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Wetlands Research Program Technical Report WRP-DE-6

Flood Tolerance of Plant Species in Bottomland Forests of the Southeastern United States

by Russell F. Theriot



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Technical Report WRP-DE-6
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Flood Tolerance of Plant Species in Bottomland Forests of the Southeastern United States

by Russell F. Theriot

Environmental Laboratory

U.S. Army Corps of Engineers
Waterways Experiment Station
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

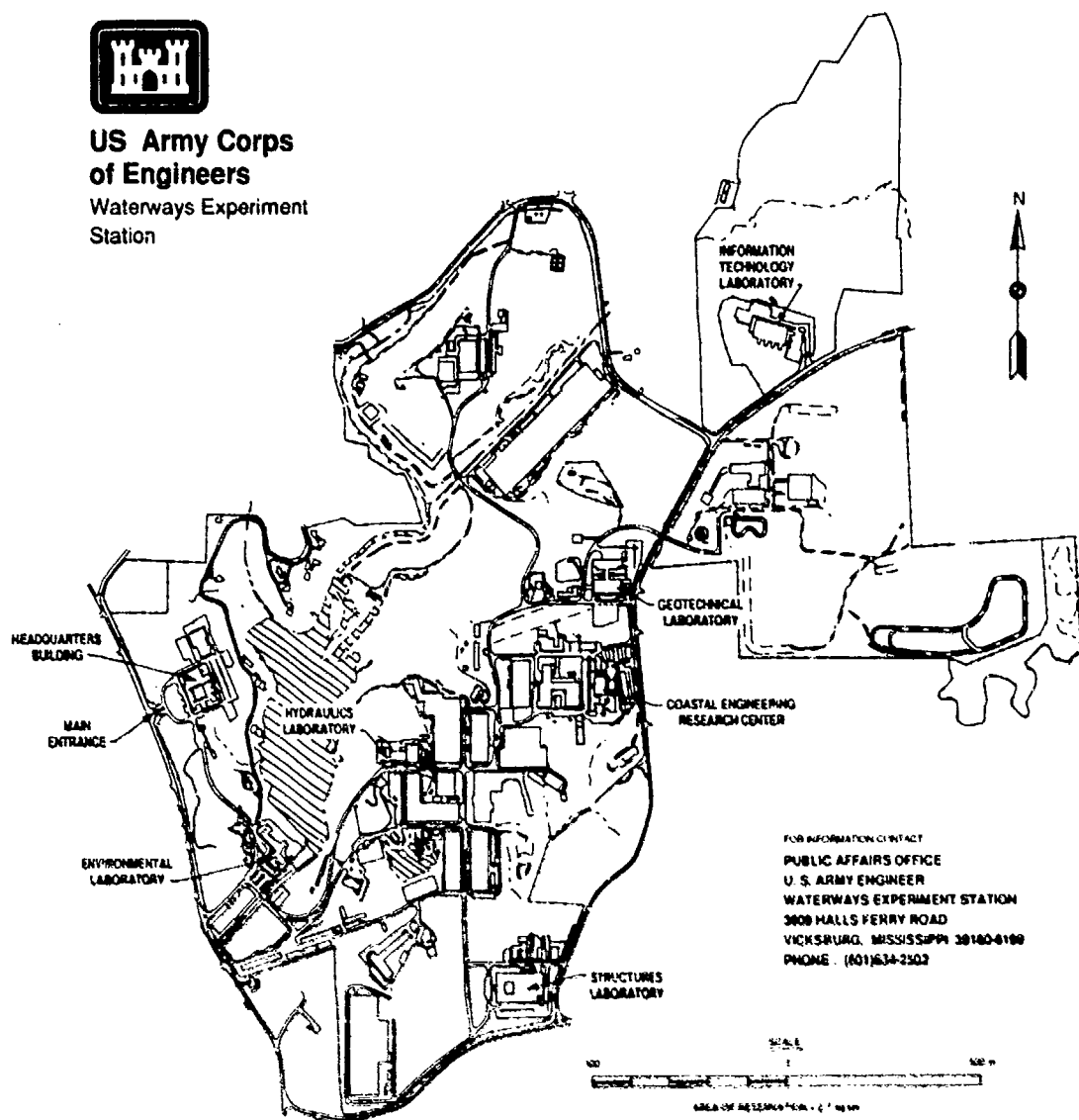
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Wetland Tolerance of Wetland Plants



Flood Tolerance of Plant Species in Bottomland Forests of the Southeastern United States (WRP-DE-6)

ISSUE:

Quantitative hydrologic information needed by Corps of Engineers Districts to make decisions concerning wetlands is most often not available. Therefore, an investigation began to identify a surrogate for hydrology. Based on the scientific literature, plant community analysis seemed to provide the best potential for providing a surrogate for hydrology.

RESEARCH:

The study area chosen was the forested bottomland systems of the Southeast United States. Data was provided from 17 study sites and used to develop numbers for the plant species encountered. Average numeric values were calculated for species from the entire study area and resulted in flood tolerance index (FTI) numbers which can be used to estimate the hydrology of an area.

SUMMARY:

Results of this study establish that at least for forested bottomland systems of the Southeastern United States it is possible to use plant community analysis to estimate hydrology. Statistical analysis indicates that FTI numbers for trees are best for hydrologic determination.

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About the Author:

The bibliography was compiled by Dr. Russell F. Theriot, a biologist at the WES Environmental Laboratory. Point of contact is Dr. Theriot, USAE Waterways Experiment Station, ATTN: CEWES-EN-C, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, Phone: (601) 634-2733.

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Preface

The work described in this report was authorized by Headquarters, U.S. Army Corps of Engineers (HQUSACE), for publication in the Delineation and Evaluation Task Area of the Wetlands Research Program (WRP). The work was performed by the U.S. Army Engineer Waterways Experiment Station (WES), Environmental Laboratory (EL). Principal Investigator was Dr. Russell F. Theriot. Mr. Sam Collinson (CECW-OR) was the WRP Technical Monitor at the time of publication.

Mr. Jesse A. Pfeiffer, Jr. (CERD-C), was the WRP Coordinator at the Directorate of Research and Development, HQUSACE; Dr. William L. Klesch (CECW-PO) served as the WRP Technical Monitors' Representative; Dr. Theriot was the Wetlands Program Manager. Mr. Ellis J. Clairain, Jr. (WES, EL), was the Task Area Manager.

Mr. Robert Pierce was the USACE Technical Monitor at the time the work was performed. Participants in the study include Dr. Dana Sanders, who provided technical assistance as research team leader; Drs. Ken Rodgers, Dan Evans, and Tom Heineke, who assisted with plant species identification; Blake Parker, who interpreted the soils data; Don Hill, who conducted geodetic surveys; Phil Jones and Jeff Irvin, who assisted with integrating the hydrologic data; Dr. Dara Wilber, who assisted with the statistical analysis; and Drs. Donal Hook, Bill Patrick, Helen Leitman, Sandra Brown, and William Mitch, who helped by providing insight through discussion of their research. The report was written under the general supervision of Dr. Robert M. Engler, EL Program Manager, Dr. John Keeley, Assistant Director, EL, and Dr. John Harrison, Director, EL.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Bruce K. Howard, EN.

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1 Introduction

Bottomland forests are found in the floodplains of rivers in the southeastern United States from eastern Texas to Virginia. They have distinct topographic features that are the result of historical hydrologic characteristics of the rivers, including periodic fluctuations in water levels and changes in stream course. Recognizable floodplain topographic features include first bottoms, second bottoms or terraces, uplands, riverfront, swamp, poorly drained flats, well-drained flats, and sloughs (Putnam, Furnival, and McKnight 1960). These features are characterized by different hydrologic regimes and can be identified as a hydrologic gradient transitional between permanent water and terrestrial uplands.

Many studies have previously described the forest communities associated with these floodplain features (Putnam, Furnival, and McKnight 1960; Broadfoot and Williston 1973; Chambless and Nixon 1975; Hodges and Switzer 1979; Mohler 1979; and Hupp and Osterkamp 1985). However, studies describing the relationship between plant species distribution and specific inundation/saturation regimes in bottomland forests are rare (Bedinger 1971; Mohler 1979; Huffman 1980; and Leitman, Sohm, and Franklin 1984). Even so, these studies all demonstrated that frequency and duration of inundation/saturation exert a controlling influence on the composition, structure, and distribution of wetland plant communities. As an example, Bedinger (1971) found a definite relationship between the distribution of plant species and the frequency and duration of flooding in the lower White River Valley, Arkansas. Using flood frequency and duration, he defined four species associations on the White River floodplain, each of which had a distinctly different tolerance to inundation. He concluded that based on plant species-flooding relationships, plant communities could be used as a basis to transfer flooding parameters to ungauged streams.

Plant Community Organization

The concept of community structure has been debated for decades. Clements (1916) first described communities as discrete, self-organizing entities that could be considered as discrete organisms. Gleason (1917) disagreed with Clements' organismal concept and proposed a hypothesis relating

to the individualistic occurrence of plants. His hypothesis has developed into the continuum concept, which indicates that plant species distribution is determined by the species' response to its environment. Whittaker (1967) and McIntosh (1980) later developed Gleason's ideas, expanding on the continuum concept. They maintain that since plant species adapt differently, no two occupy the same zone. This concept results in a continuum of overlapping species associations, each responding to subtly different environmental factors (e.g., water, soil pH, nutrients, and solar radiation). A continuum can be described for each factor in various increments or zones.

Zonation simply describes the different levels of an environmental gradient to which a species is responding. The reason zonation is so obvious in some ecosystems is that environmental gradients are "ecologically" steep and groups of species have fairly similar tolerances that tend to group them on these gradients (Mitsch and Gosselink 1986).

Gleason's individualistic hypothesis can be supported by several studies (Curtis and McIntosh 1951, Brown and Curtis 1952, Bray 1956, Whittaker 1956, Curtis 1959, Whittaker and Niering 1965, and Mohler 1979). These studies show that although species have different ecological amplitudes and, in fact, do not occupy the same niche, they organize as units based on similar ecological conditions. Moreover, intergrades caused by interspecific competition occur between defined types of plant associations. These intergrades can be attributed to continuous environmental variability in time or space or to environmental modification.

Bottomland Forest Community Organization

Van Der Valk (1981) developed a qualitative model of succession in freshwater wetlands based on the "individualistic" approach to vegetation proposed by Gleason. He based his approach on three key life history features of plant species: life-span, propagule longevity, and propagule establishment requirements. These features are all directly affected by the flooding on bottomland forests.

Brinson (1990), in discussing the "power line" designation for a wetland classification developed by Kangas (1990), considered the power and frequency of inundation as the way in which flood events organize the plant communities in riverine forests. He characterized the flood events as high, medium, and low power events with flood power and frequency of inundation being inversely proportional. High power flood events have a low frequency and determine patterns of the large floodplains features (e.g., oxbow lakes, relief levees, and low ridges and swales) that persist for hundreds to thousands of years. Medium power flood events, which occur at an intermediate frequency, affect ecosystem structures that exist from decades to hundreds of years. He identified tree species associations as an ecosystem component likely to be influenced at this scale. The low power, high-frequency flood

events occur annually and affect short-term patterns such as seed germination and seedling survival. His characterization emphasized the dramatic impact flooding has on the regeneration of vegetation in bottomland forests.

