, Asclepias tuberosa, Raphanus raphanistrum, Ipomoea spp., Desmodium spp., and Plantago spp.. Late summer and early fall brings the profusion of members of the aster family, including the Solidago spp., Ambrosia artemisiifolia, and Aster spp.
<table>
<thead>
<tr>
<th>Species</th>
<th>% Dominance</th>
<th>% Density</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large</td>
<td>Small</td>
<td></td>
</tr>
<tr>
<td>Quercus prinus</td>
<td>43.18</td>
<td>34.48</td>
<td>6.34</td>
</tr>
<tr>
<td>Quercus falcata</td>
<td>6.82</td>
<td>22.41</td>
<td>1.41</td>
</tr>
<tr>
<td>Pinus virginiana</td>
<td>11.36</td>
<td>10.34</td>
<td>9.15</td>
</tr>
<tr>
<td>Quercus margaretta</td>
<td>13.64</td>
<td>6.90</td>
<td>6.34</td>
</tr>
<tr>
<td>Kalmia latifolia</td>
<td>11.36</td>
<td>5.17</td>
<td>42.25</td>
</tr>
<tr>
<td>Ilex opaca</td>
<td>2.27</td>
<td>8.62</td>
<td>19.01</td>
</tr>
<tr>
<td>Quercus marilandica</td>
<td>4.55</td>
<td>5.17</td>
<td>1.41</td>
</tr>
<tr>
<td>Nyssa sylvatica</td>
<td>2.27</td>
<td>1.72</td>
<td>5.63</td>
</tr>
<tr>
<td>Carya glabra</td>
<td>2.27</td>
<td>- -</td>
<td>1.41</td>
</tr>
<tr>
<td>Pinus taeda</td>
<td>2.27</td>
<td>- -</td>
<td>1.41</td>
</tr>
<tr>
<td>Albizia julibrissin</td>
<td>- -</td>
<td>1.72</td>
<td>- -</td>
</tr>
<tr>
<td>Prunus serotina</td>
<td>- -</td>
<td>1.72</td>
<td>- -</td>
</tr>
<tr>
<td>Quercus rubra</td>
<td>- -</td>
<td>1.72</td>
<td>- -</td>
</tr>
<tr>
<td>Amelanchier spp.</td>
<td>- -</td>
<td>- -</td>
<td>2.11</td>
</tr>
<tr>
<td>Cornus florida</td>
<td>- -</td>
<td>- -</td>
<td>2.11</td>
</tr>
<tr>
<td>Platanus occidentalis</td>
<td>- -</td>
<td>- -</td>
<td>1.41</td>
</tr>
<tr>
<td>Castanea pumila</td>
<td>- -</td>
<td>- -</td>
<td>1.41</td>
</tr>
<tr>
<td>Robinia pseudo-acacia</td>
<td>- -</td>
<td>- -</td>
<td>1.41</td>
</tr>
</tbody>
</table>

Total Density:
- Large Tree: 615.40 stems/ ha
- Small Tree: 1506.66 stems/ ha

Total Basal Area: 29.34 m²/ha
**Fields and Field Margins:**

The open fields scattered throughout the study area are the result of agriculture practices or development. These areas support a wide variety of species and vary from one area to the next. The perimeters of these areas share many species, such as *Lonicera japonica*, *Rubus* spp., *Rhus radicans*, *Smilax rotundifolia* and *Parthenocissus quinquefolia*. Woody vegetation is also occasionally present around the perimeter. Some fields abutt forest of one of the types already described or a stand of the so-called "waste trees" such as hackberry (*Celtis laevigata*), box elder (*Acer negundo*), wild black cherry (*Prunus serotina*), red mulberry (*Morus rubra*), sumac (*Rhus glabra* and *R. copallina*), peach (*Prunus persica*), and the tree-of-heaven (*Ailanthus altissima*).

In the field proper, various members of the grass family, such as *Anthoxanthum odoratum*, *Lolium perenne*, and *Dactylis glomerata*, and the genus *Cyperus* dominate. During the spring, in the moister areas, *Valerianella radiata* and *V. locusta* and a *Vicia* spp. are common. As summer approaches, *Asclepias* spp., *Apocynum cannabinum*, *Desmodium* spp., *Datura stramonium*, and *Ipomoea* spp. dominate. During the fall, *Erigeron* spp., *Solidago* spp., and *Aster* spp. become more important.

**Cemeteries:**

A number abandoned family cemeteries or larger cemeteries with no vacancy are scattered around the study area; many more appear on the topographic maps but the headstones have been removed and the area plowed. These cemeteries often harbor a number of persisting plants including *Buxus sempervirens*, *Rosa* spp., and *Spiraea thunbergii*. A maintained cemetery at an abandoned church at the corner of the junction between Route 201 and Route 616 has an abundance of *Spiranthes grayi* throughout and *Gentiana villosa* scattered around the perimeter.
Clear-cuts:

As a result of the active deforestation taking place during the study period, a number of clear cut areas are present. The dominant species in this habitat are members of the aster family, including *Erigeron spp.*, *Liatris graminifolia*, *Solidago spp.*, and *Artemisia vulgaris*, and members of the grass family. Some of the areas are nearly barren because after the wood was harvested, the area was burned and bulldozed in preparation for the planting of loblolly pine. One clear cut along the north boundary of the study area along Route 602 is quite diverse. This area includes the headwaters of McMahon Swamp, where a small sphagnous stream traverses the clear cut. Species documented from this area include *Habenaria cristata*, *H. clavellata*, *Polygala lutea*, *Carex collinsii*, and *Xyris torta*. 
DISTRIBUTIONAL RECORDS

Taxa Collected

During this study, 824 species in 829 taxa, 431 genera of 122 families were documented (Table 23). Two-hundred forty of these are reported from Lancaster County for the first time. Compared with other recent Master's thesis from the College of William & Mary, this thesis documents more species than any other (Table 24). This reflects, in part, the plant diversity of the county and emphasizes the need for conservation within the county.

Phytogeographical Distribution of Species of Special Interest

Twelve species collected during this study are considered of special interest due to their rarity within Virginia. Four species are ranked as S3, seven as S2, and one has never been reported from Virginia before. The ranges of these species given below are derived from Gleason and Cronquist (1963, 1991) and Fernald (1950); distribution within Virginia follows Harvill et al. (1992). Due to the sensitive habitat that some of these species inhabit, specific details of their location have been omitted.

State Record

*Cypripedium kentuckiense* C. Reed

The biggest surprise during the study was probably the discovery of this plant. As explained earlier, every effort was made to recollect all species that had been previously documented from the study area. One such plant was *Cypripedium calceolus*. Harvill et al. (1991) do not separate this species into the two recognized North American varieties, var. *pubescens* (Willd) Correll and var. *parviflorum* (Salisb.) Fern., but it was assumed that var. *pubescens* was the taxon previously documented from Lancaster Co. This
Table 23: Summary of Taxa

<table>
<thead>
<tr>
<th>Division</th>
<th>Families</th>
<th>Genera</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphenophyta</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lycopodiiophyta</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Polypodiophyta</td>
<td>3</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Pinophyta</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Magnoliophyta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liliopsida</td>
<td>20</td>
<td>103</td>
<td>230</td>
</tr>
<tr>
<td>Magnoliopsida</td>
<td>95</td>
<td>310</td>
<td>572</td>
</tr>
</tbody>
</table>

Total: 122 families, 431 genera, 824 species

Total Native Species: 632 (76.6%)  
Total Introduced Species: 192 (23.4%)

Top Five Representative Families

<table>
<thead>
<tr>
<th>Family</th>
<th># of species</th>
<th>Total % of flora</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asteraceae</td>
<td>101</td>
<td>(12.2%)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>90</td>
<td>(10.9%)</td>
</tr>
<tr>
<td>Cyperaceae</td>
<td>61</td>
<td>(7.4%)</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>59</td>
<td>(7.2%)</td>
</tr>
<tr>
<td>Rosaceae</td>
<td>32</td>
<td>(3.9%)</td>
</tr>
</tbody>
</table>
Table 24: Summary of Collecting by College of William & Mary Student Botanist which resulted in numerous county records and a large total number of species collected

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>County</th>
<th># country records</th>
<th>Total# species</th>
</tr>
</thead>
<tbody>
<tr>
<td>North¹</td>
<td>1983</td>
<td>Middlesex</td>
<td>252</td>
<td>819</td>
</tr>
<tr>
<td>Corcoran¹</td>
<td>1977</td>
<td>Powhatan</td>
<td>658</td>
<td>814</td>
</tr>
<tr>
<td>Mort¹</td>
<td>1994</td>
<td>Prince George</td>
<td>167</td>
<td>786</td>
</tr>
<tr>
<td>Diggs¹</td>
<td>1976</td>
<td>Fluvanna</td>
<td>733</td>
<td>752</td>
</tr>
<tr>
<td>Van Monfrans¹</td>
<td>1980</td>
<td>Mathews</td>
<td>467</td>
<td>640</td>
</tr>
<tr>
<td>Plunkett¹</td>
<td>1990</td>
<td>Isle of Wight</td>
<td>84</td>
<td>603</td>
</tr>
<tr>
<td>Vascott¹</td>
<td>1985</td>
<td>King and Queen</td>
<td>266</td>
<td>600</td>
</tr>
<tr>
<td>Barans¹</td>
<td>1969</td>
<td>James City (College Woods)</td>
<td>115</td>
<td>545</td>
</tr>
<tr>
<td>Appler¹</td>
<td>1974</td>
<td>Fort Eustis</td>
<td>406</td>
<td>538</td>
</tr>
<tr>
<td>Crouch²</td>
<td>1990</td>
<td>James City (College Woods)</td>
<td>16</td>
<td>125</td>
</tr>
</tbody>
</table>

¹ M.A. Thesis Project  
² Senior Thesis Project
assumption was made because var. *pubescens* is widespread, while var. *parviflorum* is thought to be restricted to New England, New Jersey, Pennsylvania, Ohio, Indiana, Ontario, and at higher elevations in the Tennessee and other other areas in the southern Appalachian Mountains, including Virginia.

Alton Harvill originally collected this orchid in Lancaster Co., on 24 May 1980 (C. Stevens, pers. comm. 1994). They found two colonies with "dozens" in each. On a subsequent return trip on 18 April 1990, C.E. Stevens found the habitat had been flooded by beavers and found no trace of the plants (C. Stevens, pers. comm. 1995). The original colonies were in a disturbed swampy woods which Mr. Stevens pinpointed for me on a map. I searched this general area several times throughout the growing season and could not locate the plants.

As a last attempt on one of the last field days, I decided to hike a large tributary of Corrotoman, part of which included the watershed of the tributary on which the orchid had been found previously. Much of this area had been searched during the duration of the study, but not all at one time. That day, after five hours of hiking, I found three very tall yellow lady's slippers. These plants were located on a hummock formed at the base of an ash within the stream floodplain. This portion of the swamp was not apart of the watershed where the orchid had previously been found. Upon a return trip to the area, 101 of these lady's slippers were located in a different ravine near the Harvill/Stevens site.

The yellow lady's slipper, *Cypripedium kentuckiense*, differs from *C. calceolus* var. *pubescens* in that it is more robust and the flower is paler yellow. Since this species has previously been documented only from eastern Kentucky, eastern Tennessee, Arkansas, Oklahoma, Louisana, and Texas, the final determination of this material was withheld pending the results from a cluster analysis by Dr. Martha Case. This analysis demonstrated that the Lancaster population is much more similar to *C. kentuckiense* than
C. calceolus var. pubescens (M. Case, unpub. data). Therefore, this population is best interpreted to a C. kentuckiense population.

"S2" Species

Three species found in Lancaster Co. have been assigned a ranking of S2 by the Virginia Department of Natural Heritage (Ludwig 1995), which indicates that the species are known from only five to twenty occurrences in Virginia. Each is described separately below.

_Habenaria peramoena_ Gray (Orchidaceae)

The purple fringeless orchid is an inhabitant of damp to wet soils from New Jersey to Ontario and Missouri, south to North Carolina, Alabama, and Tennessee. Although present in several counties in the mountains and Piedmont, neither Radford _et al._ (1968), Harvill _et al._ (1992), or Weakley (1994) report this orchid from the Coastal Plain of Virginia, North Carolina, or South Carolina. This documentation from Lancaster Co. is, therefore, the first report for the southeastern coastal plain. Its location on a forested interfluval area between two small freshwater streams deep in the Bellwood Swamp system is reachable only by boat.

_Stewartia ovata_ (Cav.) Weatherby (Theaceae)

_Stewartia ovata_ is normally found in mountain woods from eastern Kentucky to northern Georgia and northern Alabama. In Virginia, it has been reported from two Mountain counties (Patrick and Henry) and one Piedmont county (Pittsylvania) (Harvill _et al._ 1992). Small disjunct populations also exist on the Coastal Plain of Virginia in James City and York counties. It was previously reported from Lancaster County (Harley 1969), but no one had reported seeing it for many years. Searches by individuals who thought they remembered the location of the population proved fruitless. A computer search of J.T. Baldwin’s publications by the library staff of Butler University which led to Baldwin’s citation of the Lancaster report which had been published by the
landowner, Winifred Harley (1969). The article only vaguely stated that the population was located at Merry Point along John's Creek. No more information was given but it served as a starting point.

Originally, I wanted to begin my search by getting permission from the homeowners of a large house overlooking John's Creek, but nobody was home. Next, I noted a driveway and followed it towards a small home surrounded by trees. Fortuitously, a search of this location resulted in the rediscovery of the population. It consists of only three small shrubs located near the top of the first west-northwest facing wooded slope north of the spit at the mouth of John's Creek. All the adjacent slopes were searched, but no more *Stewartia* were found.

This occurrence of *Stewartia* in Lancaster County may be threatened because the present landowners, who have protected it, will be moving away. The fate of this population will rest in the hands of the new owner. Given the current trend among many waterfront landowners of replacing the natural vegetation with nicely landscaped lawns, I fear that this population may be destroyed. This Lancaster population is of great phytogeographic and historical interest; therefore, it will be very important that the new owners be adequately informed of its importance.