Grubb (1977) stated that scientists have failed to understand adequately how plant communities maintain themselves because of a failure to account for the phenomenon of regeneration in plant communities. Huenneke and Sharitz (1986), in a study of microsite abundance and distribution of woody seedlings in a South Carolina cypress-tupelo swamp, concluded that the availability and nature of microsites may affect the distribution and composition of the seedling and sapling strata, thus differentiating the "regeneration niche" described by Grubb.

Although plant species association is determined by a number of interacting environmental factors, it is generally agreed that flooding is the dominant environmental factor at work in bottomland forests, affecting regeneration and life under saturated soil conditions. Flooding persisting for more than a few days will prevent the replenishment of soil oxygen once the soil microbes and plant roots consume the available soil oxygen in the root zone during respiration. Only those plant species that have evolved a mechanism for living in reducing (anaerobic) soil conditions will survive such conditions. In most instances, recurring flooding provides a competitive advantage for plant species that are adapted to saturated and reduced soils.

Chemistry of wet soils (Pearsall and Mortimer 1939, Patrick and Mikkelsen 1971, Ponnamperna 1972, Patrick and Delaune 1976; and Faulkner et al. 1991), and the various physiological effects on vegetation under reducing conditions are well documented (Cannon and Free 1920, Conway 1940, Dubinina 1961, Hosner and Boyce 1962, Hook and Brown 1973, Hook and Scholten 1978, Vester 1972, and Hook and Crawford 1980).

Zonation of Bottomland Forests

The hydrologic gradient in bottomland forests ranges from zones of nearly continuous inundation/saturation in deep swamps to infrequent inundation/saturation events for brief periods on upland sites. Because different species respond to different timing and duration of inundation, a strong correlation exists between the distribution of a species and its associated hydrologic and soil-moisture conditions (Hosner and Boyce 1962, Dickson, Hosner, and Hosley 1965, Bedinger 1971, 1978; Larson et al. 1981, Best, Segal, and Wolfe 1990, and Faulkner et al. 1991). The National Wetlands Technical Council (NWTC) proposed the zonal classification of floodplain forests (Clark and Benforado 1981). The classification system defined six hydrologic zones based on frequency and duration of inundation and soil saturation (Figure 1) and provides the basis for testing in this study.

Larson et al. (1981) summarized the works of others on the occurrence of plant species in the Gulf Coastal Plain from 238 belt transects in Texas.

Louisiana, Arkansas, Mississippi, Alabama, and Florida according to their maximum tolerance to soil-moisture or hydrologic regimes. Larson and his cohorts developed a list of 79 tree and shrub species associated with one or more of the NWTC hydrologic zones. However, the list identifies only presence or absence of a species in a zone and does not identify the ecological amplitude or optimum position of each species along the hydrologic gradient.

Purpose and Objectives

The purpose of the study was to develop flood tolerance index (FTI) numbers that reflect the optimum position for plant species occurring along the hydrologic gradient in bottomland forests of the southeastern United States. The resulting FTI numbers can then be used to estimate the hydrologic regimes of similar ungauged areas using vegetation. Specific objectives were to develop methods for translating recorded hydrologic data into hydrologic zone elevations for southeastern bottomland forests, calculate weighted averages of plant species based on dominance, and determine methods for applying FTI numbers to species occurring in bottomland forests of the southeastern United States.

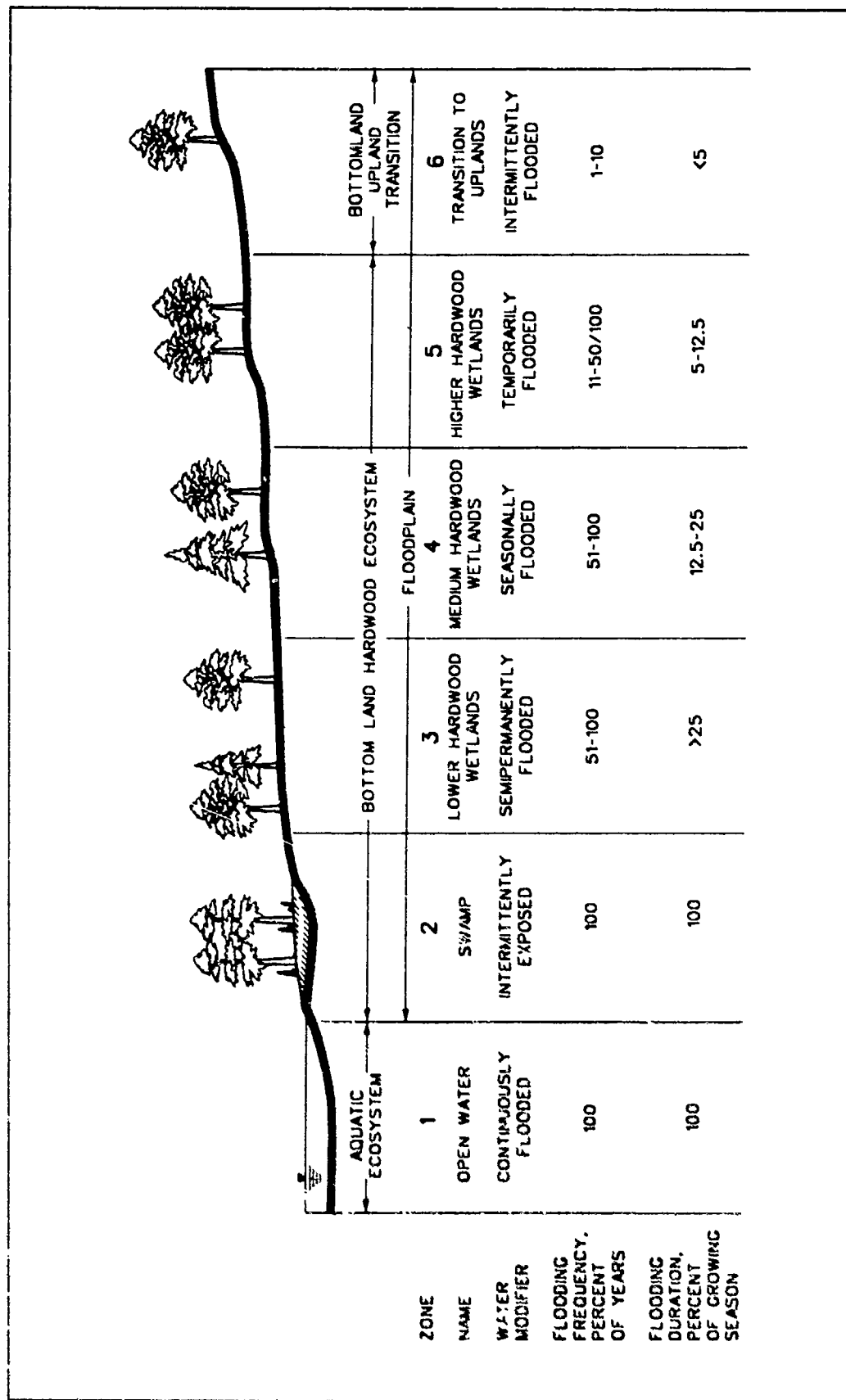


Figure 1 Zonal classification of bottomland forest wetlands (adapted from Clark and Benforado 1981)

2 Methods

Study Area

The study was conducted in portions of the subtropical ecoregion of the southeastern United States (Bailey 1980), including portions of eastern Texas and the Gulf and South Atlantic states. Northern limits of the area extended across northern Arkansas, Mississippi, Alabama, Georgia, and South Carolina. The study area included the states of Louisiana, Arkansas, Mississippi, and Alabama. Georgia and South Carolina were included, except for the piedmont region. Only the extreme eastern portion of Texas was included, as was the northern portion of Florida (Figure 2). The intent was to study natural undisturbed sites encompassing the largest possible area where the resulting FTI numbers would be applicable without including areas that would introduce too many additional species or different climatic variables.

Specific sites were selected according to the following criteria:

- a. No major disturbance (e.g., timber harvesting, ditching, or diking) had occurred during the past 20 years.
- b. Sufficient hydrologic data (10 to 20 years of daily stream gauge readings) accurately portraying water-level fluctuations on the site (considering ponding, tributary influence between site and gauge, etc.) were available.
- c. No site changes (e.g., timber harvesting or ditching) were anticipated during the study period.
- d. Soil data (e.g., soil surveys, soil series, and/or soil phases, texture, and permeability coefficients) were available.
- e. Plant communities were characteristic (e.g., plant communities with few rarely occurring species) of the study area.

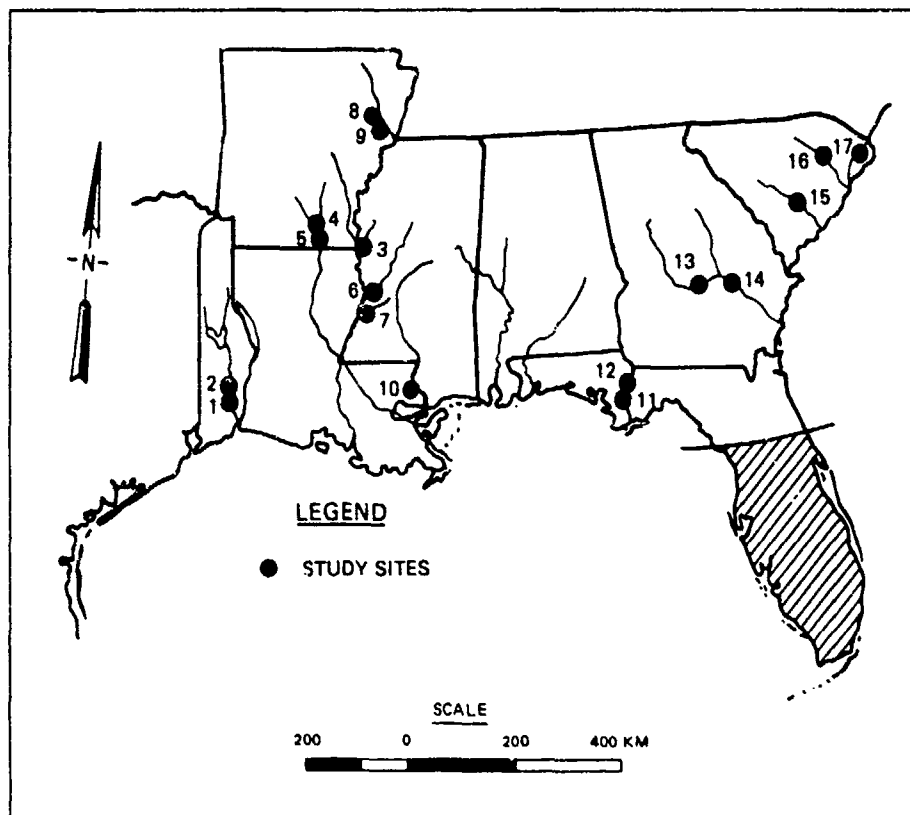


Figure 2. Study area and sites in the southeastern United States

Site Selection

Several hundred potential sites were considered, but most were eliminated because of insufficient stream gauge data. More than 50 sites were visited, but only 17 (Figure 2) satisfied all site criteria and were used in the study. Although all 17 sites met the selection criteria, not all hydrologic zones in each site were suitable for study. Some zones were too narrow, and others had been disturbed recently by agricultural or silvicultural practices.

Sites 1 and 2 were located in the Neches River basin in southeastern Texas. The Steele Bayou, Yazoo River, and Big Black River basins in Mississippi, respectively, were designated sites 3, 6, and 7. Sites 4 and 5 were located in the Ouachita River and sites 8 and 9 in the L'Anguille River basins in Arkansas. Site 10 was located in the Pearl River basin in Louisiana, and sites 11 and 12 in the Apalachicola River basin in Florida. Sites 13 and 14 were located in Georgia in the Ocmulgee River and Altamaha River basins, respectively. Sites 15, 16, and 17 were located in South Carolina in the Edisto, Lynches, and Waccamaw River basins, respectively.