**Fleischmannia incarnata (Walter) King & Robinson (Asteraceae)**

Commonly referred to as pink thoroughwort, this species is sometimes confused with *Conoclinium coelestinum*. Significant morphological differences that differentiate the two are a flat receptacle with pink to lilac corolla tubes in *Fleischmannia incarnata*, in contrast to the conical receptacle with bluish to bluish violet corolla of *Conoclinium coelestinum*. The latter commonly inhabits moist roadside ditches, swales, bordering creeks, marshes, and other similar moist habitats (Johnson 1972), whereas *Fleischmannia* is normally found in rich woods, on ditch banks, and in swamps from southeastern Virginia and west Virginia to Missouri, south to Florida and Mexico (Gleason and Cronquist 1991). With the exception of a record from Fairfax County, this
is the most northern documentation of this species. Within the Corrotoman River watershed, this species, occurred as one small population in a deeply cut rich ravine feeding into Bellwood Swamp.

"S3" Species

The following seven species have been ranked "S3" by the Virginia Dept. of Natural Heritage (Ludwig 1995), indicating that they are rare to uncommon (known from 20 to 100 occurrences within Virginia). *Lechea villosa*, previously recorded from Lancaster County, occurs on a dry, sandy clear-cut area off Rt. 675. Its current distribution within Virginia is restricted to the coastal plain (Harvill *et al.* 1992). A single population of *Triglochin striata* was found along the margin of a small brackish pocket marsh near Merry Point. A small colony of *Iris versicolor* was located along the southside of Rt. 3 in a moist ditch with open sun east of Lancaster Courthouse. *Dichanthelium ravenelli* was collected in the pine-mixed hardwoods located along the east side of the drive into White House Creek Estates. One small patch of *Desmodium fernaldii* was discovered along a ditch bank, near the woods associated with The Gospel Chapel on Rt. 614. *Quercus margaretta*, an important component of the slope forest along John's Creek (Table 22), is scattered throughout the forest on the west facing slopes of Merry Point. *Sabatia dodecandra* is of special interest because it is a rare and beautiful marsh plant. It is restricted to one pocket marsh off Route 675. Its associates include *Sagittaria falcata, Eryngium aquaticum*, and other marsh plants. *Juglans cinerea* was occasionally encountered at the head of ravines, often near an agricultural field. *Triglochin striata, Iris versicolor, Dichanthelium ravenelli, Desmodium fernaldii, Quercus margaretta, Sabatia dodecandra, and Juglans cinerea* are all new records to the county, the latter three being recorded for the first time on the Northern Neck.
SUMMARY AND CONCLUSION

During the course of this study, 824 species in 431 genera and 122 families were documented (Table 23). Two hundred forty (29.1%) of these species are herein reported from Lancaster County for the first time, of which 62 (7.5%) are Northern Neck records, two are coastal plain records and one is a state record.

When compared to the number of specimens collected from other counties, the diversity present in Lancaster County becomes apparent. In fact, more species have been collected from Lancaster and its southern neighbor, Middlesex county, then any other areas studied by students at William and Mary. I want to reiterate the immediate need to study the other counties in the area before development ensues, especially Essex and Northumberland counties, both of which were also good candidates for my thesis study.

It was previously thought that mountain-coastal plain disjuncts were restricted to or found relatively close to highly calcareous soil. Within Lancaster county, I found some of these species on or near high calcareous soil, but documented others from low calcium soil. I suggest that systematic soil analysis be done in areas south of my study area which have been reported as "hotbeds" for mountain-coastal plain disjuncts. If the original hypothesis of the relationship to highly calcareous soils holds up further south, then it could be speculated that a trend toward being less restricted to calcareous soils might exist with progressively greater distances northward.

In comparing the species which reach their northern limit within the Virginia Coastal Plain, only four species will be given northern range extensions. This supports Harvill and North's hypothesis that the Middle Peninsula is the northern limit for many southern species.
Less than 25% of the plant species in Lancaster Co. are introduced. This is comparable to other counties in Virginia for which it has been reported that 17-25% of the species present are non-native species. The general distribution of the native species is dominated (47%) by those which range west of the Mississippi but do not reach the Pacific Coast. Other well represented ranges for species found in the study area are "south to the New World Tropics" (10.16%) and "eastern North America, east of the Mississippi River" (9.41%).

Among the native species of Lancaster County, there is also a significant rare species component. The highlight of these twelve rare plants is the discovery of *Cypripedium kentuckiense*, a yellow lady's slipper. The nearest known population of this rare orchid is approximately 700 miles away.
EXPLANATION OF ANNOTATED CHECKLIST

In the annotated checklist that follows, county records are preceded by a single asterisk (*), Northern Neck records by two asterisks (**), coastal plain records by three asterisks (***) , and state records by an S with an asterisk (S*). All entries list the scientific name, followed by the authority, common name (if applicable), abundance and habitat within the study area, and the author's collection number. Scientific names of native components of the flora appear in bold typeface, while those of species introduced into the area are in normal typeface. Relative abundance was estimated for each species based on cumulative field experience gained during the study. Abundance categories range from least abundant to most abundant as follows: Rare, Uncommon, Occasional, Common, and Very Common. In some instances, species which were rarely found grew in great profusion where they were found. Such species are signified by the abbreviation (LA) for locally abundant, following their abundance category.

With a few exceptions, nomenclature follows that of the Atlas of the Virginia Flora (Harvill et al. 1992). In the Atlas, several members of the genus Viola which at times exhibit intermediate traits are grouped together as Viola palmata. Following Russell (1965), Viola cucullata and V. sororia are recognized in this current study. Similarly, the Atlas treats Carex annectens as conspecific with C. vulpinoidea and Taraxacum laevigatum with T. officinale. Here within they are accepted as distinct species. Finally, the nomenclature of Scirpus sensu lato, follows that of Strong (1993).
ANNOTATED CHECKLIST

SPHENOPHYTA

EQUISETACEAE

Equisetum arvense L., scouring rush. Rare; one colony along edge of small stream; 157.

LYCOPODIOPHYTA

LYCOPODIACEAE

Lycopodium digitatum A. Braun, running pine. Common; moist mixed hardwoods; 67, 541, 1402.

L. lucidulum Michaux, shining clubmoss. Rare; small colony on moist, N-facing knoll in a deeply cut wooded ravine; 127.

L. obscurum L., ground pine. Common; moist mixed hardwoods; 69, 1436.

POLYPODIOPHYTA

OPHIOGLOSSACEAE

Botrychium dissectum Sprengel var. dissectum Sprengel, cutleaf grapefern. Occasional; shaded stream margins; 1296.

B. dissectum Sprengel var. obliquum (Muhl.) Clute, grapefern. Uncommon; rich wooded slopes and shaded stream margins; 1136, 1295.

B. virginianum (L.) Swartz, rattlesnake fern. Occasional; rich wooded slopes and roadsides; 209.

Ophioglossum vulgatum L. var. pycnostichum Fernald, common adder's tongue fern. Rare; one small colony at bottom of rich wooded ravine; 651.

OSMUNDACEAE

Osmunda cinnamomea L., cinnamon fern. Very common; swamp margins, moist powerline right-of-way, stream banks, and moist roadsides; 271.

O. regalis L., royal fern. Common; moist roadsides, stream banks, and swamp margins; 262.
POLYPODIACEAE

Adiantum pedatum L., maidenhair fern. Rare; one colony on knoll in rich wooded ravine; 1101.

Asplenium platyneuron (L.) D. Eaton, ebony spleenwort. Common; roadsides, mixed woods, wooded slopes, and old homesites; 755.

Athyrium asplenioides (Michaux) A. Eaton, southern lady fern. Common; roadsides, ditches and wooded slopes; 627, 1094, 1097.

* A. pycnocarpon (Sprengel) Tidestrom, glade fern. Rare; one colony on knoll in rich wooded ravine; 1096.

Dennstaedtia punctilobula (Michaux) Moore, hay-scented fern. Uncommon; small colonies in deciduous hardwoods; 818.

Lorinseria areolata (L.) Presl, netted chain fern. Common; swamp and ravine bottoms, and slopes of moist hardwoods; 1070, 1333.

Onoclea sensibilis L., sensitive fern. Occasional; swamp margins and freshwater marsh margins; 1072.

Phegopteris hexagonoptera (Michaux) Fee, broad beech fern. Occasional; rich ravines, hardwood slopes, and wooded roadsides; 649, 1095.

Polystichum acrostichoides (Michaux) Schott, Christmas fern. Very common; shaded roadsides, hardwood slopes, old homesites, and powerline right-of-way; 471.

Pteridium aquilinum (L.) Kuhn, bracken fern. Common; dry, sandy, powerline right-of-way, mixed woods, and roadsides; 1354.

Thelypteris noveboracensis (L.) Nieuwland, New York fern. Common; moist woods, stream banks, and ravine bottoms; 784.

T. palustris Schott, marsh fern. Occasional; swamp and freshwater marsh margins; 1065.

PINOPHYTA

CUPRESSACEAE

Juniperus virginiana L., eastern red cedar. Occasional; wooded roadsides and mixed woods, abandoned cemetaries and disturbed sites; 95, 566.

PINACEAE

* Picea abies (L.) Karsten, Norway spruce. Rare; one stand along wood edge at old farmsite; 1339.

* Pinus echinata Miller, short-needled pine. Rare; three threes along wooded ravine head along drive entrance to Laurel Point; 1699.
*P. strobus* L., white pine. Rare (LA); one large colony on adjacent N- & S-facing slopes; 1312.

*P. taeda* L., loblolly pine. Very common; successional fields, hardwood forest margins, and mixed woods; 156.

*P. virginiana* Miller, Virginia/scrub pine. Common; forest margins, mixed woods and roadside banks; 160.

**MAGNOLIOPHYTA**

Liliopsida

**AGAVACEAE**

*Yucca filamentosa* L., yucca. Rare; roadsides and old homesites; 1059.

**ALISMATACEAE**

* Alisma subcordatum Raf., water plantain. Uncommon; muddy creek margins and muddy ruts of old logging roads; 1190.

*Sagittaria falcata* Pursh, bull tongue. Uncommon; marsh margins; 999.

* S. latifolia Willdenow, common arrowhead. Occasional; marsh margins, sphagnous stream banks of clearcuts woods, and millponds edges; 791, 1144.

* S. longirostra (Micheli) J.G. Smith, arrowhead. Uncommon; sphagnous stream banks of clearcuts woods and millponds edges; 972.

**AMARYLLIDACEAE**

* Hypoxis hirsuta (L.) Coville, yellow star grass. Rare; flat pine woods and base of dry mixed hardwood slopes; 1378, 1431.

*Narcissus biflorus* Curt, daffodil. Occasional; roadsides and old homesites; 216, 1325.

* N. poeticus* L., daffodil. Occasional; roadsides and old homesites; 188.

* N. pseudo-narcissus* L., daffodil. Common; roadsides and old homesites; 193.

**ARACEAE**

*Arisaema triphyllum* (L.) Schott, jack-in-the-pulpit. Common; moist shaded roadsides, stream banks, and moist ravine bottoms; 141, 142, 569.

*Orontium aquaticum* L., golden club. Uncommon; flood plains of small streams; 128.
**Peltandra virginica** (L.) Schott & Endlicher, arrow arum. Occasional; freshwater marshes and stream margins; 748.

**Swplocarpus foetidus** (L.) Nuttall, skunk cabbage. Occasional; wooded moist ravine bottoms and floodplains of small streams; 1303.

**COMMELINACEAE**

*Commelina communis* L., Asiatic dayflower. Common; moist roadsides, ditches, and open disturbed stream margins; 578.

* C. virginica L., Virginia dayflower. Rare; single colony on small wooded island between two small intermittent streams; 859.

* Murdannia keisak* (Hasskarl) Hand.-Mazz. Rare (LA); disturbed areas in freshwater marshes; 1067.

**CYPERACEAE**

* Carex alata* Torrey. Occasional; swamps and wet roadside ditches; 1415a, 1429.

* C. albicans* Sprengel. Occasional; forest margins and abandoned old logging roads; 170.

* C. albolutescens* Schweinitz. Common; wet roadsides, millpond margins, open shorelines, and moist clearcuts; 428, 750, 483, 750, 909.

* C. amphibola* Steudel var. *turgida* Fernald. Rare; single collection in swamp; 1426.

* C. annectans* Michaux. Common; roadsides and powerline right-of-way; 454, 1415b.

* C. atlantica* Bailey. Occasional; stream banks, swamps, and roadsides; 461, 1331b, 1406.

* C. blandana* Dewey. Uncommon; mixed hardwood slopes and wet ditches; 1350, 1416.

* C. bromoides* Willdenow. Occasional; swamps and wet ditches; 152, 187, 1362.

* C. cephalophora* Willdenow. Occasional; roadsides and powerline right-of-way; 455, 1435.

* C. collinsii* Nuttall. Uncommon; stream banks, swamps, and open wet areas; 794.

* C. comosa* Boott. Occasional; abandoned millponds and pond edges; 647, 685.

* C. complanata* Torrey & Hooker. Occasional; mixed hardwoods and roadsides; 259, 401, 437.

* C. crinita* Lam. Uncommon; swamp margins and ravine bottoms; 572, 1359.
**C. debilis** Michaux. Occasional; stream banks and sandy flood plains of small streams; 292, 812, 1336.

**C. digitalis** Willdenow. Occasional; ravine bottoms, swamp margins, and mixed-hardwood slopes; 327, 1334b.

**C. divisa** Hudson. Rare (LA); large colony along high tide mark at end of Rt. 354; 483.

**C. festucacea** Willdenow. Occasional; pond and marsh margins; 403, 1379, 1417.

* C. folliculata L. Uncommon; sphagnous stream heads, stream banks, and swamps; 801.

* C. granularis** Willdenow. Uncommon; along wet powerline right-of-way; 824.

**C. intumescens** Rudge. Occasional; swamp margins and stream banks; 282, 834, 1358.

**C. laevivaginata** (Kukenthal) Mackenzie. Occasional; stream banks and swamp margins; 257, 1319.

**C. laxiculmis** Schweinitz. Uncommon; rich mixed-hardwoods; 496, 948, 1334a.

**C. leptalea** Wahlenberg. Uncommon; stream banks and moist roadsides; 1332.

* C. lupulina** Willdenow. Occasional; swamp margins and stream banks; 855.

**C. lurida** Wahlenberg. Very common; stream banks, wet roadsides, swamps, and ditches; 258, 269, 469, 497, 640, 654, 714, 835, 1425.

**C. muhlenbergii** Willdenow. Uncommon; dry roadsides; 461, 1399.

**C. normalis** Mackenzie. Uncommon; wooded slopes and pond edges; 1495.

* C. prasina** Wahlenberg. Occasional; stream banks and swamps; 261.

* C. rosea** Willdenow. Occasional; swamps, stream banks, and wet powerline right-of-way; 259

* C. seorsa** Howe. Occasional; stream banks and swamps; 1331a.