All sites were characterized by a growing season of greater than 200 days and average annual rainfall ranging from 105 to 170 cm. The overstory typically ranged from cypress-tupelo or willow in depressions and low flats to

white oak-hickory or pine on the high ridges. Intermediate areas included overcup oak-bitter pecan, green ash, willow oak, and American elm overstory communities. The herbaceous understory was typically dense with diverse species of trees and shrubs, vines, and herbs. Appendix A includes a general description of each study site.

Determining Hydrologic Zone Elevations

Hydrologic data for each site were obtained either from the U.S. Geological Survey (flow data) or from the local Corps of Engineers District (stage or flow data). Data were analyzed using a FORTRAN computer program developed for determining hydrologic zone elevations in study sites where flooding occurred. The program output is the duration of inundation plus soil saturation of each hydrologic zone boundary, expressed as flow rate or stage data. Table 1 presents inundation/saturation frequency and duration for Zones 2 to 6.

Hydrologic zone elevations for each site were computed using the most recent 10 to 20 years of daily stream gauge data. When gauge data were provided as daily discharges (flow rate), a rating table (relationship between stage and discharge) was obtained to determine the corresponding stages (elevation).

Plant species show little or no adverse effects from flooding in the winter (dormant) season (Hall and Smith 1955; Bruckner, Bowersox, and Ward 1973). Therefore, hydrology during the dormant season was not used in this study to determine zones.

The dates of the first and last day of the growing season for each site were provided as input to the computer program. Growing season for this study was defined as the period between the last average occurrence of 32° F in the spring and the first average occurrence of 32° F in the fall. The program eliminated all nongrowing season data and ranked the remaining daily readings during the period of record from highest to lowest flow (or stage). Elevations corresponding to the 75, 25, 12.5, and 5 percent durations of inundation were computed. Because the resulting elevations did not include the period during which the soils remain saturated after a period of inundation, saturation effects were integrated. A general description of the soil series occurring in each zone of the study site was obtained from Soil Conservation Service (SCS) county soil surveys. An estimated range of permeabilities for the top 30 cm of the soil profile (i.e., defined for this study as the effective root zone) was determined. This range approximated the period required for the root zone to become saturated after inundation. The slowest value in the range of permeabilities was used to determine the minimum duration of inundation required to saturate the soil. A second range of soil permeabilities between the 30-cm and 90-cm depth was determined. The slowest permeability value of the soil profile between 30 and 90 cm was used to estimate the time required for draining of the root zone after dewatering. A mean daily transpiration factor for

Table 1
Hydrologic Zones Occurring in Bottomland Forests of the
Southeastern United States

Zone	Name	Typical Inundation/Saturation Frequency ¹	Duration ² percent
2	Semipermanently to permanently inundated or saturated	Annual (1 year frequency) 90 to 100 years/100 years	>75-100
3	Regularly inundated or saturated	51 to 90 years/100 years (>1-year to 2-year frequency)	>25-75
4	Seasonally inundated or saturated	51 to 90 years/100 years (>1-year to 2-year frequency)	>12.5-25
5	Irregularly inundated or saturated	11 to 50 years/100 years (well drained) (>10 years - 2-year frequency) 1 to 10 years/100 years (poorly drained) (100 years, 10-year frequency)	≥5-12.5
6	Intermittently inundated or saturated	1 to 10 years/100 years (100 years, 10-year frequency)	<5

Source: Adapted from Larson et al. (1981)

¹ Although typical inundation/saturation frequencies are provided for each zone, almost any frequency could be associated with any duration of inundation/saturation. Therefore, only duration of inundation/soil saturation was used to determine hydrologic zones.

² Duration based on the growing season

floodplain forests of 5.6 mm (Brown 1981) also was incorporated for computing desaturation.

Permeability and transpiration coefficients were provided as program input, and new flow (or stage) values for hydrologic zone boundaries were derived that reflected both inundation and soil saturation. This iterative process required a computer search. The computer program added the days of saturation to the days of inundation, and the output was flow (or stage) values that represented the estimated boundary of each hydrologic zone, based on inundation and saturation. The gauge elevation was added to the stage for each zone to obtain the mean sea level elevation at the gauge. When the site was not immediately adjacent to the gauging station, the change in water surface elevation between the study area and the gauging station was determined using the best available water surface profile data. Appendix B explains how the computer program analyzes the hydrology data to produce zone boundaries.

Site Preparation and Data Collection

A temporary benchmark was established at each of the 17 sites by surveying from a permanent benchmark. A reconnaissance of the area was conducted for suitable sites, and mean sea level elevations for each hydrologic zone boundary were surveyed along the topographic gradient. The contours of each hydrologic zone boundary within the site were marked with surveyor flags. Fifty-five hydrologic zones were established on the 17 study sites. Sampling methods were adapted from methods described by Whittaker (1973), except where noted.

Sample plots were established parallel to the hydrologic zone boundary (Figure 3). Plots were positioned on the downslope side of the boundary with at least a 5-m buffer between the sample plots and the upper and lower boundary of the hydrologic zone. A belt transect (20 m wide by 40 m long) containing 10 sample subplots (8 m by 10 m) was established within each zone.

Small soil pits in each sample plot were dug with a tile spade to a depth necessary to identify the soil series. In all cases, a county soil survey was used to identify the mapped soil series, and information was obtained to verify the soil series on site. Assistance from the local SCS office was used to determine the correct soil series and soil permeability coefficients for each zone sampling site.

Vegetation was sampled by vegetative layer. All trees in each sample plot were identified by species, and the diameter at breast height (1.5 m) of individuals having a diameter of greater than or equal to 7.5 cm was measured and recorded to the nearest whole centimeter.

All saplings and shrubs (woody plants less than 7.5 cm in diameter, but greater than 1.0 m in height, excluding vines) in each sample plot were identified by species, and the height class of each individual was recorded. Saplings or shrubs with more than one stem clustered from a single root system were counted as individuals only when separation occurred at or below ground level. The following height classes were used: Class 1 = 1.0 to 2.0 m, Class 2 = 2.1 to 3.0 m, Class 3 = 3.1 to 4.0 m, Class 4 = 4.1 to 5.0 m, and Class 5 = >5.0 m.

All climbing woody vines greater than 1.0 m in height in each sample plot were identified by species, the stems of each species counted, and the height class of the highest individual on each tree or sapling/shrub recorded. The following height classes were used: Class 1 = 1.0 to 3.0 m, Class 2 = 3.1 to 6.0 m, Class 3 = 6.1 to 12.0 m, and Class 4 = >12.0 m. Vines were recorded when any portion of the plant occurred in, or overhung, the plot. Individual stems were recorded when separation from the root system occurred at or below ground level.

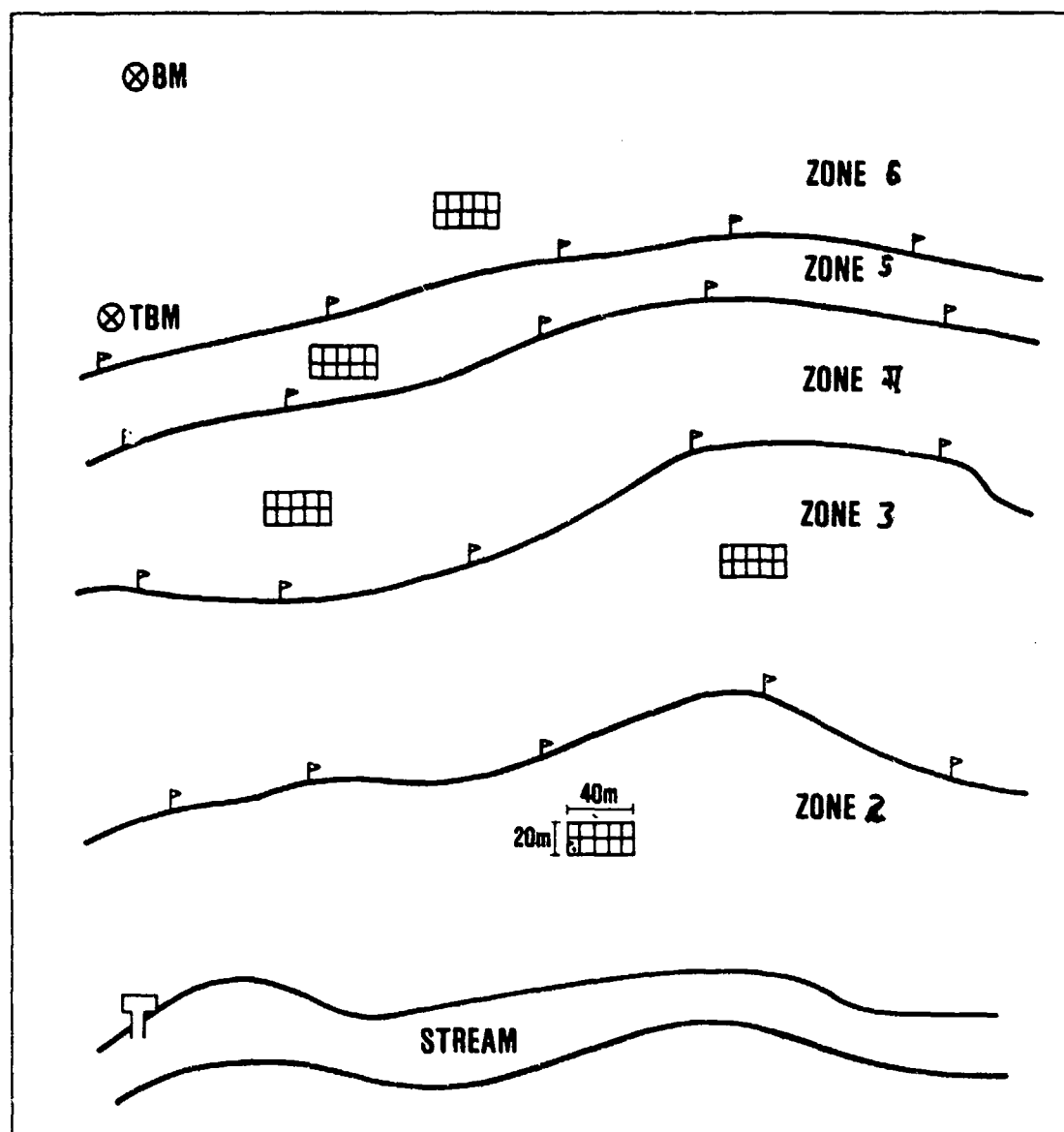


Figure 3. Representation of a typical research site

Percent cover was estimated for each species of herb and woody seedling (greater than 1.0 m in height) rooted in the plot in two randomly located 1.0-m² quadrats in each subplot using the Daubenmire (1968) cover class method.

Analyzing Vegetation Data

Importance values for species in all vegetation layers except the herbaceous layer were calculated by adding values for relative density, relative frequency, and relative dominance. Importance values for herbaceous species were

calculated by summing relative frequency and relative dominance. Importance values were used to determine the FTI number for each species.

When species could not be positively identified in the field, voucher specimens were collected and later identified. Species nomenclature was determined using the *National List of Scientific Plant Names* (U.S. Department of Agriculture 1982).