**C. striatula** Michaux. Uncommon; stream bank and north-facing wooded ridge; 496, 1317.

* C. swanii** (Fernald) MacKenzie. Uncommon; powerline right-of-way and margins of pine forests; 376, 826.

* C. tribuloides** Wahlenberg. Occasional; powerline right-of-way, roadsides, and stream banks; 403, 495.

** Cyperus brevifoliioides** T. & G. Rare (LA); carpeting yard at Northern Neck Nursery; 1691.
** C. difformis L. Rare (LA); single population along boat ramp at Blakemore Millpond; 1128.

C. echinatus (L.) Wood. Occasional; dry roadsides and forest margins; 594, 656, 882, 893, 1285.

* C. erythrorhizos Muhl. Occasional; marsh margins and swamp margins; 1291.

* C. esculentus L. Common; moist roadsides, field margins, open fields, and stream banks; 839.

C. filicinus Vahl. Uncommon; dense colonies scattered among a few brackish pocket marshes; 983.

** C. flavescens L. Occasional; swamp margins and wet ditches; 1121.

C. iria L. Common; roadsides, open fields, ditches, and gardens; 844, 922, 1245.

C. lancastriensis Gray. Occasional; shaded roadsides, ditches, stream banks, and field margins; 757, 833.

C. lupulinus (Spreng.) Marcks. Occasional; shaded roadsides, stream headwaters, and clearcuts; 729, 759.

C. odoratus L. Common; marshes and swamps; 1039, 1215, 1236, 1287.

C. pseudovegetus Steudel. Uncommon; wet powerline right-of-way and ditches; 767.

* C. strigosus L. Common; roadsides, field margins, open fields, and gardens; 882, 1004, 1009, 1066, 1215, 1285, 1287.

Dulichium arundinaceum (L.) Britton. Occasional; swamps and shaded banks of tidal freshwater streams; 854, 1003.

Eleocharis obtusa (Willdenow) Schultes. Occasional; stream heads and wet ditches; 907, 1038, 1125.

** E. tortilis (Link) Schultes. Rare (LA); single population along sphagnous stream head within clearcuts area; 792.

* E. tuberculosa (Michaux) R. & S. Occasional; stream heads, millpond edges, and wet ditches; 894.

Fimbristylis autumnalis (L.) R. & S. Occasional; roadsides, ditches, and emergency overflow of millponds; 1126.

F. castanea (Michaux) Vahl. Common; pocket marshes of brackish waters; 917.

Rhynchospora capitellata (Michaux) Vahl. Occasional; wet roadsides, wet powerline right-of-way and ditches; 881, 911.

* R. glomerata (L.) Vahl. Uncommon; wet roadsides and ditches; 911.
**R. gracilenta** Gray. Occasional; wet roadsides, wet powerline right-of-way, and ditches; 881.

* **R. microcephala** Small. Occasional; stream banks, wet roadsides, and millpond edges; 1204.

*Schoenoplectus pungens* (Vahl) Strong. Common; pocket marshes and margins of brackish waters; 404, 475, 971.

**S. robustus** (Pursh) Strong. Common; pocket marshes and margins of brackish waters; 742, 961.

**S. validus** (Vahl) Strong. Common; freshwater marshes, wet ditches, and swamp margins; 698, 847.

* **Scirpus atrovirens** Willdenow. Occasional; wet roadsides, powerline right-of-way, and ditches; 449, 668.

**Scleria triglomerata** Michaux. Rare; single small population along dry wooded slope; 928.

**DIOSCOREACEAE**

* **Dioscorea batatas** Dene., wild yam. Rare (LA); single rampant population along entrance to Hickory Hollow Nature Trail; 1393.

**D. villosa** L., wild yam. Occasional; shaded roadsides, mixed woodlands and forest margins; 669, 683.

**IRIDACEAE**

* **Iris pseudacorus** L., yellow iris. Rare; single colony in wet ditch near old homesite; 344.

* **I. versicolor** L., northern blue flag. Rare (LA); single population along roadside ditch; 343.

* **I. virginica** L., southern blue flag. Uncommon; roadside ditches and wet roadsides adjacent of swamp; 1322.

*Sisyrinchium angustifolium* Miller, blue-eyed grass. Common; shaded roadsides and wooded slopes; 266, 310.

**S. mucronatum** Michaux, blue eyed grass. Uncommon; along trails of mixed hardwoods; 1404.

**JUNCACEAE**

**Juncus acuminatus** Michaux. Occasional; wet roadsides and edges of millponds; 472, 735.
J. canadensis La Harpe. Very common; wet powerline right-of-way and open stream banks; 730, 731, 737, 910, 912.

J. coriaceus Mackenzie. Common; wet roadsides, open stream banks, and ditches; 670, 823, 837.

J. debilis Gray. Common; wet roadsides, open stream banks, and ditches; 789.

J. effusus L., soft rush. Common; wet roadsides, ditches, and millpond margins; 247, 473, 641, 676.

J. marginatus Rostk. Common; wet roadsides, ditches, and open stream banks; 666, 732.

J. roemerianus Scheele, black needle rush. Common; pocket marshes; 505.

* J. secundus Poiret. Uncommon; roadsides; 436.

J. tenuis Willdenow, path rush. Very common; roadsides, field margins, and ditches; 328, 430, 442, 553, 800.

* Luzula acuminata Raf., wood rush. Uncommon; wooded slopes; 111.

L. bulbosa (Wood) Rydberg. Occasional; wooded slopes and stream banks; 197, 236.

L. echinata (Small) Hermann. Occasional; wooded slopes; 148, 150, 538.

JUNCAGINACEAE

* Triglochin striata R. & P., arrow grass. Rare (LA); single colony on muddy margin of tidal marsh; 932.

LEMNACEAE

* Lemna minor L., duckweed. Common; pond surfaces; 1375.

Spirodela polyrhiza (L.) Schleiden. Very common; pond surfaces; 1420.

** Wolffia borealis (Engelman) Landolt, water meal. Occasional; surfaces of ponds and pools in ditches; 1419.

LILIACEAE

Allium vineale L., field garlic. Common; roadsides, field margins, and open fields; 480, 584.

Asparagus officinalis L., asparagus. Uncommon; roadsides, field margins, and margins of brackish waters; 960.

Erythronium americanum Ker., trout lily. Occasional; extensive colonies along margin of flood plain and stream banks; 1308.
**Hemerocallis fulva** (L.) L., common orange daylily. Occasional; moist roadsides, ditches, and old homesites; 474.

**Medeola virginiana** L., Indian cucumber root. Occasional; stream banks, wooded slopes, and ravine bottoms; 285.

**Melanthium virginicum** L., Bunchflower. Rare; two colonies along stream headwaters; 804.

**Muscari atlanticum** Boiss. & Reuter, grape hyacinth. Occasional; roadsides, open grassy fields, and yards; 99.

**M. comosum** (L.) Miller. Rare; one population along border of hayed field; 381.

* **Ornithogalum umbellatum** L., star-of-bethlehem. Rare; small colonies along wooded hilltop near playing fields and farm fields; 251.

**Polygonatum biflorum** (Walter) Elliott, Solomon's seal. Common; mixed hardwood slopes; 571, 1345, 1349.

**Smilacina racemosa** (L.) Desfontaines, false Solomon's seal. Occasional; mixed pine-hardwood and older growth mixed hardwood slopes; 443.

**Smilax bona-nox** L., china brier. Occasional; wet roadsides, river bluffs, and marsh margins; 986.

**S. glauca** Walter, saw brier. Common; forest margins and disturbed roadsides; 623, 753.

* **S. herbacea** L. Uncommon; swamp margins and stream banks; 950.

**S. rotundifolia** L., common greenbrier. Very common; roadsides, disturbed woods, and forest margins; 245, 275, 398, 507, 672.

* **Uvularia perfoliata** L., bellwort. Occasional; mixed hardwoods and rich ravine slopes; 250.

**U. sessilifolia** L., bellwort. Uncommon; hardwood ravine slopes; 1709.

**Veratrum viride** Aiton, false hellebore. Occasional; extensive stands along headwater streams, mainly restricted to the Cabin Swamp system; 260.

**ORCHIDACEAE**

* **Corallorhiza odontorhiza** (Willdenow) Nuttall, late coralroot. Rare; single small colony at base of rich wooded slope; 1299.

**Cypripedium acaule** Aiton, pink lady's slipper. Occasional; pine woods and dry oak-beech forest; 271.

S* **C. kentuckiense** Reed, yellow lady's slipper. Rare (LA); swamp drainage basin and wet wooded ravine feeding; 1370, 1433, 1434.
Goodyera pubescens (Willdenow) R. Brown, downy rattlesnake orchis. Occasional; mixed hardwood slopes; 836.

* Habenaria clavellata (Michaux) Sprengel, green woodland orchis. Rare; sphagnous stream head; 790.

** H. cristata (Michaux) R. Brown, crested yellow orchis. Rare; single small colony at interface of hardwood forest and clearcuts along north boundary of county; 867.

* H. lacera (Michaux) Lodd., ragged orchis. Occasional; flood plains of small streams and margins of swamps at heads of millponds; 679.

*** H. peramoena Gray, purple fringeless orchis. Rare; single colony on wooded fluvial deposit between two small streams; 858.

Isotria verticillata (Willdenow) Raf., common whorled pogonia. Occasional; mixed hardwood slopes; 286.

Liparis lilifolia (L.) Lindley. Rare; two small populations alongside trails through hardwoods; 1343.

* Orchis spectabilis L., showy orchis. Rare; single colony on knoll of rich, wooded ravine; 1102.

** Spiranthes grayi Ames, ladies' tresses. Rare (LA); forest margins and old cemeteries; 1043

Tipularia discolor (Pursh) Nuttall, cranefly orchis. Common; mixed hardwood slopes; 943.

POACEAE

* Agrostis gigantea Roth. Common; roadsides, and margins of forest and millponds; 595, 596, 598, 702, 1068.

* A. hyemalis (Walter) BSP., hairgrass. Common; roadsides and field margins; 1077, 1252, 1408.

* A. perennans (Walter) Tuckerman, autumn bent grass. Occasional; along dry roadsides and powerline right-of-way; 1195.

* Aira caryophyllea L., hairgrass. Uncommon; roadsides and field margins; 385.

Andropogon glomeratus (Walter) BSP., beardgrass. Uncommon; roadsides and ditch banks; 1222, 1290.

A. scoparius Michaux, little blue stem. Very common; roadsides, open fields, and forest margins; 885, 1172, 1200, 1232, 1258, 1261.

A. ternarius Michaux, beardgrass. Common; roadsides and open fields; 1076, 1196, 1268.
* A. virginicus *L.*, broomedge. Rare (LA); single stand at crest of roadside ditch; 1269.

Anthoxanthum odoratum *L.*, sweet vernal grass. Very common; open fields, roadsides, and yards; 87, 130, 147, 162, 235, 246, 307, 815.

** A. aristatum **Boessier. Uncommon; along mowed portion of roadside; 762.

Aristida dichotoma *Michaux*, three-awned grass. Occasional; open fields; 1112, 1131, 1265.

** A. oligantha **Michaux, three-awned grass. Rare (LA); extensive colony along dry roadside bank; 1135.

Atrrenatherum elatius *(L.)* Presl. Common; along agricultural fields, roadsides, wood margins; 630.

* Arthraxon hispidus **(Thunb.) Makino. Rare (LA); abundant population along moist powerline right-of-way; 1165.

* Bromus japonicus **Murray, brome grass. Common; roadsides, clearcuts, and open fields; 591, 481.

B. racemosus *L.*, brome grass. Uncommon; old homesites and roadsides; 412.

** B. sterilis *L.*, brome grass. Occasional; roadsides and open fields; 1324.

Cenchrus tribuloides *L.*, sand bur. Rare; small population along sandy beach; 963.

Chasmanthium laxum *(L.)* **Yates.** Common; open fields and roadsides; 889, 1129.

Cinna arundinacea *L.* Common; margins of marshes and millponds and stream banks; 1064, 1071.

Cynodon dactylon *(L.)* Persoon, burmuda grass. Common; open fields and yards; 587.

Dactylis glomerata *L.*, orchard grass. Very common; open fields, roadsides, and margins of forests near agricultural lands; 368, 393.

* Danthonia sericea **Nuttall, oat grass. Common; roadsides, ditch banks, and sandy fields; 440, 562, 1355, 1397.

D. spicata *(L.)* **R. & S.,** june grass. Occasional; roadsides and open fields; 563.

Dichanthelium acuminatum *(Swartz)* **G. & C.** Uncommon; wood edges and roadsides; 621.

D. boscii *(Poiret)* **G. & C.** Uncommon; mixed hardwood slopes; 517.
**D. clandestinum** (L.) Gould. Common; margins of millponds, stream banks, and swamps; 514, 574, 1405.

**D. commutatum** (Schultes) Gould. Very common; roadsides, powerline right-of-way, and mixed hardwood slopes; 298, 356, 527, 618, 1380.

**D. depauperatum** (Muhl.) Gould. Occasional; powerline right-of-way and clearcuts; 355, 1412A.

**D. dichotomum** (L.) Gould. Occasional; shaded roadsides and forest edges; 771.

**D. linearifolium** (Schribner) Gould. Occasional; stream banks and roadsides; 528.

**D. ravenellii** (Schribn. & Merr.) Gould. Rare; upland pine-mixed hardwoods at White House Creek Estates; 488.

**D. scoparium** (Lam.) Gould. Occasional; swamps, stream margins, and wet powerline right-of-way; 878.


**Digitaria sanguinalis** (L.) Scopoli, crab grass. Common; lawns, open fields, and roadsides; 1198.

**Distichlis spicata** (L.) Greene. Common; marshes and margins of brackish tidal streams; 921.

**Echinochloa crus-galli** (L.) Beauvois, barnyard grass. Uncommon; roadsides and open fields; 814.

**E. walteri** (Pursh) Heller, Walter's millet. Common; tidal freshwater and brackish marshes; 1061.

**Eleusine indica** (L.) Gaertner, goose grass. Very common; roadsides, ditch banks, open fields, and yards; 832, 987, 1183.

**Elymus virginicus** L., Terrell grass. Occasional; roadside powerline right-of-way; 702.

**Eragrostis cilianensis** (All.) Mosher stink grass. Occasional; open fields, roadsides, and yards; 845, 958, 988.

**E. curvula** (Schrader) Nees. Common; roadsides; 508, 519, 615.

**E. hirsuta** (Michaux) Nees. Common; open fields and roadsides; 1088.

**E. spectabilis** (Pursh) Steudel, tumble grass. Common; open fields, roadsides, and clearcuts 870.

**Erianthus contortus** Elliott. Occasional; roadsides and powerline right-of-way; 899, 1017, 1208, 1288.
* **Festuca elatior** L., taller fescue. Very common; roadsides and open fields; 309, 349, 377, 397, 479, 485, 486, 482.

* **F. myuros** L., red-tail fescue. Uncommon; roadsides; 1413.

* **F. obtusa** Biehler. Occasional; mixed hardwood slopes and swamp margins; 777.

* **F. octoflora** Walter. Occasional; pine forest margins, roadsides, and driveway edges; 378, 1398.

* **Glyceria septentrionalis** Hitchcock, sweet grass. Uncommon; stream banks, and swamp and millpond margins; 704.

* **G. striata** (Lam.) Hitchcock, fowl-meadow grass. Occasional; stream banks, and swamp and millpond margins; 347, 575, 645, 1355.

* **Holcus lanatus** L., velvet grass. Uncommon; roadsides; 1371.

* **Hordeum pusillum** Nuttall, little barley. Common; roadsides and open fields; 331, 353, 1410.

* **H. vulgare** L., field barley. Common; field margins and roadsides; 205.

* **Leersia oryzoides** (L.) Swartz, rice-cutgrass. Occasional; stream banks and wet ravines; 646, 1106.

* **L. virginica** Willdenow, cutgrass. Occasional; stream banks and wet ravines; 1192.

* **Lolium perenne** L., common darnel, rye-grass. Common; roadsides and open fields; 346, 438.

* **Miscanthus sinensis** Anderson, eulalia. Uncommon; roadsides and old homesites; 1089.

* **Muhlenbergia schreberi** J. F. Gmelin, drop-seed. Common; field margins, roadsides, and yards; 1301.

* **Panicum anceps** Michaux. Common; roadsides and open fields; 707, 718, 1091, 1119.

* **P. dichotomiflorum** Michaux. Common; roadsides, open fields, and marsh margins; 1083, 1127, 1199, 1246, 1267.

* **P. rigidulum** Nees. Rare (LA); single population along spillway of abandoned millpond; 939.

* **P. verrucosum** Muhl. Occasional; powerline right-of-way, roadsides, and clear-cuts; 1110.

* **P. virgatum** L., switchgrass. Common; open fields, roadsides, marshes, and stream banks; 884, 905, 922, 927, 1056, 1063, 1123.
*Paspalum dilatatum* Poiret, dallis grass. Common; yards, roadsides, and open fields; 580, 820.

*P. floridanum* Michaux. Uncommon; roadsides; 1698.

*P. laeve* Michaux. Occasional; roadside banks, open fields, and clearcuts; 811

*P. setaceum* Michaux. Uncommon; roadsides; 828.

*Phragmites australis* (Cav.) Steudel, phragmites, reed grass. Rare (LA) large population along low wet area of beach and in wet seepage area of sandy field; 962.

*Poa annua* L., annual bluegrass. Common; roadsides and yards; 98, 354, 426.

*P. autumnalis* Elliott. Uncommon; mixed hardwood slopes and sandy stream banks; 254, 545, 1318.

** P. bulbosa* L. Rare; population scattered along roadside; 208.

* P. compressa* L., wiregrass. Common; roadsides, along trails in mixed hardwoods, and powerline right-of-way; 655, 705, 1400.

*P. pratensis* L., kentucky bluegrass. Common; open fields, roadsides, and woodland margins; 137a, 383, 1320, 1321.

* P. sylvestris* Gray. Common; mixed hardwoods, roadsides, and powerline right-of-way; 322, 366, 547.

** P. trivialis* L., rough bluegrass. Uncommon; open field, open wooded area, and roadside; 137b, 593.

*Secale cereale* L., rye. Occasional; open fields and roadsides; 337, 1352.

*Setaria geniculata* (Lam.) Beauvois. Very common; roadsides, open fields, and yards; 614, 638, 722, 760, 920.

* S. magna* Grisebach, giant foxtail. Uncommon; wet roadside ditches; 1018.

*Sorghum halepense* (L.) Persoon, Johnson grass. Common; corn fields, open fields, and roadsides; 515, 611, 803, 1086.

*Spartina alterniflora* Loiseleur, salt-water cordgrass. Common; river margins along tidal salt water; 964.

*S. cynosuroides* (L.) Roth, tall salt-water cordgrass. Occasional; brackish marshes and river margins; 848.

*S. patens* (Aiton) Muhl., salt-meadow grass. Common; brackish and higher salt water marshes, marsh margins, and salt water meadows; 919.

*Sphenopholis obtusata* (Michaux) Scribner. Uncommon; roadsides and open fields; 364.
Sporobolus indicus (L.) R. Brown, smut-grass. Occasional; yards, roadsides, and baseball diamonds; 957.

Stipa avenacea L., black oat-grass. Uncommon; sandy open fields and roadsides; 453.

Tridens flavus (L.) Hitchcock, tall red-top. Common; roadsides and open fields; 774, 1122.

Tripsacum dactyloides (L.) L., gama-grass. Common; roadsides and ditches; 586, 688.

Triticum aestivum L., wheat. Occasional; field margins; 382.

Zizania aquatica L., wild rice. Occasional; millponds and fresh water marsh margins; 1007, 1069.

POHOTEDERIACEAE

* Heteranthera reniformis R. & P., mud plantain. Rare; mud flats and muddy flood plains; 1033.

Pontederia cordata L., pickerelweed. Common; freshwater marshes; 696.

POTAMOGETONACEAE

* Potamogeton epihydrus Raf., pondweed. Occasional; backwaters and millponds; 1001.

P. nodosus Poiret, pondweed. Occasional; backwaters and millponds; 681.

RUPPIACEAE

Ruppia maritima L., ditch grass. Rare (LA); tidal mud flats; 970.

SPARGANIACEAE

Sparganium americanum Nuttall, bur reed. Very common; submerged in streams, shallow river channels, and in very wet open ravine bottoms; 684.

TYPHACEAE

Typha angustifolia L., narrow leaved cattail. Common; freshwater and brackish marshes and edges of brackish waters; 644, 747.

T. latifolia L., common cattail. Common; freshwater marshes, millponds, and margins of open freshwaters; 1207.
XYRIDACEAE

*XYris torta* Smith, yellow eyed grass. Rare; single colony along sphagnous stream in clearcuts; 797.

Magnoliopsida

ACANTHACEAE

*Ruellia caroliniensis* (Gmelin) Steudel, hairy ruellia. Common; roadsides; 605, 691, 1276.

ACERACEAE

* Acer negundo* L., box elder. Occasional; powerline right-of-way, fence rows, and forest margins; 210.

** A. platanoides* L., Norway maple. Rare; single tree probably from seed bank of road fill; 191.

A. rubrum* L., red maple. Very common; bottomland hardwoods, upland woods, roadsides, and forest margins; 120.

A. saccharinum* L., silver maple. Uncommon; roadsides, old homesites, and stream margins; 938.

AIZOACEAE

*Mollugo verticillata* L., carpet weed. Rare (LA); wet roadside ditches; 707.

AMARANTHACEAE

*Amaranthus cannabinus* (L.) J. D. Sauer. Occasional; freshwater marshes; 744, 745.

A. hybridus* L. slender amaranth. Occasional; weedy roadsides, powerline right-of-way, and gardens; 989, 1184, 1230.

ANACARDIACEAE

*Rhus copallina* L., dwarf sumac. Common; forest margins, scrub woods, and scrubby powerline right-of-way; 565.

R. glabra* L., smooth sumac. Occasional; forest margins and wooded fence rows; 612.

R. radicans* L., poison ivy. Common; roadsides, open moist forest, and disturbed areas; 320.

R. vernix* L., poison sumac. Rare; single colony in *Smilax*-infested ravine bottom; 1240.
ANNONACEAE

Asimina triloba (L.) Dunal, paw paw. Very common; forest margins, stream banks, and ravine bottoms; 181.

APIACEAE

Angelica venenosa (Greenway) Fernald, hairy angelica. Uncommon; dry road sides and forest margins; 1024.

* Chaerophyllum tainturieri Hooker, wild chervil. Occasional; roadsides, forest margins, and disturbed open areas of stream banks and ravine bottoms; 213, 409.

Cicuta maculata L., water hemlock. Uncommon; freshwater tidal marshes and swamps; 861, 1025.

* Cryptotaenia canadensis (L.) DC., honewort. Uncommon; stream banks and ravine bottoms; 781.

Daucus carota L., Queen Anne's lace. Occasional; roadsides and open fields; 636.

Eryngium aquaticum L., button snakeroot. Rare; single colony in brackish pocket marsh; 998.

Hydrocotyle ranunculoides Lf., water pennywort. Common; shallow semi-permanent still waters and shallow streams; 1238.

H. umbellata L., water pennywort. Uncommon; wet ditches and shallow stream margins; 632.

H. verticillata Thunberg, water pennywort. Uncommon; margins of brackish pocket marshes; 643.

Oxypolis rigidior (L.) Raf., cowbane. Occasional; swamps, stream flood plains, and wet ravines; 1025B, 1365.

* Ptilimnium capillaceum (Michaux) Raf., mock bishop's weed. Rare (LA; hummocks in freshwater marshes; 849.

* Sanicula canadensis L., snakeroot. Occasional; mixed woods and trails through mixed hardwood forest; 255, 629.

** S. smalli Bicknell, clustered snakeroot. Uncommon; mixed woods and trails through mixed hardwood forest; 491

APOCYNACEAE

Apocynum cannabinum L., Indian hemp. Common; roadsides, powerline right-of-way, and open fields; 373.

* Vinca major L., large periwinkle. Uncommon; shaded roadsides, old homesites, and disturbed slopes; 184.
V. minor L., common periwinkle. Occasional; shaded roadsides, old homesites, and slopes; 73.

AQUIFOLIACEAE

** Ilex glabra (L.) Gray, inkberry. Rare (LA); single colony along powerline right-of-way dominated by herbaceous vegetation; 1168.

** I. laevigata (Pursh) Gray, smooth winterberry. Rare; single tree in sphagnous streamhead; 802.

I. opaca Aiton, American holly. Common; mixed hardwoods and wooded powerline right-of-way; 304.

I. verticillata (L.) Gray, winterberry. Occasional; stream banks and swamp margins; 582.

ARALIACEAE

Aralia nudicaulis L., wild sarsaparilla. Rare; single population along high, dry ridge; 540.

Aralia spinosa L., devil's walking stick. Uncommon; wooded powerline right-of-way, field margins, and disturbed roadsides; 954A

* Hedera helix L., English ivy. Uncommon; roadsides and old homesites; 190.

Panax trifolius L., dwarf ginseng. Rare; two populations in seepage areas on flood plain terrace and beech wooded slopes above terrace; 140.

ARISTOLOCHIACEAE

* Aristolochia serpentaria L., Virginia snakeroot. Rare; ravine bottoms of rich woods; 650.

* Asarum canadense L., wild ginger. Uncommon; slopes of rich woods and swamp margins; 221.

Hexastylis virginica (L.) Small, heart leaf ginger. Common; hardwood slopes; 68, 122.

ASCLEPIADACEAE

Asclepias amplexicaulis Smith, blunt leaved milkweed. Uncommon; roadsides and powerline right-of-way; 819.

A. incarnata L., swamp milkweed. Occasional; streambanks, swamps and millpond margins; 675.

A. syriaca L., common milkweed. Common; roadsides, powerline right-of-way, and open fields; 608.
A. tuberosa L., butterfly weed. Common; roadsides and powerline right-of-way; 560.

A. variegata L., white milkweed. Uncommon; roadside banks; 457.

* A. verticillata L., whorled milkweed. Rare; single small population along roadside powerline; 1016.

Matelea carolinensis (Jacquin) Woodson. Occasional; shaded roadsides, powerline right-of-way, and forest margins; 518.

ASTERACEAE

Achillea millefolium L., yarrow. Occasional; roadsides; 317.

* Ageratina altissima (L.) K. & R., tall boneset. Uncommon; rich ravine bottoms and shaded roadsides; 1104.

A. aromatica (L.) K. & R., small white snakeroot. Uncommon; ravine slopes and roadsides; 1273.

Ambrosia artemisiifolia L., common ragweed. Common; weedy roadsides, fields and powerline right-of-way; 995.

Antennaria plantaginifolia (L.) Richards, plantain-leaved pussytoes. Common; roadsides, open fields, powerline right-of-way, and yards; 132.

** A. solitaria Rydberg, solitary pussytoes. Uncommon; steep slopes above rich ravine bottoms; 72.

Anthemis arvensis L., field chamomile. Common; roadsides and open fields; 214, 529.

** Arnica acaulis (Walter) BSP., leopard's bane. Rare; single population along roadside; 1388.

Artemisia vulgaris L., common mugwort. Common; weedy roadsides, powerline right-of-way, and open fields; 1087.

Aster dumosus L., bushy aster. Occasional; roadsides and open fields; 1114, 1133.

A. gracilis Nuttall. Uncommon; moist roadsides; 940, 1132.

** A. grandiflorus L. Rare; single population along old logging road through open forested area; 1186.

A. infirmus Michaux, cornel-leaved aster. Occasional; wooded slopes and ravine bottoms; 980.

A. lateriflorus (L.) Britton. Common; roadsides, abandoned logging roads, and field margins; 1210, 1266.
A. *pilosus* Willdenow, heath aster. Common; roadsides, powerline right-of way, and field margins; 606, 1224, 1247, 1256.

A. *puniceus* L., purple stemmed aster. Uncommon; stream banks and swamp margins; 1218, 1239.

* A. *simplex* Willdenow, paniced aster. Uncommon; moist roadsides, swamp bottoms, and forest margins; 1103, 1250, 1281, 1284.

A. *subulatus* Michaux, annual salt marsh aster. Occasional; brackish marshes; 1139.

A. *tenuifolius* L., perennial salt marsh aster. Occasional; brackish marshes; 1062.

A. *undulatus* L., wavy leaved aster. Occasional; older growth wooded slopes; 1194, 1251, 1271.

** A. *vimineus* Lam., small-headed aster. Uncommon; wood margins, open fields, and roadsides; 1270.

B. *baccharis* halimifolia L., groundsel tree. Occasional; forest margin just upslope from marshes; 1153, 1173.

B. *bidens* bipinnata L., Spanish needles. Common; roadsides and forest margins; 1120.

* B. *discoidea* (T. & G.) Britton. Occasional; stream banks and swamp margins; 1074.