Calculating Species FTI Numbers

Changes in composition of biotic communities along environmental gradients can be addressed with several statistical techniques, the most notable being gradient analysis (Whittaker 1978). Gradient analysis can take several different forms depending on the objective of the analysis. Inferring environmental values (e.g., hydrologic zones) from vegetative species composition is called a "calibration problem" by Ter Braak and Prentice (1988) and is the appropriate approach for this study.

One method of calibration is to use weighted averaging (WA) to estimate environmental factors at sites based on species optima. If a species exhibits a unimodal distribution with respect to an environmental variable, its occurrence is concentrated around the peak of this function (Ter Braak and Prentice 1988). Species with similar optima will naturally tend to occur together. Therefore, an intuitive estimate of the environmental factor of a site is the average of the optima for the species present. The FTI numbers represent weighted averages of species occurrence.

Two additional statistical methods of calibrating an environment (hydrologic zone) with vegetation, recommended by Ter Braak and Prentice (1988), are cluster analysis and discriminant function analysis. These two methods were applied to test the reliability of the FTI numbers.

FTI numbers were calculated for each species occurring in each vegetation layer. A species could have three different FTI numbers at a given site, depending on its growth form. For example, *Quercus nigra* would have three different FTI numbers when present on a site as a tree, sapling, and seedling. Species FTI numbers for each site were computed by the following formula:

$$FTI_i = \frac{\sum_j (f_{ij} \cdot IV_{ij})}{\sum_j f_{ij}}$$

where

i = the i^{th} species

$j = 2.5, 3.5 \dots 6.5$ (hydrologic zone)¹

IV_{ij} = importance value for species i in the hydrologic zone j

After species FTI numbers were computed for all species in all sites, the average FTI number ($\overline{FTI}$) for each species across all sites was calculated using the following formula:

$$\overline{FTI}_i = \frac{\sum_{j=1}^{n_i} FTI_{ij}}{n_i}$$

where

i = the i^{th} species

j = sites 1 to 17

FTI_{ij} = FTI number of species i at site j

n_i = number of sites at which species i occurred

¹ Because vegetation was sampled between zone boundaries, midrange zone numbers (e.g., 2.5 for Zone 2, 3.5 for Zone 3, etc.) for zones were used in calculating FTI numbers.

3 Results and Discussion

Flood Analysis of Study Sites

Twenty years of hydrologic data were used for all sites except sites 4, 5, and 14. Sites 4 and 5 had a 19-year hydrologic record, and site 14 had a 12-year record. Calculations of change in water surface elevation between the gauging station and site was necessary for sites 1, 2, 3, 5, 9, 12, and 17. All other sites were adjacent to the gauging station and did not require adjustments. Hydrologic analyses of sites 11 and 12 at the Apalachicola River were verified using information from another study (Leitman, Sohm, and Franklin 1984).

The hydrologic records for all sites were analyzed by season for five-year increments. In all cases, variation in flow through time was determined to be within normal seasonal and annual fluctuations. Therefore, it was assumed that the hydrologic record reflected normal conditions (i.e., no major drainage projects during the period of record had significantly impacted the plant community structure).

The hydrologic data also were analyzed to determine annual flood frequency and duration for each site. The boundaries between Zones 2 and 3 and between Zones 3 and 4 are flooded virtually every year (Table 2). The boundary between Zones 4 and 5 is flooded at least every other year, and the boundary between Zones 5 and 6 is flooded from once in 20 years to 3 out of every 4 years. Similar findings were reported by Clark and Benforado (1981) and Roelle et al. (1987).

In general, the average duration of a flood event by site ranged from 3 months to longer than 5 months for the Zone 2-3 boundary, from 3 weeks to greater than 2 months for the Zone 3-4 boundary, from 1 week to 1 month for the Zone 4-5 boundary, and from less than 1 day to 10 days for the Zone 5-6 boundary (Table 3).

As an example, a hydrograph of site 3 at Steele Bayou (Appendix C) for 20 years of data shows that flooding conditions vary greatly from one season to another and from one year to another. Also, flooding during the growing season usually occurs during early spring and is usually continuous with the

Table 2
Annual Flood Frequency (Percent of Years in Which Boundary
Is Exceeded at Least Once During Growing Season for More
Than Seven Days) for Zone Boundaries

Site	Zone Boundaries			
	2-3	3-4	4-5	5-6
1	100	90	70	10
2	100	90	70	10
3	100	100	85	25
4	100	94	61	20
5	100	85	55	20
6	100	96	77	20
7	100	100	92	75
8	100	100	96	60
9	100	100	96	65
10	100	100	83	70
11	100	100	95	70
12	100	100	95	70
13	100	100	90	65
14	100	100	92	67
15	100	90	85	55
16	100	100	100	70
17	100	100	90	70

nongrowing season flooding. Flooding rarely occurs late in the growing season. Unusual events such as the 1973 flood can greatly affect the calculated value of average events. For example, if the data for 1973 were excluded, the average duration per flood event at site 3 is reduced to 37 days, 25 days, 9 days and less than 1 day, from 143, 30, 14, and 6 days, for Zone boundaries 2 through 5, respectively (Table 4). Such an event has an especially large effect on average duration even over a 20-year period, especially in the higher zones.

Vegetation Data

Vegetation data were collected at each of the 55 hydrologically defined zones for the 17 study sites (Appendix D). Eleven stands were sampled in Zone 2, 15 stands in Zone 3, 14 stands in Zone 4, 4 stands in Zone 5, and

Table 3
Average Annual Duration of Flood Events (Days) for Zone Boundaries

Site	Zone Boundaries			
	2-3	3-4	4-5	5-6
1	119	21	12	<1
2	119	21	12	<1
3	143	30	14	6
4	92	41	19	7
5	93	51	24	8
6	152	44	22	9
7	153	50	25	10
8	139	20	15	<1
9	139	20	15	<1
10	141	32	14	3
11	143	20	16	8
12	143	20	18	6
13	162	29	15	8
14	159	53	24	5
15	162	52	25	9
16	174	58	8	<1
17	198	66	31	10
Study Area Average	143 $\pm$ 26	37 $\pm$ 18	18 $\pm$ 6	6 $\pm$ 3

11 stands in Zone 6. The total possible number of stands that could have been sampled for each zone was 17. Some zones were unsuitable for analysis due to disturbance or because they were too narrow to support sampling areas (Appendix A). Zone 5 was especially susceptible to disturbance. In some cases Zone 5 was cleared because it was dry enough to be farmed during the growing season. In other cases, Zone 5 was too narrow because it was located near the toe of a slope. Therefore, Zone 5 was sampled only at sites 3, 11, 12, and 14.

FTI numbers were calculated for 74 tree species, 118 species of saplings and shrubs, 31 species of woody vines, and 268 species of herbs and woody seedlings, representing 312 different plant species. Because some species occurred in more than one vegetative layer, the total number of species FTI numbers exceeded the total plant species identified.

Table 4
FTI Numbers of Species Commonly Occurring in Bottomland
Forests

Scientific Name	Common Name	FTI Number
Trees		
<i>Nyssa aquatica</i>	Water tupelo	2.62
<i>Salix nigra</i>	Black willow	2.83
<i>Fraxinus caroliniana</i>	Pop-ash	2.87
<i>Taxodium distichum</i>	Bald cypress	2.97
<i>Planera aquatica</i>	Water elm	3.12
<i>Acer drummondii</i>	Drummond red maple	3.48
<i>Forestiera acuminata</i>	Swamp privet	3.48
<i>Gleditsia aquatica</i>	Water locust	3.50
<i>Carya aquatica</i>	Water hickory	3.54
<i>Quercus lyrata</i>	Overcup oak	3.73
<i>Quercus launifolia</i>	Laurel oak	3.89
<i>Betula nigra</i>	River birch	4.01
<i>Acer rubrum</i>	Red maple	4.21
<i>Ilex decidua</i>	Possumhaw holly	4.35
<i>Fraxinus pennsylvanica</i>	Green ash	4.44
<i>Ulmus americana</i>	American elm	4.46
<i>Quercus nuttallii</i>	Nuttall's oak	4.50
<i>Quercus phellos</i>	Willow oak	4.81
<i>Acer negundo</i>	Box elder	4.83
<i>Celtis laevigata</i>	Sugarberry	4.84
<i>Carpinus caroliniana</i>	American hornbeam	4.84
<i>Liquidambar styraciflua</i>	Sweetgum	5.03
<i>Platanus occidentalis</i>	Sycamore	5.18
<i>Nyssa sylvatica</i>	Black gum	5.27
<i>Carya alba</i>	Pecan	5.57
<i>Quercus nigra</i>	Water oak	5.73
<i>Morus rubra</i>	Red mulberry	5.75
<i>Ilex opaca</i>	American holly	5.79
<i>Ulmus alata</i>	Winged elm	6.43

(Sheet 1 of 4)

Table 4 (Continued)

Scientific Name	Common Name	FTI Number
<i>Pinus taeda</i>	Loblolly pine	6.41
<i>Quercus alba</i>	White oak	6.50
<i>Sassafras albidum</i>	Sassafras	6.50
<i>Fagus grandifolia</i>	American beech	6.50
<i>Cornus florida</i>	Flowering dogwood	6.50
<i>Ostrya virginiana</i>	American hophornbeam	6.50
<i>Quercus stellata</i>	Post oak	6.50
<i>Quercus falcata</i>	Southern red oak	6.50
<i>Carya tomentosa</i>	Mockernut hickory	6.50
Saplings and Shrubs		
<i>Salix nigra</i>	Black willow	2.83
<i>Itea virginica</i>	Virginia willow	2.83
<i>Planera aquatica</i>	Water elm	3.01
<i>Cephalanthus occidentalis</i>	Buttonbush	3.13
<i>Styrax americana</i>	Snowbell	3.41
<i>Forestiera acuminata</i>	Swamp privet	3.57
<i>Cynilla racemiflora</i>	Tit	3.72
<i>Celtis laevigata</i>	Sugar berry	4.37
<i>Crataegus viridis</i>	Green hawthorn	4.46
<i>Carya illinoensis</i>	Pecan	5.00
<i>Platanus occidentalis</i>	Sycamore	5.05
<i>Acer negundo</i>	Box elder	5.20
<i>Magnolia grandiflora</i>	Southern magnolia	5.43
<i>Liquidambar styraciflua</i>	Sweetgum	5.52
<i>Cornus drummondii</i>	Rough leaf dogwood	5.69
<i>Vaccinium ellipticum</i>	Elliott blueberry	5.82
<i>Quercus nigra</i>	Water oak	5.92
<i>Sambucus canadensis</i>	Elderberry	5.95
<i>Halesia diptera</i>	Silverbell	6.09
<i>Morus rubra</i>	Red mulberry	6.25
<i>Cercis canadensis</i>	Redbud	6.37
(Sheet 2 of 4)		

Table 4 (Continued)