* B. *frondosa* L., beggar's ticks. Occasional; stream banks and swamp margins; 1117, 1143.

* B. *laevis* (L.) BSP., larger bur marigold. Uncommon (LA); open swamps and beaver pond margins; 1191.

* B. *polylepis* Blake. Very common; restricted to roadside ditches; 1036, 1209.

C. *centaurea* cyanus L., bachelor's buttons. Occasional; roadsides, field margins, and fallow fields; 224, 390.

C. *maculosa* Lam., spotted knapweed. Uncommon; moist roadsides and margin of abandoned millpond; 694.

C. *chrysanthemum* leucanthemum L., oxeye daisy. Common; roadsides and open fields; 305, 1137.

** C. *cirsium* arvense (L.) Scopoli, Canada thistle. Occasional; field margins and weedy powerline right-of way; 976.

C. *discolor* (Willdenow) Sprengel, field thistle. Occasional; roadsides and field margins; 1035.
Conoclinium coelestinum (L.) DC., mistflower. Common; roadsides and forest margins; 996.

Coreopsis lanceolata L., lanced-leaved coreopsis. Uncommon; shaded roadsides; 387, 1049.

Eclipta alba Hasskarl. Rare; moist roadside ditches; 1197.

Elephantopus carolinianus Raeusch, elephant's foot. Occasional; roadsides and forest margins; 1013, 1213.

E. tomentosus L., tobacco weed. Common; roadsides, forest margins, wooded trails, and parking lot margins; 953.

Erechtites hieracifolia (L.) DC., fireweed. Common; weedy roadsides, powerline right-of-way, and clearcuts; 1010.

Erigeron annuus (L.) Persoon, daisy fleabane. Very common; roadsides, open fields, and forest margins; 294, 1022.

E. canadensis L., horseweed. Very common; roadsides, open fields, and forest margins; 504, 899.

E. philadelphicus L., daisy fleabane. Rare; single population in roadside lawn; 1314.

E. strigosus Willdenow, lesser daisy fleabane. Occasional; roadsides and open fields; 311, 609, 1180.


E. fistulosus (Barratt) K. & R., joe-pye weed. Occasional; abandoned millponds; 686, 1028.


Eupatorium album L., white boneset. Uncommon; open slopes and dry roadsides; 924, 951.

E. capillifolium (Lam.) Small, dog fennel. Common; weedy roadsides and clearcuts; 1166.

** E. godfreyanum Cronquist. Rare; single population along powerline right-of-way; 1175.


* E. perfoliatum L., thoroughwort. Uncommon; swamp margins, millpond margins, and stream headwaters; 1206.
E. pilosum Walter, rough boneset. Occasional; weedy roadsides, powerline right-of-way, and clearcuts; 1111, 1259.

E. rotundifolium L. ssp. rotundifolium (Bigelow) M. & F. Uncommon; roadsides and powerline right-of-way; 1690.

E. rotundifolium L. ssp. ovatum (Bigelow) M. & F. Uncommon; roadsides and clearcuts; 1708.

E. serotina Michaux. Occasional; pocket marshes and weedy roadsides; 1707.

** Fleishmannia incarnata (Walter) K. & R. Rare (LA); single population in rich ravine bottom; 1099.

* Galinsoga parviflora Cavanilles. Occasional; garden weed and roadsides; 993.

Gnaphalium obtusifolium L., sweet everlasting. Common; roadsides and open fields; 1272.


* Helenium flexuosum Raf., sneezeweed. Rare; scattered along open roadside of Rt. 354 on west side of Corrotoman River; 772.

Helianthus atrorubens L., sunflower. Occasional; open fields, roadsides, and powerline right-of-way; 1019, 1262.

H. tuberosus L., Jerusalem artichoke. Occasional; roadsides and field margins; 1085, 1155.

Heterotheca aspera (Small) Shinners, camphorweed. Common; roadsides, field margins, and clearcuts; 721.

* H. graminifolia (Michaux) Shinners, grass leaved aster. Uncommon; roadsides and dry open hillsides; 886.

H. mariana (L.) Shinners, Maryland golden aster. Common; roadsides, powerline right-of-way, and old logging roads; 1044, 1161.

Hieracium gronovii L., hairy hawkweed. Very common; roadsides, powerline right-of-way, and yards; 903.

H. venosum L., rattlesnakeweed. Very common; roadsides, powerline right-of-way, and wooded slopes; 263, 283, 537.

Hypochoeris radicata L., cat's ear. Common; dry open roadsides; 306.

Iva frutescens L., marsh elder. Common; marsh margins and shrub zone near brachish waterways; 1058.

Krigia virginica (L.) Wildenow, dwarf dandelion. Occasional; roadsides and open field margins; 287, 362.
Lactuca canadensis L., wild lettuce. Common; roadsides and powerline right-of-way; 728.

L. floridana (L.) Gaertner wild lettuce. Rare; single population at base of rich wooded slope bordering swamp bottom; 1141, 1294.

Liatris graminifolia (Walter) Willdenow, blazing star. Very common; roadsides, powerline right-of-way, and clearcuts; 1109.

Mikania scandens (L.) Willdenow, climbing hempweed. Common; open stream banks and swamp and marsh margins; 1005, 1154.

** Parthenium integrifolium L., wild quinine. Rare; single population along roadside powerline right-of-way; 1090.

Pluchea purpurascens (Swartz) DC., salt marsh fleabane. Common; salt meadow near mouth of Corrotoman River, brackish pocket marshes, shoreline of brackish water, and extensive marshes; 969.

Prenanthes serpentaria Pursh, lion's foot. Occasional; roadsides and forest margins; 1274, 1278.

Pyrrhopappus carolinianus (Walter) DC. Common; roadsides, ditches, and open fields; 585, 597, 604.

Rudbeckia hirta L., black-eyed Susan. Occasional; roadsides, powerline right-of-way, and open fields; 520, 567.

R. laciniata L., green-headed coneflower. Occasional; stream banks, flooded swamps, and swamp margins; 945, 1428.

Senecio anonymus Wood, ragwort. Common; roadsides and open fields; 330, 375, 924.

S. aureus L., golden ragwort. Common; stream banks and swamp margins; 70, 223.

Sericocarpus asteroides (L.) BSP., white topped aster. Occasional; banks of roadside ditches and forest margins; 559, 579.

S. linifolius (L.) BSP., narrow leaved white topped aster. Uncommon; banks of roadside ditches and forest margins; 810.

Solidago bicolor L., silver rod. Occasional; roadsides and powerline right-of-way; 1159, 1229.

* S. caesia L., blue stemmed goldenrod. Uncommon; wooded banks and steep exposed slopes; 1040, 1253.

S. canadensis L., Canada goldenrod. Common; roadsides, powerline right-of-way, and field margins; 1164, 1275.
S. **erecta** Pursh, slender goldenrod. Occasional; roadsides and field margins; 1156, 1234, 1260, 1692.

S. **graminifolia** (L.) Salisbury, grass-leaved goldenrod. Common; roadsides, powerline right-of way, field margins, and clearcuts; 1060, 1158, 1221.

*S. juncea* Aiton, early goldenrod. Very common; roadsides, powerline right-of way, field margins, open fields, and clearcuts; 736, 1697.

S. **nemoralis** Aiton, gray goldenrod. Common; roadsides, powerline right-of way, and clearcuts; 1163, 1263.

S. **odora** Aiton, sweet goldenrod. Very common; roadsides, powerline right-of way, field margins, open fields, and clearcuts; 716.

**S. pinetorum** Small. Rare; single colony along dry, open roadside; 1020.

S. **rugosa** Miller, rough-stemmed goldenrod. Common; roadsides, powerline right-of-way, open fields, and clearcuts; 1081, 1147, 1211.

S. **sempervirens** L., seaside goldenrod. Uncommon; open sandy areas near brackish waters; 1225.

S. **tenuifolia** Pursh, slender-leaved goldenrod. Common; roadsides, powerline right-of-way, field margins, open fields, and clearcuts; 1187.

Sonchus asper (L.) Hill, spiny-leaved sow-thistle. Occasional; roadsides, powerline right-of way, and field margins; 423.

Taraxacum laevigatum (Willd.) DC., red-seeded dandelion. Rare; single detected population in lawn near Merry Point; 85.

T. officinale Wiggers, dandelion. Common; roadsides, open fields, and yards; 194.

Verbesina occidentalis (L.) Walter, wing stem, crown beard. Common; roadsides, powerline right-of-way, and forest margins; 776.

Vernonia glauca (L.) Willd., ironweed. Uncommon; dry open roadsides; 888.

Xanthium strumarium L., cocklebur. Common; field margins and open fields; 1157.

**BALSAMINACEAE**

Impatiens capensis Meerburg, spotted touch-me-not. Common; stream banks and swamps; 778.

**BERBERIDACEAE**

Podophyllum peltatum L., may apple. Occasional; moist roadsides, moist wooded slopes, and ravine bottoms; 185.
BETULACEAE


*Betula nigra* L., river birch. Uncommon; spillway zone of millponds; 435.

*Carpinus caroliniana* Walter, American hornbeam, ironwood. Common; stream banks, swamp margins, and mixed hardwoods; 115, 773.

*Corylus americana* Walter, American hazelnut. Uncommon; wooded slopes; 741, 1304.

BIGNONIACEAE

*Campsis radicans* (L.) Bureau, trumpet creeper. Common; roadsides, field and forest margins, and disturbed wooded areas; 577.

*Catalpa speciosa* (Barney) Engelman, catawba tree. Occasional; roadsides on western side of Corrotoman River; 429.

BORAGINACEAE


*M. micrantha* Lehmann, forget-me-not. Occasional; roadsides, yards, and along parking area to Chesapeake Nature Trail; 74, 84, 1357.

BRASSICACEAE

*Arabidopsis thaliana* (L.) Heynhold, mouse-ear cress. Very common; roadsides, open fields, and yards; 78, 218, 230, 445.

*Barbarea verna* (Miller) Ascherson, early wintercress. Occasional; roadsides, open fields, and agricultural fields; 100.

*B. vulgaris* R. Brown, yellow rocket. Occasional; roadsides, open fields, and agricultural fields; 101.

*Cakile edentula* (Bigelow) Hooker, sea rocket. Rare; salt meadows and beach berm near mouth of Corrotoman River; 967.

*Capsella bursa-pastoris* (L.) Medicus, shepherd's purse. Occasional; roadsides, open fields, and field margins; 135.

*Cardamine bulbosa* (Schreber) BSP., spring cress. Occasional; stream banks and swamps; 151, 248.

*C. hirsuta* L. Very common; roadsides, yards, open fields, disturbed stream banks, and swamp margins; 93.
* C. pensylvanica Willdenow, Pennsylvania bittercress. Occasional; stream banks and swamps; 149.

Draba verna L., whitlow grass. Occasional; open fields; 182, 1311.

Lepidium campestre (L.) R. Brown, cow cress. Common; roadsides and open fields; 229, 268.


Raphanus raphanistrum L., wild radish. Occasional; roadsides and field margins; 277, 968.

* Sisymbrium officinale (L.) Scopoli, hedge mustard. Uncommon; field margins and open fields; 548.

Teesdalia nudicaulis (L.) R. Brown. Very common; roadsides, open fields, and field margins; 91, 139, 174, 372.

**BUXACEAE**

Buxus sempervirens L., boxwood. Rare; abandoned farmhouses and old homesites; 1340.

**CACTACEAE**

Opuntia humifusa (Raf.) Raf., prickly pear cactus. Rare (LA); steep-sandy slopes near Merry Point; 549.

**CALLITRICHACEAE**

Callitriche heterophylla Pursh. water starwort. Rare; single population on farm pond; 1384.

**CAMPANULACEAE**

Lobelia cardinalis L., cardinal flower. Occasional; stream banks, swamp margins, and freshwater marshes; 862, 1030, 1146.

L. inflata L., Indian tobacco. Occasional; roadsides, field margins, and yards; 846, 865.

L. nuttallii R. & S. Common; roadsides, field margins, and unmowed yards; 719, 808.

L. puberula Michaux, downy lobelia. Occasional; roadsides, stream banks, and field margins; 1037, 1118, 1160.

CAPRIFOLIACEAE

** Lonicera fragrantissima Lindl. & Pax, fragrant honeysuckle. Occasional; persisting on roadsides and at old homesites; 110, 1306.

L. japonica Thunberg, Japanese honeysuckle. Very common; roadsides, powerline right-of-way, field margins, forest margins, and other disturbed areas; 299.

L. sempervirens L., coral honeysuckle. Occasional; roadsides and steep open slopes; 342.

Sambucus canadensis L., common elder. Occasional; moist roadsides, stream banks, and swamp margins; 433.

* Symphoricarpos orbiculatus Moench, buck brush, coral berry. Uncommon; forest margins and old homesites; 1293.

Viburnum acerifolium L., maple leaved viburnum. Rare (LA); rich wooded slopes; 1297.

V. dentatum L., southern arrow wood. Uncommon; moist roadsides and forest margins; 663.

V. nudum L., possum haw. Common; stream banks, swamps, and swamp margins; 583, 682.

V. prunifolium L., black haw. Common; stream banks, swamp margins, and moist hardwood slopes; 625, 853, 988.

CARYOPHYLLACEAE

* Cerastium glomeratum Thuillier, mouse-ear chickweed. Very common; roadsides, open fields, and yards; 75, 163, 1390.

Dianthus armeria L., Deptford pink. Very common; roadsides, open fields, field margins, and clearcuts; 513.

Lychnis alba Miller, white campion. Common; roadsides and open fields; 512.

L. coronaria (L.) Desr., lamb's ear. Uncommon; roadsides and old homesites; 564.

Saponaria officinalis L., bouncing bet. Uncommon; moist roadsides and field margins; 637.

Scleranthus annuus L., knawel. Occasional; dry roadsides, field margins, and open fields; 334.

Silene stellata (L.) Aiton f., starry campion. Occasional; hardwood slopes; 973, 1031.

Stellaria media (L.) Villars, common chickweed. Very common; roadsides, field margins, and yards; 76, 82, 410.
CELASTRACEAE

*Euonymus americanus* L., hearts abustin' with love. Common; roadsides, forest margins, and wooded slopes; 405, 1277.

CERATOPHYLLACEAE

* Ceratophyllum demersum* L., hornwort. Rare (LA); submerged in streams through abandoned millpond; 1002.

CHENOPODIACEAE

*Atriplex patula* L., orach. Occasional; marsh margins; 1226.