Scientific Name	Common Name	FTI Number
<i>Vaccinium arboreum</i>	Farkleberry	6.45
<i>Gleditsia triacanthos</i>	Honey locust	6.50
<i>Quercus alba</i>	White oak	6.50
<i>Cornus florida</i>	Flowering dogwood	6.50
<i>Ilex vomitoria</i>	Yaupon	6.50
Woody Vines		
<i>Ipomoea wrightii</i>	Morning glory	2.50
<i>Smilax walteri</i>	Walter's greenbriar	3.05
<i>Brunnichia cirrhosa</i>	Ladies' eardrops	3.58
<i>Ampleopsis arborea</i>	Peppervine	3.94
<i>Campsis radicans</i>	Trumpet creeper	4.05
<i>Vitis palmata</i>	Cat grape	4.07
<i>Trachelospermum difforme</i>	Star jasmine	4.18
<i>Vitis riparia</i>	Riverbank grape	4.27
<i>Smilax laurifolia</i>	Bamboo-vine	4.33
<i>Cocculus carolinus</i>	Carolina moonseed	4.37
<i>Berchemia scandens</i>	Rattan vine	4.55
<i>Smilax bona-nox</i>	Saw greenbriar	4.75
<i>Toxicodendron radicans</i>	Poison ivy	4.82
<i>Smilax rotundifolia</i>	Common greenbriar	5.18
<i>Vitis rotundifolia</i>	Muscadine grape	5.71
<i>Parthenocissus quinquefolia</i>	Virginia creeper	5.93
<i>Lonicera japonica</i>	Japanese honeysuckle	6.50
<i>Gelsimium sempervirens</i>	Carolina jessamine	6.50
Herbs		
<i>Ludwigia decurrens</i>	Primrose-willow	2.50
<i>Rorippa islandica</i>	Yellowcress	2.50
<i>Echinodorus cordifolius</i>	Creeping burhead	3.00
<i>Aster simplex</i>	Lowland white aster	3.04
<i>Boehmeria cylindrica</i>	Small-spike falsonettle	3.34
<i>Spermacoce glabra</i>	Smooth buttonweed	3.50
(Sheet 3 of 4)		

Table 4 (Concluded)		
Scientific Name	Common Name	FTI Number
<i>Saururus cernuus</i>	Lizard-tail	3.65
<i>Leersia lenticularis</i>	Catchfly grass	3.67
<i>Justicia ovata</i>	Waterwillow	3.83
<i>Urtica chamaedryoides</i>	Nettle	4.42
<i>Clematis virginiana</i>	Virgins bower clematis	4.57
<i>Eupatorium rugosum</i>	White snakeroot	4.67
<i>Cocculus carolinus</i>	Snailseed	4.78
<i>Viola missouriensis</i>	Missouri violet	4.83
<i>Hypericum hypericoides</i>	St. Johnswort	5.25
<i>Mitchella repens</i>	Partridge berry	5.32
<i>Arundinaria gigantea</i>	Giant cane	5.34
<i>Vitis rotundifolia</i>	Muscadine	5.89
<i>Gelsemium sempervirens</i>	Carolina jessamine	6.31
<i>Sanicula canadensis</i>	Black snakeroot	6.39
<i>Galium aparine</i>	Catchweed bedstraw	6.50
<i>Carex albolutescens</i>	Sedge	6.50
<i>Cynanchum laeve</i>	Cynanchum	6.50
<i>Lonicera sempervirens</i>	Trumpet honeysuckle	6.50
(Sheet 4 of 4)		

Appendix E contains a listing by stratum of the plant species identified in this study and the calculated FTI numbers with standard deviations provided for each species.

FTI numbers were calculated for all plants identified by species in this study, regardless of how frequently they occurred in the study. The FTI numbers calculated for species with few occurrences may be suspect. FTI numbers for some of the more commonly occurring species in the study are listed in Table 4. These species can generally be found along the moisture gradient in any bottomland hardwood forest in the southeastern United States in roughly the order from wettest to driest community as presented. Some species, such as Nuttall's oak, are common in only part of the region, and not all species can be expected on the same site because of the species' response to other environmental gradients.

Examples of FTI numbers by life stage for woody species are presented in Table 5. Although differences between FTI numbers for tree and sapling life stages are not great, FTI numbers for saplings tend to be slightly higher than for trees because saplings are generally more sensitive to flooding than trees. The sapling life stage also tends to occur in a broader range of zones than the tree life stage because of temporal variations in selective pressures (e.g., competition and response to flooding). FTI numbers of seedlings have little value in determining hydrologic zones because they only reflect seed dispersal potential and germination wherever seedbed conditions are favorable. For example, seedlings of least tolerant species (e.g., *Sassafras albidum*) occasionally occur in lower zones (Table D3, Zone 3), but the individuals do not survive to maturity unless the hydrologic regime is drastically altered.

Table 5
Variations in Species Flood Tolerance Index Numbers
According to Life Stage

Scientific Name	Tree	Sapling	Seedling
<i>Taxodium distichum</i>	2.97	3.33	3.09
<i>Gleditsia aquatica</i>	3.50	3.15	3.27
<i>Carya aquatica</i>	3.54	3.70	3.69
<i>Quercus lyrata</i>	3.73	3.99	3.80
<i>Fraxinus pennsylvanica</i>	4.44	4.27	4.00
<i>Quercus nuttallii</i>	4.50	4.50	4.50
<i>Acer negundo</i>	4.83	5.20	5.58
<i>Celtis laevigata</i>	4.84	4.37	4.77
<i>Liquidambar styraciflua</i>	5.03	5.52	4.87
<i>Quercus nigra</i>	5.73	5.92	5.85
<i>Sassafras albidum</i>	6.50	6.50	6.07

The average importance value was plotted for each species in every zone where it occurred in the study. Although a species can be expected to occur in a number of zones, many had a peak occurrence in a particular zone (Figure 4). However, because this study did not analyze a continuous gradient, FTI numbers were calculated from mean importance values across the entire study and do not necessarily represent the maximum in ecological amplitude for a species.

Three general species distribution patterns are shown in Figure 4. The first pattern includes species such as water tupelo (NYAQ) and bald cypress (TADI), in which mean importance value is greatest in Zone 2 and the species no longer occurs after either Zone 3 or 4. This pattern is indicative of species having the strongest competitive advantage in areas of greatest duration of

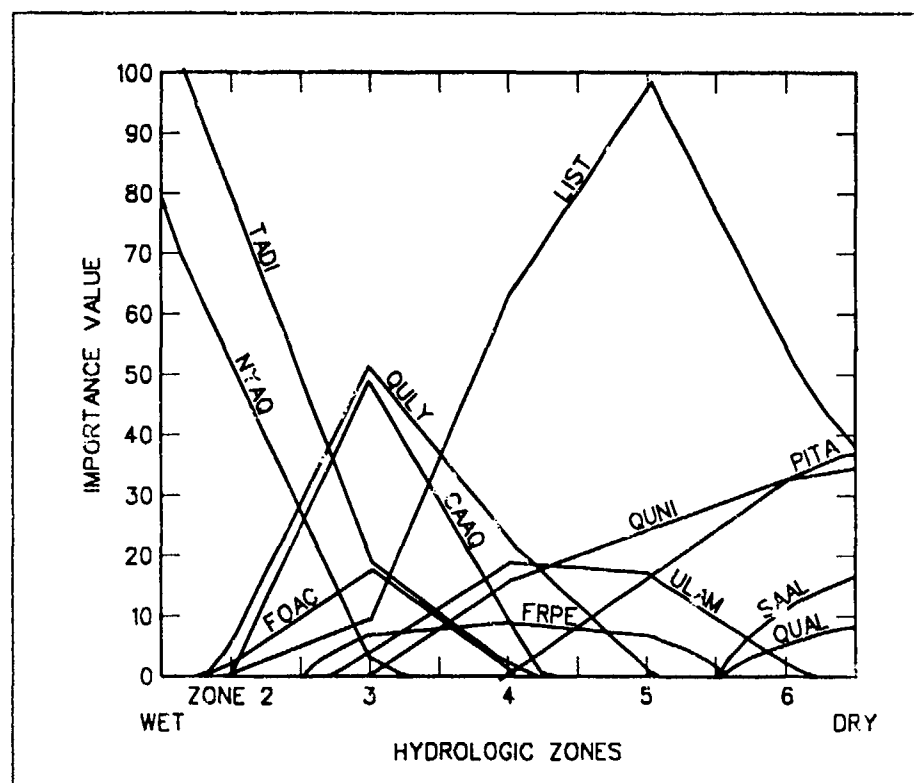


Figure 4. Ecological amplitude of some commonly occurring species; CAAQ: *Carya aquatica*; FOAC: *Forestiera acuminata*; FRPE: *Fraxinus pennsylvanica*; LIST: *Liquidambar styraciflua*; NYAQ: *Nyssa aquatica*; PITA: *Pinus taeda*; QUAL: *Quercus alba*; QULY: *Quercus lyrata*; QUNI: *Quercus nigra*; SAAL: *Sassafras albidum*; TADI: *Taxodium distichum*; and ULAM: *Ulmus americana*

inundation/soil saturation. The second pattern is typified by species such as water oak (QUNI), loblolly pine (PITA), sassafras (SAAL), and white oak (QUAL), in which the greatest mean importance value occurs in Zone 6 (uplands) and decreases from Zone 5 to 2. Hence, they have a stronger competitive advantage in areas where inundation/soil saturation is less than 5 percent of the growing season. However, some of these species (e.g., water oak and loblolly pine) may occasionally occur as dominants in wetlands. The third pattern is typified by species having the greatest mean importance values in Zones 3, 4, and 5. Species in this group sometimes occur as dominant species in either Zone 2 or 6, but are best adapted for occurrence at some point in Zones 3, 4, and 5. Species having the greatest mean importance values in Zone 3 are overcup oak (QULY) and bitter pecan (CAAQ), while American elm (ULAM) and sweetgum (LIST) develop the greatest mean importance values in Zones 4 and 5, respectively.

Other systems have been developed to identify the degree of wetness for which a species is best adapted (e.g., Hook 1984, Reed 1988). These systems used qualitative descriptions, such as "most tolerant" or "obligate hydrophyte,"

and are based primarily on the literature or "expert evaluations" and not on a single coordinated study. Species evaluations were also made by life forms in this study, and no such distinction was made in the other two systems. However, all three systems, including the FTI numbers, were developed to identify a degree of wetness for which a species is best adapted. They all have five categories that vary from wettest to driest. Therefore, an obvious comparison would be to compare species having an FTI integer of 2, with the most tolerant and obligate designation, an FTI integer of 3, with the highly tolerant and facultative wet description, etc.

Species identified in this study are listed along with corresponding FTI numbers and ratings of those species from the systems developed by Hook and Reed in Appendix E. Among selected tree species shown in Table 6, all species having an FTI number from 2 to 4 are obligate plants (OBL) in the *National List of Plant Species that Occur in Wetlands: Southeast (Region 2)* (Reed 1988) and have a water-logging-tolerance rating of most or highly tolerant (Hook 1984). All listed species except *Pinus taeda* that have an FTI number of 6 to 6.5 are facultative upland (FACU) species (Reed 1988) and are rated by Hook (1984) as the least-tolerant species. *P. taeda* (FTI-6.41) has an indicator status of facultative (FAC) and is rated by Hook as moderately tolerant of waterlogged soils. All species except *Betula nigra* that have an FTI number of 4 to 6 are facultative wet (FACW) or FAC and are rated as moderately or weakly tolerant. *B. nigra*, an obligate species, occurs on well-drained soils, often on natural berms. FTI numbers were computed only for bottomland forests and do not reflect occurrence in other wetland types (e.g., pocosins and Carolina bays); thus, slight deviations from the above pattern should be expected for some species. Also, some species may have genetic variants that possess varying degrees of flood tolerance. Hook et al. (1988) reported that interspecific variation in tolerant to waterlogging exists in loblolly pine (*Pinus taeda*). This variation may also be true of other species.

Although the system using the National Wetlands Inventory (NWI) indicator status (Reed 1988) does not allow comparison of hydrologic definitions, the actual average duration of flooding in this study compared with Hook's (1984) waterlogging tolerance rating definitions yields strong agreement. For example, assuming an average 225-day growing season, the most tolerant rating can be defined as approximately 200 days (Appendix E). The boundary between Zones 2 and 3 (which theoretically would be slightly drier because the designation most tolerant is best compared to Zone 2, not the boundary between Zones 2 and 3) has a duration of inundation/soil saturation that ranges from 92 to 198 days. Highly tolerant ranges from 30 to 90 days versus 20 to 66 days for the Zone 3-4 boundary. Weakly tolerant ranges from 1 to 4 weeks, while the Zone 4-5 boundary ranges from 8 to 31 days. "Least tolerant" is defined as waterlogging for a few days, but usually less than 2 percent of the growing season. Using the 225-day growing season, this condition could be assumed to be 3 or 4 days. The boundary between Zones 5 and 6 varied from less than 1 to 10 days.

Table 6
Comparison of Three Water-Tolerance Ratings for Selected
Bottomland Forest Tree Species

Species	FTI ¹ ± Standard Deviation	NWI ² Status Region 2	Waterlogging Tolerance Rating Group ³
<i>Nyssa aquatica</i>	2.62 ± 0.20	OBL	Most tolerant
<i>Salix nigra</i>	2.83 ± 0.58	OBL	Most tolerant
<i>Fraxinus caroliniana</i>	2.87 ± 0.41	OBL	Most tolerant
<i>Taxodium distichum</i>	2.97 ± 0.61	OBL	Most tolerant
<i>Forestiera acuminata</i>	3.48 ± 0.50	OBL	Most tolerant
<i>Gleditsia aquatica</i>	3.50 ± 0.00	OBL	Highly tolerant
<i>Carya aquatica</i>	3.54 ± 0.34	OBL	Highly tolerant
<i>Quercus lyrata</i>	3.73 ± 0.68	OBL	Highly tolerant
<i>Betula nigra</i>	4.01 ± 1.73	OBL	Moderately tolerant
<i>Diospyros virginiana</i>	4.13 ± 0.82	FAC	Moderately tolerant
<i>Acer rubrum</i>	4.21 ± 0.68	FAC	Moderately tolerant
<i>Fraxinus pennsylvanica</i>	4.44 ± 0.67	FACW	Moderately tolerant
<i>Ulmus americana</i>	4.46 ± 0.62	FACW	Moderately tolerant
<i>Quercus phellos</i>	4.81 ± 1.07	FACW	Moderately tolerant
<i>Acer negundo</i>	4.83 ± 0.47	FACW	Moderately tolerant
<i>Carpinus caroliniana</i>	4.84 ± 0.61	FAC	Weakly tolerant
<i>Celtis laevigata</i>	4.84 ± 0.56	FACW	Weakly tolerant
<i>Liquidambar styraciflua</i>	5.03 ± 0.65	FAC+	Moderately tolerant
<i>Carya illinoensis</i>	5.57 ± 1.01	FAC+	Weakly tolerant
<i>Pinus taeda</i>	6.41 ± 0.14	FAC	Moderately tolerant
<i>Cornus florida</i>	6.50 ± 0.00	FACU	Least tolerant
<i>Fagus grandifolia</i>	6.50 ± 0.00	FACU	Least tolerant
<i>Quercus alba</i>	6.50 ± 0.00	FACU	Least tolerant
<i>Sassafras albidum</i>	6.50 ± 0.00	FACU	Least tolerant

¹ Mean for all study sites

² Taken from Reed (1988); see Appendix A

³ Taken from Hook (1984); see Appendix B

Weighted Averaging

Weighted average estimates of species optima in this study were calculated as FTI values as previously described, with importance values used as the indicator of species abundance at each site.

The use of the weighted averaging approach requires that a number of conditions be met, including: (a) species exhibit unimodal abundance distributions; (b) species optima are equally spaced along the environmental variable; (c) species have equal tolerances of the environmental variable; and (d) species have equal maximum values for the environmental variable. Strict adherence to some of these conditions is not always possible. Additional considerations should also be noted. Species-rich samples should not occur at one end of the gradient. Environmental tolerances of species should not vary substantially. The standard deviation of FTI numbers is an estimate of tolerance in this analysis. Species with narrow tolerances have low FTI numbers and standard deviations, and those with wide tolerance have high standard deviations.

Some of the aforementioned conditions are not strictly met in this study. Although species richness was fairly even across the hydrologic gradient, few species had a peak abundance in Zone 5, perhaps because Zone 5 was under-sampled ($n = 4$) relative to the other zones. The condition of a unimodal abundance distribution is upheld for tree species with peaks in hydrologic Zones 2, 3, and 6, but several species (e.g., *Ilex opaca*, *Quercus nigra*, *Nyssa sylvatica*, and *Liquidambar styraciflua*) exhibit bimodal distributions with peaks in Zones 4 and 6. Again, this pattern may have been influenced by fewer samples being taken in Zone 5. The condition of equal tolerances is also violated somewhat. For instance, those species with abundance peaks in Zones 2 and 6 have narrow tolerances; whereas, those that commonly occur in Zone 4 are also fairly common in other hydrologic zones as well. However, these deviations from the conditions for weighted averaging analysis do not necessarily render the FTI method invalid. Additional analyses were applied to help determine its validity.

Statistical Analysis of the Vegetation Data

To evaluate a method of identifying hydrologic zones based on vegetative associations, the analysis must be based on common species occurring within the region of interest. Species that occur infrequently may be excellent indicators of hydrologic conditions when present, but their limited abundance makes evaluating their usefulness in determining a hydrologic zone difficult. For this reason, species occurring relatively infrequently in this study were not used in testing the validity of the weighted averages (FTI numbers). More than half of the 74 tree species ($n = 44$) recorded had 20 or fewer individuals throughout the study region and, therefore, were not used in the analyses. The remaining 30 tree species accounted for 90.4 percent of the individual trees. One hundred and eighteen species of saplings and shrubs were recorded. Only those

29 species which represented at least one percent or more of the total and together accounted for 78 percent of the total saplings and shrubs data set were used in the statistical analysis. A total of 31 vine species were recorded; the 20 more common species accounted for 96.5 percent of all individuals and were the species analyzed statistically. The herbaceous ground-cover data set contained 268 species. Most occurred only rarely in this study, and only 30 species whose abundances equaled or exceeded 1 percent of the total herb individuals were included in the analysis. These species accounted for 48.9 percent of all individuals in this vegetative category.

Cluster Analyses

A method of calibration suggested by Ter Braak and Prentice (1988) is cluster analysis in which an environmental value (hydrologic zone) is predicted through use of species abundance indicators (relative frequency). In addition to relative frequency, cluster membership was used as a predictor of hydrologic zone. Species were clustered according to similar abundance distributions across the hydrologic gradient.

Cluster analysis was used to group the 30 tree species into five clusters based on the five hydrologic zones. Results (Figure 5) show that, with the exception of chinaberry (MEAZ) and deciduous holly (ILDE), five distinct groups can be discerned. Table 7 gives the relative frequencies of occurrence of each species in each hydrologic zone (species are grouped by cluster). Inspection of the data reveals why chinaberry and deciduous holly did not group readily. Chinaberry is the only species that occurs almost exclusively in Zone 5. Its occurrence is also restricted to a single site. The distribution of deciduous holly peaks in Zones 2 and 3, but not to the extent of other common species in these zones. Because chinaberry and deciduous holly did not group readily, they were eliminated from further analysis.

A closer inspection of Table 7 indicates that the five clusters have modal peaks that correspond, with varying amplitude, to the five hydrologic zones. Trees in cluster 1 are found almost exclusively in Zones 2 and 3. Likewise, trees in cluster 2 occur most commonly in Zone 3. Cluster 5 had the most restrictive distribution, with three of the four species occurring exclusively in Zone 6. The remaining clusters, 3 and 4, had less distinctive modes, but exhibited greater distributions in Zones 4 and 6.

Cluster analysis on the entire sapling and shrub data set did not produce distinct groupings (Figure 6). Silver bell (HADI) was not evaluated further because it occurred at a single site. The data set was split into the two sapling and shrub (bush) components, and cluster analysis was recalculated on each component. The saplings alone ($n = 17$) grouped more distinctly (Figure 7) than the shrubs ($n = 11$) (Figure 8). Shrubs, therefore, were not used in any further analyses. Saplings alone grouped into five distinct groups but not as

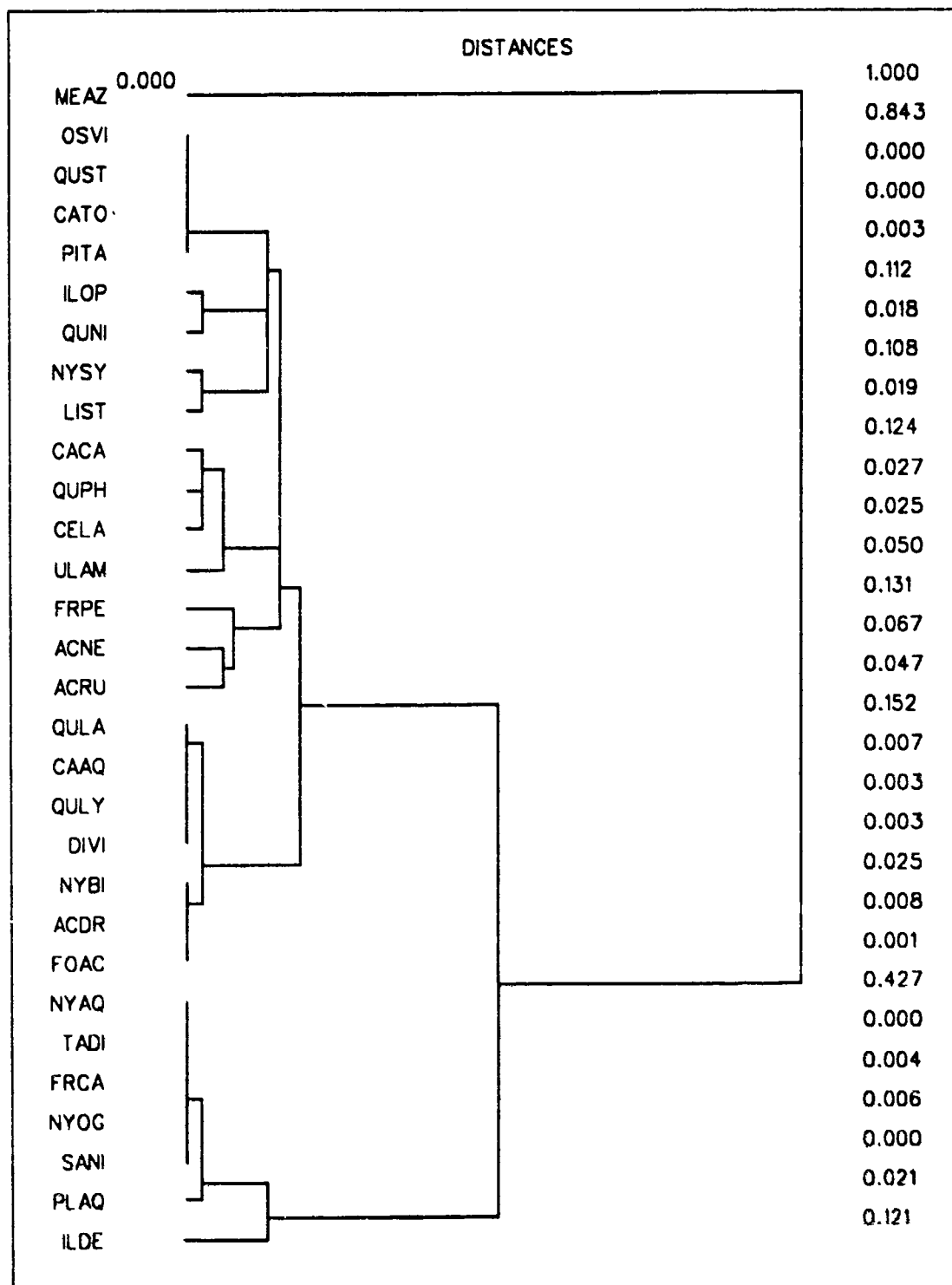


Figure 5. Cluster diagram for trees (Distance metric is 1-Pearson correlation coefficient, single linkage method - nearest neighbor)