*Chenopodium album* L., lamb's quarters. Common; weedy roadsides, clearcuts, and gardens; 990.

*C. ambrosioides* L., Mexican tea. Occasional; margins of salt and brackish waters and dumpsite for dirt and yard clippings; 901.

CISTACEAE

* Helianthemum canadense* (L.) Michaux, frostweed. Uncommon; roadside powerline right-of-way; 291.

*Lechea pulchella* Raf., pinweed. Occasional; roadsides and open fields; 720.

*L. racemulosa* Michaux, pinweed. Occasional; roadsides and open fields; 816, 879.

*L. villosa* Elliott, pinweed. Uncommon; open fields; 871.

CLETHRACEAE

*Clethra alnifolia* L., sweet pepperbush. Common; stream banks, swamp margins, millponds, and forest/marsh interface; 555.

CONVOLVULACEAE

*Calystegia sepium* (L.) R. Brown, hedge bindweed. Common; moist roadsides, ditches, and field margins; 419, 431.

*Convolvulus arvensis* L., field bindweed. Common; cultivated, fallow, and open fields; 371, 693.

*Cuscuta campestris* Yuncker, common dodder. Occasional; parasitic on various herbaceous hosts in swamps and on stream banks; 872.

*C. gronovii* Wildenow, dodder. Uncommon; parasitic on various plants with swamp forest behind pocket marsh; 1694.

*Ipomoea coccinea* L., red morning glory. Occasional; roadsides and ditches; 959.
* I. hederacea Jacquin, ivy-leaved morning glory. Occasional; roadsides and ditch banks; 876.

* I. lacunosa L., small white morning glory. Occasional; roadsides and ditch banks; 979.

* I. pandurata (L.) Meyer, wild potato vine. Occasional; roadsides and ditch banks; 687.

* I. purpurea (L.) Roth, common morning glory. Common; roadsides, powerline right-of-way, and ditch banks; 875.

**CORNACEAE**

* Cornus alternifolia Lf., alternate-leaved dogwood. Rare; scattered trees on woodland edges and on mixed hardwood slopes; 270, 692, 1255.

* C. amomum Miller, silky dogwood. Common; stream banks, swamps, and margins of swamps and millponds; 699, 780.

* C. florida L., flowering dogwood. Common; mixed hardwood forest and forest margins; 154.

* C. foemina Miller, swamp dogwood. Uncommon; swamp margins and abandoned millponds; 842.

**CRASSULACEAE**

* Penthorum sedoides L., ditch stonecrop. Rare; shaded stream banks and wooded ravines; 1193.

**CUCURBITACEAE**

Cucumis melo L., squash. Rare; single population in an old garden or dump site; 954.

Melothria pendula L., creeping cucumber. Uncommon; swamp margins and field margins; 913.

**DIAPENSIACEAE**

Galax urceolata (Poiret) Brummitt, galax. Rare (LA); mixed hardwood slopes near Merry Point; 671.

**EBENACEAE**

* Diospyros virginiana L., persimmon. Occasional; forest margins, swamp margins, and fence rows; 434.

**ELAEAGNACEAE**

Elaeagnus umbellata Thunberg, Russian olive. Occasional; roadsides and forest margins; 153, 916.
ERICACEAE

*Chimaphila maculata* (L.) Pursh, pipsissewa. Occasional; mixed hardwood slopes throughout; 124, 536.

*Epigaea repens* L., trailing arbutus. Occasional; shaded roadside banks and steep wooded slopes above streams; 123.

*Gaylussacia baccata* (Wangenheim) K. Koch, black huckleberry. Common; roadsides, dry mixed hardwoods, top of ditches, and powerline right-of-way; 201, 202.

*G. frondosa* (L.) T. & G., dangleberry. Common; roadsides, top of ditches, and hardwood slopes; 238, 493, 806.

*Kalmia latifolia* L., mountain laurel. Common; steep west- and north-facing wooded slopes; 284.

*Leucothoe racemosa* (L.) Gray, fetterbush. Occasional; swamp margins, moist wooded slopes, and ravine bottoms; 239.

*Lyonia ligustrina* (L.) DC., maleberry. Occasional; moist roadsides, swamps, wooded slopes, and forest margins; 602, 677.

*L. mariana* (L.) D. Don, staggerbush. Occasional; roadsides, wooded slopes, and forest margins; 358, 439.

*Monotropa uniflora* L., Indian pipe. Uncommon; wooded slopes and mesic ravine bottoms; 542.

**Rhododendron atlanticum* (Ashe) Rehder, dwarf azalea. Occasional; mixed hardwood forest margins and roadsides; 1386.

*R. periclymenoides* (Michaux) Shinners, pinkster. Occasional; roadsides, forest margins, and wooded slopes; 172.

*R. viscosum* (L.) Torrey, swamp honeysuckle. Occasional; stream banks, swamp margins, and ditches; 617.

*Vaccinium corymbosum* L., highbush blueberry. Occasional; clearcuts and moist mixed hardwoods; 199.

*V. fuscatum* Aiton, highbush blueberry. Occasional; roadsides, ditch banks, forest margins, and dry woods; 119, 396.

*V. pallidum* Aiton, sweet lowbush blueberry. Common; dry roadside banks and mixed hardwood slopes; 1361, 1387, 1392.

*V. stamineum* L., deerberry. Very common; roadsides, ditch banks, clearcuts, and forest margins; 204, 232, 240, 359, 727.
EUPHORBIACEAE

* Acalypha gracilens Gray, three-seeded mercury. Common; disturbed roadsides, field margins, and agricultural fields; 843, 908.

* A. rhomboidea Raf., three-seeded mercury. Common; disturbed roadsides, field margins, and agricultural fields; 877, 1228.

* Croton glandulosus L. var. septentrionalis Mueller-Aargau, croton. Common; disturbed roadsides, field margins, and cultivated fields; 902, 1078.

* Euphorbia cyparissias L., cypress spurge. Uncommon; roadsides; 106.

E. maculata L., milk purslane. Common; roadsides, open fields, and clearcuts; 768.

E. nutans Lagasca. Common; open fields, roadsides, and clearcuts; 1014.

FABACEAE

* Albizia julibrissin Durazzini, mimosa tree. Occasional; roadsides and field margins; 335, 610.

* Amphicarpa bracteata (L.) Fernald, hog peanut. Uncommon; swamp margins and ravine bottoms; 1098.

* Apios americana Medicus, wild bean. Uncommon; stream banks and swamp margins; 856.

* Baptisia tinctoria (L.) R. Brown, wild indigo. Uncommon; roadsides and open fields; 620, 664.

* Cassia chamaecrista L., partridge pea. Common; roadsides and forest margins; 869.

* Cassia nictitans L., wild sensitive plant. Common; roadsides and forest margins; 930.

* Cercis canadensis L., red bud. Uncommon; roadsides and rich ravine slopes; 109.

* Clitoria mariana L., butterfly pea. Occasional; roadsides, powerline right-of-way, and forest margins; 619, 701.

* Crotalaria sagittalis L., rattle box. Occasional; roadsides, powerline right-of-way, and forest margins; 868, 1050.

* Cytisus scoparius (L.) Link, scotch broom. Uncommon; roadsides and forest margins; 280.

* Desmodium canescens (L.) DC., hairy tick trefoil. Common; powerline right-of-way; 703.

D. ciliare (Willdenow) DC., hairy small-leaved tick trefoil. Occasional; roadsides and powerline right-of-way; 1011, 1171.
* **D. fernaldii** Schubert. Rare; single population along roadside ditch bank; 1181.

**D. laevigatum** (Nuttall) DC., smooth tick trefoil. Occasional; roadsides and powerline right-of-way; 1023, 1082, 1116, 1176, 1257.

**D. nudiflorum** (L.) DC., naked-flower tick trefoil. Uncommon; forest margins and wooded slopes; 783, 887.

**D. nuttallii** (Schindler) Schubert. Occasional; swamp margins, rich ravine of mixed hardwoods, and roadsides; 1034, 1093, 1105.

**D. paniculatum** (L.) DC., paniced tick trefoil. Common; roadsides, powerline right-of-way, and field margins; 1012, 1087, 1130, 1140.

**D. pauciflorum** (Nuttall) DC., few-flowered tick trefoil. Rare (LA); single population along swamp margin; 740, 947.

**D. rotundifolium** DC., dollar-leaved tick trefoil. Rare; pine mixed hardwood slopes; 1243.


**Galactia regularis** (L.) BSP., milk pea. Uncommon; field margins; 752.

* **Gleditsia triacanthos** L., honeylocust. Uncommon; roadsides and forest margins; 897.

**Gymnocladus dioicus** (L.) K. Koch, Kentucky coffeetree. Rare (LA); single naturalized population at old dump site; 1313.

**Indigofera tinctoria** L. Rare (LA); large colony at homesite where homeowner has occasional mowed it and said has been there since they bought the place 25 years ago; 1347, 1702.

**Lathyrus hirsutus** L. Uncommon; roadsides and ditches; 345, 416, 552.

**L. latifolius** L., everlasting pea. Rare (LA); single roadside population; 898.

* **Lespedeza angustifolia** (Pursh) Elliott Occasional; margins of pine forests and roadsides; 1188, 1289.

**L. bicolor** Turcz. Occasional; powerline right-of-way and field margins; 1178.

**L. cuneata** (Dumont) G. Don, sericea lespedeza. Very common; roadsides, ditch banks, and field margins; 1227.

**L. procumbens** Michaux, trailing bushclover. Common; roadsides, powerline right-of-way, and ditch banks; 1113, 1120.

**L. repens** (L.) Barton, creeping bushclover. Common; roadsides, powerline right-of-way, and ditch banks; 561, 769.
* L. stipulacea Maxim., Korean lespedeza. Common; roadsides, open fields, and powerline right-of-way; 1079.

L. thunbergii Nakai. Uncommon; field margins and fence rows; 956; waif not listed in Atlas.

L. virginica (L.) Britton, slender bushclover. Occasional; roadsides and powerline right-of-way; 1048, 1080.

Lupinus perennis L., wild lupine. Rare; two small populations, one along dry wooded hilltop roadside and another in mixed pine-hardwoods on hilltop; 1382.

* Medicago lupulina L., black medic. Uncommon; roadsides and old homesites; 873.

Melilotus alba Medicus, white sweet clover. Uncommon; roadside gravel and open fields; 476.

* M. officinalis (L.) Pallas, yellow sweet clover. Occasional; roadsides and open fields; 384.

** Phaseolus polystachios (L.) BSP., wild bean. Uncommon; wooded slopes and ravine bottoms; 1047.

Pueraria lobata (Willd.) Ohwi, kudzu; Rare (LA); one very extensive population overtaking old agricultural field; 1053.

Robinia pseudo-acacia L., black locust. Common; roadsides and forest margins; 392.

Strophostyles helvula (L.) Elliott, wild bean. Rare; steep sandy river bluffs; 1244.

Stylosanthes biflora (L.) BSP., pencil flower. Common; roadsides, powerline right-of-way, and ditch banks; 516, 761.

Tephrosia spicata (Walter) T. & G., hoary pea. Common; roadsides; 756.

T. virginiana (L.) Persoon, goat's rue. Rare; wooded roadside bank; 1394.

Trifolium arvense L., rabbit's foot clover. Occasional; roadsides; 467, 1286.

* T. aureum Pollich, hop clover. Uncommon; roadsides; 660.

T. campestris Schreber, large hop clover. Very common; roadsides, field margins, and yards; 161, 363, 1418.

T. dubium Sibthorp, little hopclover. Very common; roadsides, field margins, and yards; 267.

* T. hybridum L. Uncommon; roadside ditch banks; 1375.

T. incarnatum L., crimson clover. Common; open fields and roadsides; 225.
**T. pratense** L., red clover. Occasional; roadsides and open fields; 264.

**T. repens** L., white clover. Occasional; roadsides and field margins; 274.

*Vicia grandiflora* Scopoli. Occasional; roadsides, field margins, and ditch banks; 389.

**V. lathyroides** L. Occasional; field margins, roadsides, and sandy banks; 88

**V. hirsuta** (L.) SF. Gray. Occasional; moist roadsides, stream margins, and powerline right-of-way; 322.

**V. sativa** L., spring vetch. Common; roadsides, field margins, and ditch banks; 96, 297, 351.

**V. villosa** Roth. Common; field margins, roadsides, and powerline right-of-way; 278, 723.

**Wisteria floribunda** (Willd.) DC., wisteria. Uncommon; old homesites and lots in housing development; 1328.

**FAGACEAE**

**Castanea dentata** (Marshall) Borkhausen, American chesnut. Occasional; saplings on older growth hardwood slopes; 539, 543, 570.

**C. pumila** (L.) Miller, chinquapin. Occasional; roadsides, forest margins, and hardwood slopes; 402, 492.

**Fagus grandifolia** Ehrhart, American beech. Common; hardwood forests; 121.

**Quercus alba** L., white oak. Common; mixed hardwood forests throughout; 1367.

**Q. coccinea** Muenchhausen, scarlet oak. Occasional; forest margins and hardwood forests; 1217, 1254.

**Q. falcata** Michaux, southern red oak. Common; mixed pine woods, forest margins and hardwood forests; 134.

**Q. margaretta** Ashe. Rare (LA); bluffs along Merry Point; 550.

**Q. marilandica** Muenchhausen, blackjack oak. Occasional; river bluffs, forest margins, and dry open slopes; 1346.

**Q. michauxii** Nuttall, basket oak. Common; swamps, stream margins, and lower slopes adjacent to swamps; 1212.

**Q. nigra** L., water oak. Occasional; young hardwood forest margins, pine woods, and stream margins; 399, 406.

**Q. phellos** L., willow oak. Uncommon; hardwood forest margins, roadsides, and old homesites; 421.
Q. prinus L., chestnut oak. Occasional; river bluffs; 929, 1233.

Q. rubra L., northern red oak. Common; hardwood forests; 179.

Q. stellata Wangenheim, post oak. Uncommon; dry open slopes; 365.

Q. velutina Lam., black oak. Occasional; hardwood forests; 1248.

GENTIANACEAE

** Gentiana villosa L., Sampson's snakeroot. Occasional; powerline right-of-way and forest margins; 1108, 1167.

Obolaria virginica L., pennywort. Rare; single colony in rich wooded ravine bottom; 126.

** Sabatia dodecandra (L.) BSP., large marsh pink. Rare (LA); single large population along brackish marsh edge; 1000.

S. stellaris Pursh, marsh pink. Rare (LA); single population in pocket marsh; 918.

GERANIACEAE

Geranium carolinianum L., Carolina cranesbill. Very common; roadsides, field margins, and yards; 300, 352.