Table 7
Relative Frequencies in Each Hydrologic Zone of Tree Species
Used in the Statistical Analyses; Groupings of Species Cor-
respond to Cluster Membership

Species	Hydrologic Zone					Cluster
	2	3	4	5	6	
NYAQ'	85.0	15.0	0	0	0	1
TADI	82.7	15.6	1.8	0	0	
FRCA	79.1	20.9	0	0	0	
NYOG	93.9	6.1	0	0	0	
SANI	96.5	3.5	0	0	0	
PLAQ	67.7	31.6	0.7	0	0	
QULA	0.9	70.1	26.2	0	2.8	2
CAAQ	0.9	80.0	19.2	0	0	
QULY	6.5	72.9	20.0	0.6	0	
DIVI	0	70.6	20.6	2.9	5.9	
NYBI	15.3	84.7	0	0	0	
ACDR	7.1	88.1	4.8	0	0	
FOAC	3.6	94.0	2.4	0	0	
CACA	5	2.8	63.7	17.0	15.9	3
QUPH	0	8.6	74.1	10.3	6.9	
CELA	2.0	9.8	62.8	21.6	3.9	
ULAM	1.9	21.2	50.0	25.0	1.9	
FRPE	0	45.2	42.9	11.9	0	
ACNE	0	31.1	53.3	4.4	11.1	
ACRU	6.8	38.4	52.0	1.4	1.4	
ILOP	0	0	41.7	0	58.3	4
QUNI	0	1.6	32.8	7.4	58.24	
NYSY	0	0	55.9	5.9	38.2	
LIST	0.3	6.0	45.4	14.9	33.3	
OSVI	0	0	0	0	100	5
QUST	0	0	0	0	100	
CATO	0	0	0	0	100	
PITA	0	0	7.3	0	92.7	

* Represents the first two letters of the plant genus and the first two letters of the species name i.e. NYAQ stands for *Nyssa aquatica*. Species codes for all species are identified in Appendix E

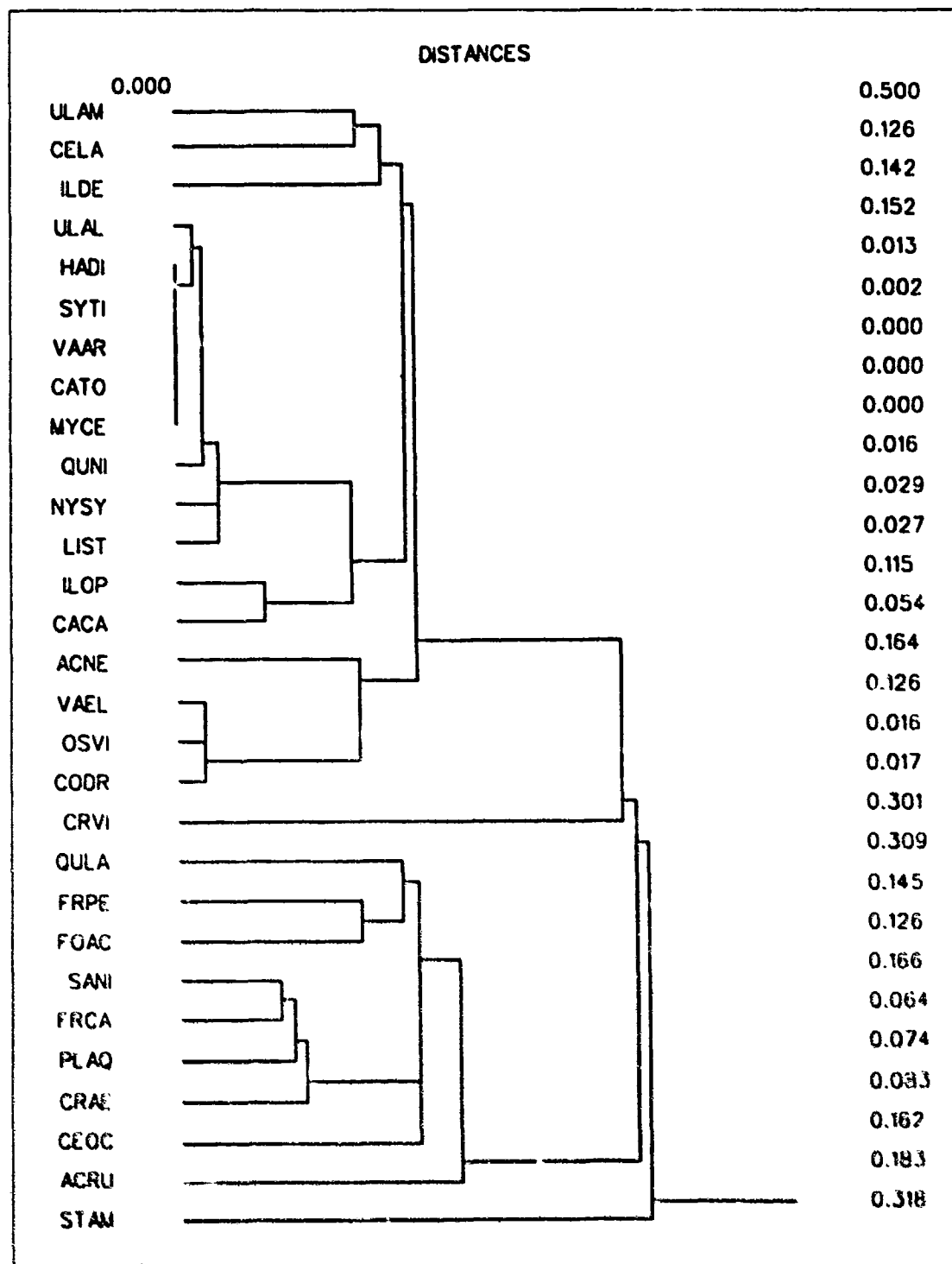


Figure 6 Cluster diagram for saplings and shrubs (Distance metric is 1-Pearson correlation coefficient, single linkage method - nearest neighbor)

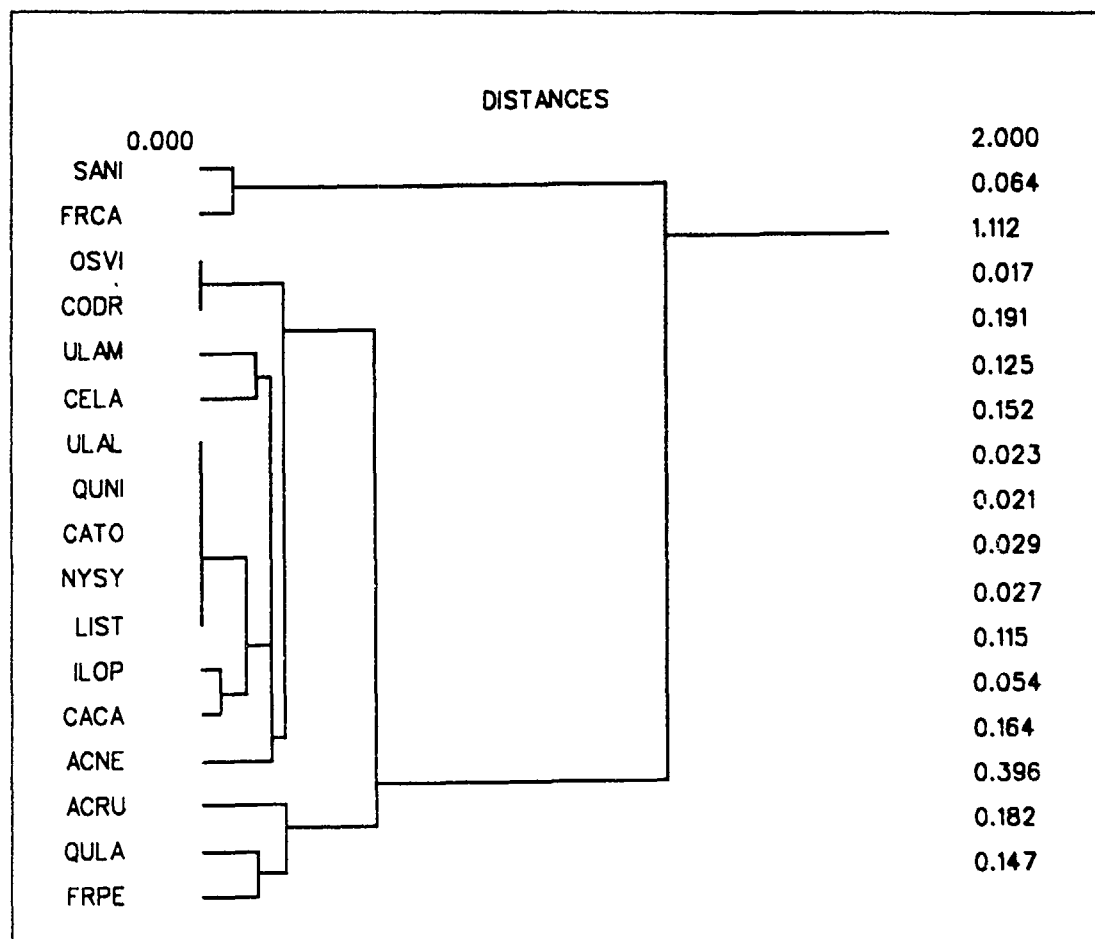


Figure 7. Cluster diagram for saplings alone (Distance metric is 1-Pearson correlation coefficient, single linkage method - nearest neighbor)

strongly as trees. The relative frequency of occurrence and cluster membership of the sapling species are given in Table 8.

The vine data produced five clusters, morning glory (IPWR) being a single species cluster corresponding to Zone 2 (Figure 9). Two vine species poison ivy (TORA) and trumpet creeper (CARA) were not included in larger clusters, largely because of their apparent wide tolerances of hydrologic conditions. Table 9 depicts the relative abundance distributions of each vine species across the hydrologic gradient within a cluster and illustrates a pattern similar to but not as strong as that of the tree species.