* G. molle L., dovesfoot cranesbill. Common; roadsides, field margins, and gravel parking areas; 340, 414B.

HAMAMELIDACEAE

Hamamelis virginiana L., witch hazel. Occasional; rich hardwood slopes; 974.

Liquidambar styraciflua L., sweet gum. Very common; roadsides, powerline right-of-way, forest margins, ravine bottoms, and hardwood slopes; 273.

HYPERICACEAE

Hypericum candense L., Canadian St. John's wort. Rare; small population on sandy slope along forest margins above small stream; 799.

H. gentianoides (L.) BSP., orange grass. Common; roadsides, forest margins, and clearcuts; 880.


H. hypericoides (L.) Crantz, St. Andrew's cross. Occasional; roadsides, clear cuts, and ditch banks; 798, 1223.

H. mutilium L. Occasional; clearcuts, abandoned roads, and wooded trails; 733B, 788.
**H. perforatum** L., common St. John's wort. Occasional; open stream banks, and margins of swamps and mill ponds; 592.

**H. punctatum** Lam., spotted St. John's wort. Common; roadsides, swamp margins, wet powerline right-of-way, and upland forest margins; 622.

* **H. stans** (Michaux) Adams & Robson, St. Peter's wort. Occasional; powerline right-of-way and disturbed wooded slopes; 807A.

**H. virginicum** L., marsh St. John's wort. Occasional; stream banks and swamp margins; 795, 1219.

* **H. walteri** Gmelin, St. John's wort. Occasional; stream banks and swamp margins; 782, 1249.

**JUGLANDACEAE**

**Carya cordiformis** (Wangenheim) K. Koch, bitternut hickory. Rare; rich wooded slopes; 1298.

**Carya glabra** (Miller) Sweet, pignut hickory. Uncommon; mixed hardwoods; 1424, 1693.

**C. illinoensis** (Wang) K. Koch, pecan. Rare; roadsides and old homesites; 464.

**C. pallida** (Ashe) Engler & Graebner, sand hickory. Very common; roadsides, forest margins, hardwood forests, and pine-mixed hardwood forests; 252, 926, 1216, 1422.

**C. tomentosa** (Poiret) Nuttal, hickory. Uncommon; wooded roadsides and hardwood slopes, may be more common than perceived as there appeared to be a hybridization of characteristics between **C. tomentosa** and **C. pallida**; 1706.

* **Juglans cinerea** L., butternut. Uncommon; forest margins, wooded areas in fields at head of small stream, and old homesites; 316.

**J. nigra** L., black walnut. Occasional; ravine bottoms, wooded slopes, and old homesites; 1704.

**LAMIACEAE**

* **Cunila origanoides** (L.) Britton, dittany. Occasional; hardwood slopes and forest trails; 1292.

**Glechoma hederacea** L., ground ivy. Very common; roadsides, disturbed stream banks, field margins, and yards; 112, 288.

**Lamium amplexicaule** L., henbit. Very common; disturbed stream banks, field margins, and yards; 80, 449.

**L. purpureum** L., purple dead-nettle. Common; disturbed stream banks, yards, and roadsides; 83.
**Lycopus virginicus** L., bugleweed. Occasional; stream banks and swamps; 539, 1008, 1026.

**Mentha piperita** L., peppermint. Rare (LA); large population along spillway of pond; 935.

**Monarda punctata** L., horsemint. Rare; roadsides and old homesites; 932.

**Perilla frutescens** (L.) Britton. Uncommon; roadsides and field margins; 1177, 1185.

**Prunella vulgaris** L., selfheal. Common; roadsides, field margins, and ditch banks; 657, 840, 883, 1151.

**Salvia lyrata** L., lyre-leaved sage. Common; roadsides and powerline right-of way; 243, 265, 308.

**Satureja vulgaris** (L.) Fritsch, wild basil. Uncommon; powerline right-of way and field margins; 842, 1189.

* **Scutellaria elliptica** Muhl., hairy skullcap. Rare; rich wooded slopes and along forest trail; 576.

**S. integrifolia** L., hyssop skullcap. Common; roadsides, powerline right-of way, and dry ditch banks; 502, 556, 726.

**S. lateriflora** L., mad-dog skullcap. Occasional; stream banks and swamp margins; 946.

**Teucrium canadense** L., American germander. Occasional; roadsides and field margins; 966.

**Trichostema dichotomum** L., blue curls. Common; roadsides, field margins, and open fields; 92, 994.

**LAURACEAE**

**Lindera benzoin** (L.) Blume, spicebush. Common; swamps, stream banks, and upland forest margins; 71.

**Sassafras albidum** (Nuttall) Nees, sassafras. Common; roadsides, forest margins, and fence rows; 138, 171.

**LENTIBULARIACEAE**

**Utricularia biflora** Lam., bladderwort. Occasional; floating on millponds and other still water; 1221, 1421.

**LINACEAE**

* **Linum intercursum** Bicknell. Rare; few plants along wet roadside near stream crossing; 738.
** L. usitatissimum L., common flax. Rare; small population along roadsides near spillway of abandoned millpond; 323.

* L. virginianum L., common flax. Occasional; roadsides, field margins, and open fields; 775, 1021.

LOGANIACEAE

Polypermum procumbens L. Occasional; roadsides and field margins; 725, 763.

LYTHRACEAE

Decodon verticillatus (L.) Elliott, swamp loosestrife. Occasional; swamp margins and millpond spillways; 934.

Lagerstroemia indica L., crape myrtle. Uncommon; persisting and spreading from cultivation along roadsides, abandoned cemeteries, and old homesites; 1138; waif not listed in Atlas.

Lythrum lineare L., loosestrife. Occasional; brackish pocket marshes; 925.

MAGNOLIACEAE

Liriodendron tulipifera L., tulip tree. Very common; mixed forest, disturbed hardwood forest margins, ravine bottoms, old clearcuts, and powerline right-of-way; 293.

Magnolia virginiana L., sweet bay. Occasional; sphagnous stream heads and stream banks, and swamp margins; 494, 1055.

MALVACEAE

** Althaea rosea Cav., hollyhock. Rare; stand along forest margin and stand at Merry Point, no evidence on homesite at either location; 634.

Hibiscus moscheutos L., mallow-rose. Occasional; wet roadside ditches and fresh to brackish marshes; 743, 914.

* H. syriacus L., rose of Sharon. Rare; old homesites; 1305.

Kosteletzkya virginica (L.) Gray, seashore mallow. Occasional; pocket marshes and open brackish marshes; 984.

* Sida spinosa L., prickly mallow. Occasional; roadsides, and cultivated and agricultural fields; 1046.

MELASTOMATACEAE

Rhexia mariana L., meadow beauty. Common; open moist roadsides; 665, 689.

R. virginica L., meadow beauty. Rare; clear cut sphagnous stream margin; 734.
MENISPERMACEAE

* Menispernum canadense L., moonseed. Uncommon; roadside banks sloping towards waterways; 1323.

MORACEAE

Broussonetia papyrifera (L.) Vent., paper mulberry. Occasional; fence rows, margins of agricultural fields, and old homesites; 1338.

Maclura pomifera (Raf.) Schneider., osage orange. Uncommon; fence rows; 1342.

Morus alba L., white mulberry. Occasional; forest margins and fence rows; 173.

M. rubra L., red mulberry. Common; forest margins and fence rows; 244.

MYRICACEAE

Myrica cerifera L., wax myrtle. Common; powerline right-of way, forest and marsh margins, and stream banks; 237.

* M. heterophylla Raf., wax myrtle. Occasional; sphagnous seeps in streamheads; 805.

NYMPHAEACEAE

Nuphar luteum (L.) Sibthorp & Smith, yellow pond lily. Common; millponds and sunny backwaters along tidal freshwater streams; 674.

Nymphaea odorata Aiton, fragrant water lily. Rare; medium-sized population on farm pond; 1203.

NYSSACEAE

Nyssa sylvatica Marshall, black gum. Common; deciduous forests, roadsides, and stream banks; 395, 1344.

Nyssa sylvatica Marshall var. biflora (Walter) Sargent, black gum. Rare; along mixed hardwood river bank overhanging into river; 850.

OLEACEAE

Chionanthus virginicus L., fringe tree. Uncommon; moist forest margins and sphagnous streamheads; 242.

** Forsythia suspensa (Thunb.) Vahl, forsythia. Occasional; persisting and spreading from cultivation along roadsides, forest margins, and at old homesites; 104.

* Fraxinus americana L., white ash. Uncommon; fence rows and hardwood slopes; 1179.

* F. pennsylvanica Marshall, red ash. Common; swamp bottoms; 1214, 1363.
* Ligustrum sinense Loureiro, privet. Occasional; persisting and spreading from cultivation along forest margins and roadsides; 415, 460.

**ONAGRACEAE**

* Circaea lutetiana L. ssp. canadensis (L.) A. & M., enchanter’s nightshade. Common; field margins and disturbed moist wooded slopes; 603, 631.

* Epilobium coloratum Biehler, willow herb. Occasional; swamp margins and abandoned millponds; 1066.

Ludwigia alternifolia L., seedbox. Very common; stream banks, swamp margins, ditches, and moist roadsides; 662.

* L. decurrens Walter, loosestrife. Uncommon; stream banks, abandoned millponds, and swamp margins; 813.

L. palustris (L.) Elliott, water purslane. Occasional; stream banks, submerged in still waters, and swamps; 1032.

Oenothera biennis L., evening primrose. Occasional; roadsides, field margins, and agricultural fields; 831.

O. laciniata Hill, cut-leaved evening primrose. Occasional; roadsides and powerline right-of-way; 303, 312, 829.

**OROBANCHACEAE**

Epifagus virginiana (L.) Barton, beech drops. Common; dry, beech-dominated mixed hardwood forest; 535, 1107.

**OXALIDACEAE**

Oxalis dillenii Jacquin, wood sorrel. Very common; roadsides, powerline right-of-way, field margins, and yards; 175, 276, 367, 450.

* O. stricta L., upright yellow wood sorrel. Uncommon; roadsides and forest margins; 458, 978.

O. violacea L. Occasional; rich wooded ravine bottoms, mixed hardwoods, and shaded roadsides; 1353.

**PAPAVERACEAE**

* Sanguinaria canadensis L., bloodroot. Uncommon; rich ravine slopes; 648, 1310.

**PASSIFLORACEAE**

Passiflora incarnata L., passion flower. Uncommon; powerline right-of-way; 690.
PHRYMACEAE

*Phryma leptostachya* L., lopseed. Uncommon; rich wooded slopes; 749.

PHYTOLACCACEAE

*Phytolacca americana* L., pokeweed. Occasional; clearcuts, roadsides, and other disturbed areas; 509.

PLANTAGINACEAE

*Plantago aristata* Michaux, bracted plantain. Common; roadsides; 590.

*P. lanceolata* L., English plantain. Occasional; roadsides and yards; 386.

*P. rugellii* Dcne., pale plantain. Very common; roadsides, field margins, and yards; 952, 1300.

*P. virginica* L., hoary plantain. Common; roadsides, field margins, and yards; 165, 231, 350.

PLATANACEAE

*Platanus occidentalis* L., sycamore. Occasional; swamp bottoms, forest margins, and roadsides; 936.

PLUMBAGINACEAE

*Limonium carolinianum* (Walter) Britton, sea lavender. Uncommon; pocket marshes; 1700.

POLEMONIACEAE

* Phlox paniculata* L., perennial phlox. Uncommon; roadsides and ditch banks; 607, 937.

** P. subulata* L. Occasional; roadside banks, yards, and old church sites; 133, 1372.

POLYGALACEAE

*Polygala incarnata* L., milkwort. Common; roadsides, powerline right-of-way, and field margins; 558.

** P. lutea* L., yellow milkwort. Rare (LA); one population near sphagnous headwaters in recent clearcuts; 1205.

*P. mariana* Miller, milkwort. Common; roadsides, powerline right-of-way, and field margins; 557, 717.

POLYGONACEAE

** *Fagopyrum esculentum* Moench, buckwheat. Rare (LA); open areas within disturbed forest; 1182.
*Polygonum arifolium* L., halberd-leaved tearthumb. Uncommon; swamps and marsh margins; 874.

*P. aviculare* L., common knotweed. Occasional; roadsides and edge of gravel roadways; 904.

* P. cespitosum* Blume, long-bristled smartweed. Occasional; moist roadsides, ditches, and forest margins; 633, 711, 821.


**P. erectum** L. Occasional; field margins and roadsides; 588.

* P. hydropiperoides* Michaux, mild water pepper. Common; open swamps and freshwater marshes; 825.

*P. pensylvanicum* L., pinkweed. Common; ditches and disturbed moist areas; 477, 892.

* P. persicaria* L., lady's thumb. Occasional; roadsides and powerline right-of-way; 447, 708, 891, 1695.

*P. punctatum* Elliott, water smartweed. Common; swamps, stream banks, and wet roadsides; 653, 1237.

*P. sagittatum* L., arrow-leaved tearthumb. Occasional; swamp margins and freshwater marshes; 601.

* P. scandens* L., climbing false buckwheat. Uncommon; swamp margins and open stream banks; 1052.

*P. virginianum* L., Virginia knotweed. Occasional; swamps and stream banks; 949.

*Rumex acetosella* L., garden sorrel. Common; roadsides, powerline right-of-way, and yards; 90, 452.

*R. conglomeratus* Murray. Occasional; open fields; 746.

*R. crispus* L., yellow dock. Common; roadsides, open fields, and agricultural fields; 313, 407, 484.

*R. obtusifolius* L., blunt leaved dock. Uncommon; open fields and field margins; 626, 822.

*R. verticillatus* L., swamp dock. Occasional; marshes; 697.

**PORTULACACEAE**

*Claytonia virginica* L., spring beauty. Common; floodplains, ravine bottoms, and stream banks; 116.
Portulaca grandiflora Hook. rose moss. Uncommon; dump site for dirt and yard clippings, and old homesites; 900; waif not listed in Atlas.

* P. oleracea L., common purslane. Rare; two small colonies along field margin and roadside; 838.

PRIMULACEAE

Anagallis arvensis L., scarlet pimpernel. Common; roadsides and open fields; 451.

* Lysimachia ciliata L., fringed loosestrife. Uncommon; stream banks and swamp margins; 860.

L. quadrifolia L., whorled loosestrife. Rare; disturbed wooded slopes; 817.

* Samolus parviflorus Raf., water pimpernel. Occasional; freshwater marsh margins; 695.

RANUNCULACEAE

* Anemone quinquefolia L., wood anemone. Rare (LA); one population along small stream flood plain; 113.

A. virginiana L., thimbleweed. Occasional; wet powerline right-of way, stream banks, and moist roadsides; 713.

* Aquilegia canadensis L., wild columbine. Rare; upland hardwood forest margins in upper reaches of rich ravine system; 183.

Caltha palustris L., marsh marigold. Common; swamps and small stream flood plains; 70.

Clematis terniflora DC. Rare (LA); climbing on boxwood at old homesite; 1015.

C. virginiana L., virgin's bower. Rare (LA); open area of swamp bottom; 1282.

* Consolida ambigua (L.) Ball & Heywood, rocket larkspur. Rare (LA); spreading from cultivation along roadside; 463.

Hepatica americana (DC.) Ker, hepatica. Occasional; rich hardwood slopes; 143.

Ranunculus abortivus L., kidneyleaf buttercup. Common; stream banks, swamp margins, and moist ravine bottoms; 180, 315.

R. bulbosus L., bulbous buttercup. Very common; roadsides, field margins, open fields, and yards; 314.

* R. hispidus Michaux, buttercup. Rare (LA); swamps and small stream flood plain; 1315.

R. recurvatus Poiret. Occasional; swamps and stream banks; 256, 628.
**R. sardous** Crantz, buttercup. Common; roadsides, field margins, open fields, and yards; 338, 386, 448, 546, 1330.

**Thalictrum pubescens** Pursh, tall meadow rue. Occasional; swamp and millpond margins, and freshwater marshes; 544, 678, 1427.

**RHAMNACEAE**

**Ceanothus americanus** L., New Jersey tea. Occasional; roadsides and powerline right-of-way; 523.

**ROSACEAE**

**Agrimonia pubescens** Wallroth, agrimony. Occasional; wooded slopes and forest paths; 933, 941, 1100.

**Alchemilla microcarpa** Brossier & Reuter, parsley-piert. Rare (LA); in lawn on roadside along bank of ditch; 1407.

**Amelanchier arborea** (Michaux) Fernald, common shadbush. Occasional; roadsides and forest margins; 94, 108, 1409.

**A. canadensis** (L.) Medicus, downy shadbush. Occasional; roadsides and forest margins; 107, 203, 1409.

**Aronia arbutifolia** (L.) Elliott, chokeberry. Occasional; roadsides, forest margins, and on slopes above streams; 200, 710, 1235.

**Chaenomeles lagenaria** Koidz., flowering quince. Uncommon; roadsides and forest margins; 215; waif not listed in Atlas.

**Crataegus crus-galli** L., Cockspur-thorn. Rare; small population along roadside; 318.

**Duchesnea indica** (Andrz.) Focke, Indian strawberry. Common; roadsides, field margins, yards, and disturbed wooded sites; 379.

**Fragaria virginiana** Duchesne, wild strawberry. Uncommon; roadsides and wooded slopes; 158.

**Geum canadense** Jacquin, white avens. Occasional; stream banks, wet powerline right-of-way, and moist roadsides; 680, 712.

**Malus pumila** Miller, common apple. Uncommon; forest margins and old homesites; 169.

**Potentilla canadensis** L., dwarf cinquefoil. Very common; roadsides, field margins, open fields, and yards; 233, 680, 712.

**P. recta** L., sulfur cinquefoil. Rare; one population along roadside; 281.

**P. simplex** Michaux, common cinquefoil. Occasional; disturbed areas on mixed hardwood slopes and roadsides; 348, 1360, 1396.
**Prunus angustifolia Marshall.** Rare (LA); single population atop ditch bank between road and corn field; 1703.

* P. munsoniana* Wight & Hedrick, wildgoose plum. Rare (LA); local thicket along roadside; 102.

* P. persica* (L.) Batsch, peach. Occasional; roadsides, fence rows, and forest margins; 97, 102.

* P. serotina Ehrhart,* wild black cherry. Common; roadsides, powerline right-of-way, fence rows, and forest margins; 136, 212, 1329.

* P. tenella* Batsch., Russian almond. Rare; single population at old homesite; waif not listed in Atlas; 1341.

**Pyrus communis** L., common pear. Occasional; roadsides and forest margins; 103, 131.

* Rosa carolina* L., pasture rose. Very common; roadsides, ditch banks, and field margins; 487, 530.

* R. multiflora* Murray, multiflora rose. Uncommon; field margins, open fields, and old homesites; 341.

* R. odorata* Sweet, tea rose. Rare; single shrub along river bank near mouth of Corrotoman, possibly an old homesite; 965; waif not listed in Atlas.

* R. palustris* Marshall, swamp rose. Occasional; swamp margins and abandoned millponds; 600.

* R. wichuraiana* Crepin, memorial rose. Occasional; roadsides and rocky banks near homesites; 422.

** Rubus bifrons** Tratt. Occasional; along trails through mixed hardwoods; 420, 1401, 1430.

* R. cuneifolius* Pursh, black raspberry. Uncommon; wooded roadsides; 1696.

* R. flagellaris* Willdenow, northern dewberry. Occasional; roadsides and forest margins; 227, 289, 321.

* R. occidentalis* L., black raspberry. Occasional; powerline right-of-way and forest margins; 253, 1381, 1391.

* R. phoenicolasius* Maxim., wineberry. Occasional; roadsides and forest margins; 425.

** Spiraea prunifolia** Seib. & Zucc., bridal wreath. Occasional; roadsides and forest margins; 144.

* S. thunbergii* Sieb. Rare; single plant at old cemetery site; 192, 466.
RUBIACEAE

*Cephalanthus occidentalis* L., buttonbush. Occasional; swamp margins and abandoned millponds; 599, 787.

*Diodia teres* Walter, rough buttonweed. Occasional; moist roadsides and dry ditch bottoms; 758.

*D. virginiana* L. buttonweed. Occasional; roadsides and ditches; 613.

*Galium aparine* L., cleavers. Very common; forest margins and disturbed moist areas; 176, 296, 326, 360.

*G. circaezans* Michaux, wild licorice. Occasional; hardwood slopes; 489.

*G. obtusum* Bigelow var. *filifolium* (Wieg.) Fernald, bedstraw. Common; swamps, swamp margins, flood plains, and moist ravines; 534.

*G. obtusum* Bigelow var. *obtusum* Bigelow, bedstraw. Occasional; swamps, swamp margins, flood plains, and moist ravines; 468.

*G. pilosum* Aiton, hairy bedstraw. Common; roadsides and forest margins; 589.

*G. tinctorium* L., bedstraw. Uncommon; millpond edges, stream banks, and swamp margins; 642.

*G. triflorum* Michaux, sweet-scented bedstraw. Occasional; forest margins; 490.

*Houstonia caerulea* L., bluets. Occasional; roadsides and yards; 146, 329.

*H. purpurea* L., houstonia. Common; roadsides, field margins, and yards; 380, 661, 975.

*Mitchella repens* L., partridge berry. Common; hardwood forests, wooded roadside banks, and powerline right-of way; 388.

*Sherardia arvensis* L. Uncommon; roadsides and field margins; 89.

SALICACEAE

*Populus alba* L., white popular. Occasional; roadsides and powerline right-of way; 754.

*P. grandidentata* Michaux, big-toothed aspen. Occasional; roadsides and forest margins; 765, 1316.

**Salix babylonica** L., weeping willow. Rare; few trees along edge of farm pond; 1383.

*S. humulis* Marshall, small pussy-willow. Rare (LA); single colony along wet roadside ditch; 1414.
**S. nigra Marshall**, black willow. Occasional; river banks and millpond heads; 1326, 1351, 1364, 1376.

### SANTALACEAE


### SAURURACEAE

*Saururus cernuus* L., lizard's tail. Occasional; swamps and flood plains; 573.

### SAXIFRAGACEAE

*Chrysosplenium americanum* Schweinitz, water mat. Uncommon; still waters; 117.

** Decumaria barbara** L., climbing hydrangea. Rare (LA); originally spotted as a fallen fruit collected on leaf but many vines climbing tall trees in wet wooded rich ravine; 1432, 1705.

*Hydrangea arborescens* L., wild hydrangea. Uncommon; moist hardwood slopes along roadsides; 470.

*Itea virginica* L., Virginia willow. Common; stream banks and margins of swamps and millponds; 673.

### SCROPHULARIACEAE

*Agalinis maritima* (Raf.) Raf. Rare; several in pocket marsh NW of John's Creek and Merry Point; 982.

*A. purpurea* (L.) *Pennell*. Uncommon; roadsides and powerline right-of-way; 1169.

*Aureolaria virginica* (L.) Farwell, downy false foxglove. Occasional; roadsides, powerline right-of-way, and forest margins; 533, 1092.

*Chelone glabra* L., turtlehead. Uncommon; stream banks and swamps; 1148.

*Gratiola neglecta* Torry, water hedge hyssop. Occasional; pond margins and flooded muddy areas; 1385.

*G. pilosa* Michaux, hedge hyssop. Common; roadsides, powerline right-of-way, and sandy forest paths; 796, 1302.

*G. virginiana* L. Rare; wet pool within higher ground of freshwater marsh; 1145.

* Kickxia elatine* (L.) Dumortier, canker root. Rare (LA); one population along roadside ditch and agricultural field; 1084.

*Linaria canadensis* (L.) Dumont, old field toad-flax. Common; roadsides and open fields; 196, 234, 324, 357.
* Lindernia anagallidea (Michaux) Pennell. Uncommon; shallow still water of streams, seasonally flooded areas, margins of millponds, and marshes; 827.

L. dubia (L.) Pennell, false pimpernel. Uncommon; shallow still water of streams, margins of millponds, and marshes; 851.

Mimulus alatus Aiton, monkey flower. Uncommon; stream banks and marsh margins; 857.

* M. ringens L., monkey flower. Uncommon; stream banks and marsh margins; 863.

Paulownia tomentosa (Thunberg) Steudel, princess tree. Occasional; roadsides and forest margins; 279.

Pedicularis canadensis L., early woodbetony. Rare; one small population along rich hardwoods slope and one large population in mixed hardwood flatwoods; 1377.

Verbascum blattaria L., moth mullen. Occasional; roadsides, powerline right-of-way, and open fields; 503, 510.

V. thapsus L., common mullein. Uncommon; roadsides and open fields; 931.

* Veronica arvensis L., corn speedwell. Very common; roadsides, field margins, and yards; 301, 408.

V. hederifolia L., ivy-leaved veronica. Occasional; yards, roadsides, and fields; 86.

* V. peregrina L., purslane speedwell. Common; moist places on roadsides, and in fields, and yards; 226, 446.

V. persica Poiret, bird's eye. Occasional; roadsides and disturbed sites; 706.

SIMAROUBACEAE

Ailanthus altissima (Miller) Swingle, tree of Heaven. Rare (LA); single population along roadside in "trash woodland" area along powerline right-of-way; 1701.

SOLANACEAE

Datura stramonium L., jimsonweed. Occasional; roadsides, open fields, and agricultural fields; 462.

** Nicandra physalodes (L.) Gaertner, apple of Peru. Rare (LA); small population along field margin; 1264.

** Physalis heterophylla Nees, groundcherry. Uncommon; roadsides and field margins; 1274, 1369.
Solanum carolinense L., horse nettle. Occasional; roadsides and forest margins; 532.

* S. ptycanthum DC., nightshade. Occasional; roadsides and forest margins; 841, 955.

THEACEAE

Stewartia ovata (Cav.) Weatherby, summer dogwood, mountain camellia. Rare; three shrubs on bluff of John’s Creek; 639.

TILIACEAE

* Tilia americana L., American basswood. Rare; moist fence rows and roadside thickets; 915.

ULMACEAE

* Celtis occidentalis L., hackberry. Occasional; roadsides, fence rows, and forest margins; 211, 432, 506.

* Ulmus americana L., American elm. Occasional; swamps; 114.

URTICACEAE

Boehmeria cylindrica (L.) Swartz, false nettle. Common; swamps and stream banks; 779, 786.

* Pilea fontana (Lunell) Rydberg, clearweed. Uncommon; flood plains and fluvial deposits between two small streams; 1149, 1283.

* P. pumila (L.) Gray, clearweed. Uncommon; stream flood plain and fluvial deposits between two small streams; 1152.

VALERIANACEAE

Valerianella locusta (L.) Latterade, comsalad. Common; roadsides, field margins, and ditch banks; 159, 177, 206, 228, 302, 1356.

V. radiata (L.) Dufr., comsalad. Common; roadsides, field margins, and ditch banks; 186, 241, 411 [too immature to determine to forma].

V. radiata (L.) Dufr. f. fernaldii (Dyal) Eggers, comsalad. Rare; one collection along roadside; 1423.

VERBENACEAE

Callicarpa americana L., beauty berry. Rare (LA); single population along powerline right-of-way; 1231.

* Verbena hastata L., blue vervain. Rare (LA); single population in abandoned millpond; 785.
V. urticifolia L., white vervain. Occasional; roadsides and forest margins; 652.

**VIOLACEAE**

* Viola arvensis Murray, wild pansy. Occasional; open fields and roadsides; 79, 896.

V. conspersa Reichenbach, American dog violet. Uncommon; rich ravine bottoms and stream flood plains; 219.

V. cucullata Aiton. Uncommon; stream banks and moist ravine bottoms; 220.

V. primulifolia L. Common; stream banks, swamp margins, and sphagnous headwaters; 145, 195, 1327.

V. rafinesquii Greene, field pansy. Common; roadsides, open fields, and yards; 77, 164, 207.

* V. sagittata Aiton, arrow-leaved violet. Uncommon; stream banks; 1168, 1403.

**VITACEAE**

Parthenocissus quinquefolia (L.) Planchon, Virginia creeper. Very common; roadsides, forest margins, and swamp margins; 700.

Vitis aestivalis Michaux, summer grape. Common; roadsides and forest margins; 290, 400, 418, 526.

V. rotundifolia Michaux, muscadine. Occasional; roadsides and forest margins; 551.

V. vulpina L., winter grape. Occasional; roadsides and forest margins; 370, 413.
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Vita


Joined the faculty in the Department of Biology at Vassar College, Poughkeepsie, New York in June 1995. Serve as the survey botanist and assistant curator of the herbarium. Will be continuing thesis related work at Vassar where work is focused on an inventory of the Vassar Ecological Preserve, development of a geographic information system, and computerization of the herbarium.