The herb data also did not cluster distinctly (Figure 10). Inspection of the abundance distributions of the herbaceous species reveals an absence of strong unimodal peaks that correspond to hydrologic zones; therefore, this vegetative type is less useful in classification. The lack of significant clustering of the shrub and herbaceous data sets was consistent with the results of ordination attempts of the ground layer at Neches River sites by Mohler (1979). Mohler concluded that the herbs and low shrubs were relatively unimportant

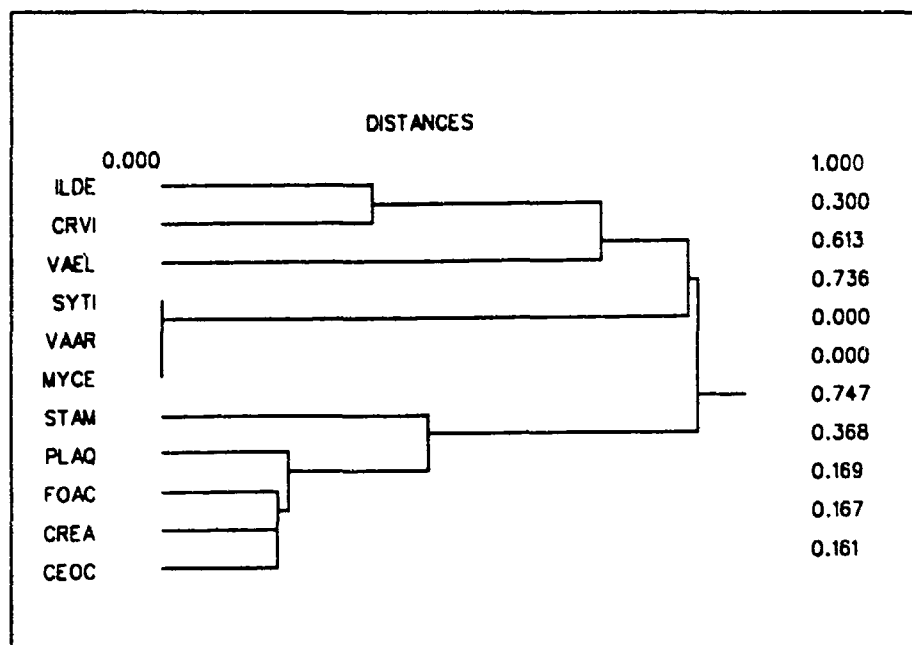


Figure 8 Cluster diagram for shrubs alone (Distance metric is 1-Pearson correlation coefficient, single linkage method - nearest neighbor)

components of the forest when compared to the trees. Clearly, the low shrubs and herbaceous species are more prone to bias due to successional processes and vegetative change caused by local disturbances which may be unrelated to the environmental gradient.

Results of cluster analyses suggest that cluster membership for tree data provide better indicators of hydrologic zones than saplings or vines. Shrubs and herbaceous species would be the least useful of all strata types.

Discriminant Function Analysis

Discriminant function analysis (DFA) is used to determine functions which allow one to classify an individual into one of the hydrologic zones using a number of independent variables. The independent variables in this analysis are the average importance values for each tree cluster and vine cluster in each zone. In cases where only one species in a cluster was present in a zone, that importance value alone was used. Table 10 lists the data set upon which this analysis was based.

Three analyses were performed using DFA. The first analysis developed a classification model using only the importance value from tree clusters. This model correctly classified 47 of 55 sites for an overall misclassification rate of 14.6 percent (Table 11). In all cases, errors involved an assignment to a neighboring zone. For instance, a single Zone 3 site was assigned to Zone 2, and three Zone 6 sites were assigned to Zone 5. The greatest error in

Table 8
Relative Frequency of Occurrence of Each Sapling Species In
the Hydrologic Zones Along with Their Cluster Memberships

Species	2	3	4	5	6	Cluster
SANI	99.4	0.6	0.0	0.0	0.0	1
FRCA	61.0	21.2	2.7	0.0	15.1	
ACRU	1.4	35.8	35.1	4.6	23.0	2
FRPE	0.0	50.0	21.9	21.9	6.3	
QULA	4.7	53.3	36.7	3.6	1.8	
ULAM	0.0	2.0	42.1	32.2	23.7	3
CELA	0.0	13.1	47.5	19.5	19.9	
OSVI	0.0	0.0	0.0	71.2	28.8	4
CODR	0.0	0.0	1.5	80.0	18.5	
ULAL	0.0	0.0	0.8	17.7	81.5	5
QUNI	0.0	0.4	14.2	11.1	74.2	
CATO	0.0	0.0	0.0	0.0	100.0	
NYSY	0.0	0.0	24.7	22.7	52.6	
LIST	0.0	5.4	24.2	14.6	55.8	
ILOP	0.0	0.0	55.5	5.0	39.5	
CACA	0.2	1.4	40.6	15.7	42.0	

classification that occurred for Zone 4 sites was expected because of the greater tolerance of species for this zone. As previously shown (Figure 4), Zone 4 is that portion of the hydrologic gradient that has species common to all three distribution patterns identified. Three Zone 6 sites were assigned to Zone 5 primarily because of the lack of Zone 6 species being identified as commonly occurring. A better agreement would be expected if all species were used.

The second model examined the ability of vine cluster importance values to predict zone. Although vines did not cluster as well as trees, a DFA was examined because their cluster patterns were similar. However, this model correctly classified only 26 of 55 zones for a 52 percent misclassification. This model was not considered adequate, and the results of its classification are not presented.

A final model was generated to examine the effectiveness of using the average site FTI numbers of all observed tree species at a site for each of the 55 sites. This model correctly classified 45 of 55 sites for an overall misclassification rate of 18.2 percent (Table 12). All misclassifications were in an

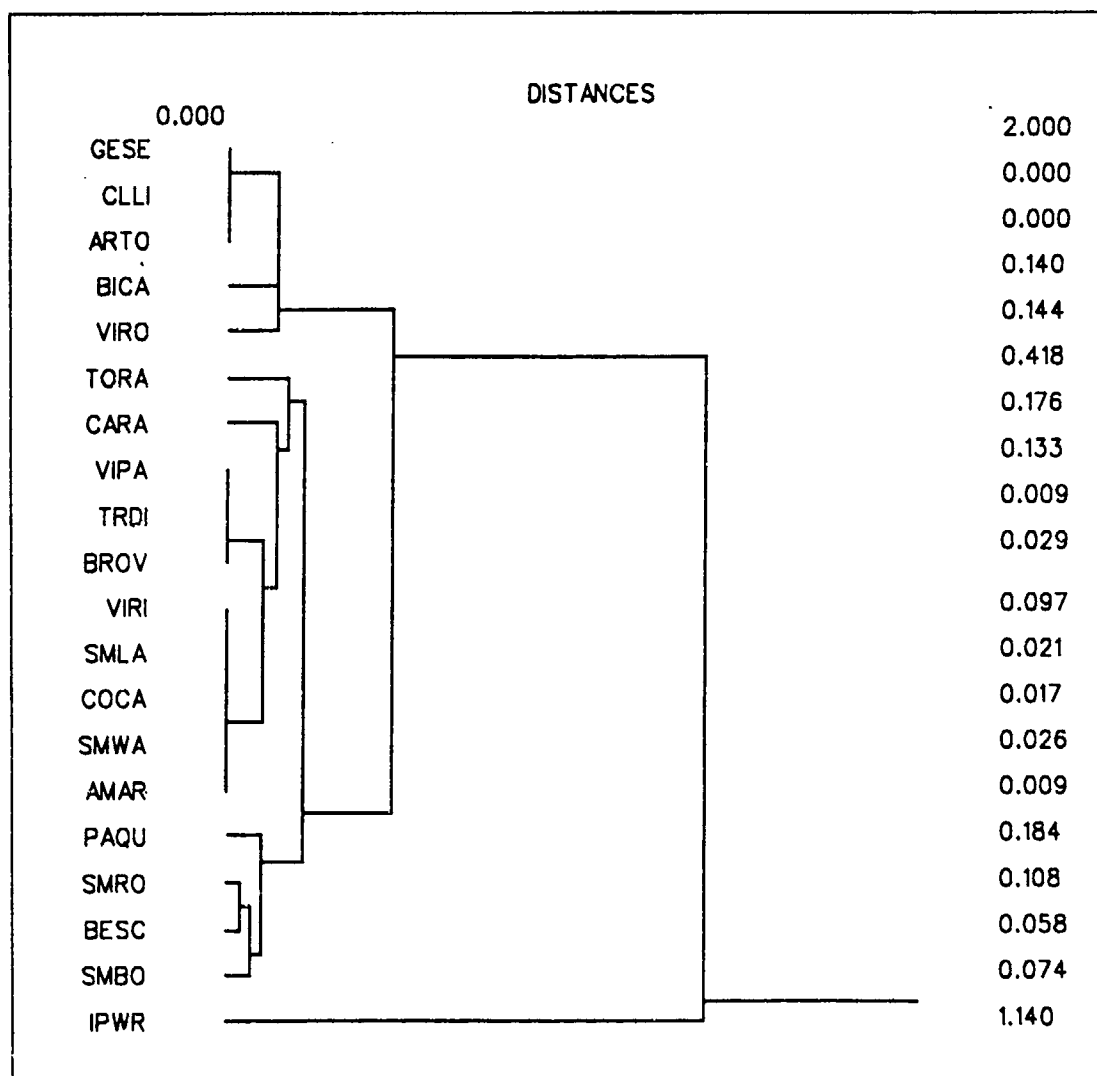


Figure 9. Cluster diagram for vines (Distance metric is 1-Pearson correlation coefficient, single linkage method - nearest neighbor)

adjacent zone. Zones 2, 3, and 5 were misclassified twice; Zone 4 was misclassified 3 times; and Zone 6 was misclassified only once. Using FTI numbers for all observed tree species improved the results obtained in the first DFA using the importance values of only the commonly occurring species.

In examining the data (Table 13), it appears that three of the misclassifications occur at site 10 (Pearl River, observations 27 to 30). The hydrology at this site was obtained from two gauges, and it is possible that an error was made in combining the hydrologic data from the two gauges. It seems ironic that the only zone correctly predicted at this site was Zone 4. Table 13 also shows the percentage probability of each of the 55 sites occurring in a zone.

Figure 11 shows the mean site FTI plotted against the observed and predicted hydrologic zones. As expected, mean FTI numbers were greater than

Table 9
Relative Frequencies in Each Hydrologic Zone of the Vine
Species Used in Statistical Analyses

Species ¹	Hydrologic Zone					Cluster
	2	3	4	5	6	
IPWR	100	0	0	0	0	1
VIPA	0	64.1	30.5	5.5	0	2
TRDI	2.1	70.2	26.9	0	0.8	
BROV	13.4	65.2	17.8	3.6	0	
VIRI	1.0	33.3	43.8	7.6	14.3	
SMLA	1.8	47.4	45.6	0	5.3	3
COCA	0	41.9	52.9	0	5.2	
SMWA	9.1	36.4	53.8	0	0.7	
AMAR	13.2	37.2	46.3	0	3.3	
PAQU	1.5	55.9	2.2	40.4		4
SMRO	0	2.4	71.4	7.1	19.1	
BESC	4.6	13.7	61.1	14.5	6.1	
SMBO	6.7	13.3	43.3	26.7	10.0	
GESE	0	0	0	0	100	5
CLLI	0	0	0	0	100	
ARTO	0	0	0	0	100	
BICA	0	19.8	3.1	25.0	52.1	
VIRO	1.6	6.0	20.0	24.4	48.0	

¹ Groupings of species correspond to cluster membership.

the observed hydrologic zones at the low end (Zone 2) and less than the zones at the upper end (Zone 6) of the hydrologic gradient due to the lack of outlying zones (e.g., Zones 1 and 7) to pull these averages toward either extreme. Therefore, using DFA classification decision points show that average site FTI numbers as high as 3.45 would still be in Zone 2, and average site FTI numbers as low as 5.33 would still be in Zone 6. The lower end of the predicted Zone 4 (4.16) compares favorably with the observed (4.0). Zone 5 predicted and observed zone values are the same (5.0).

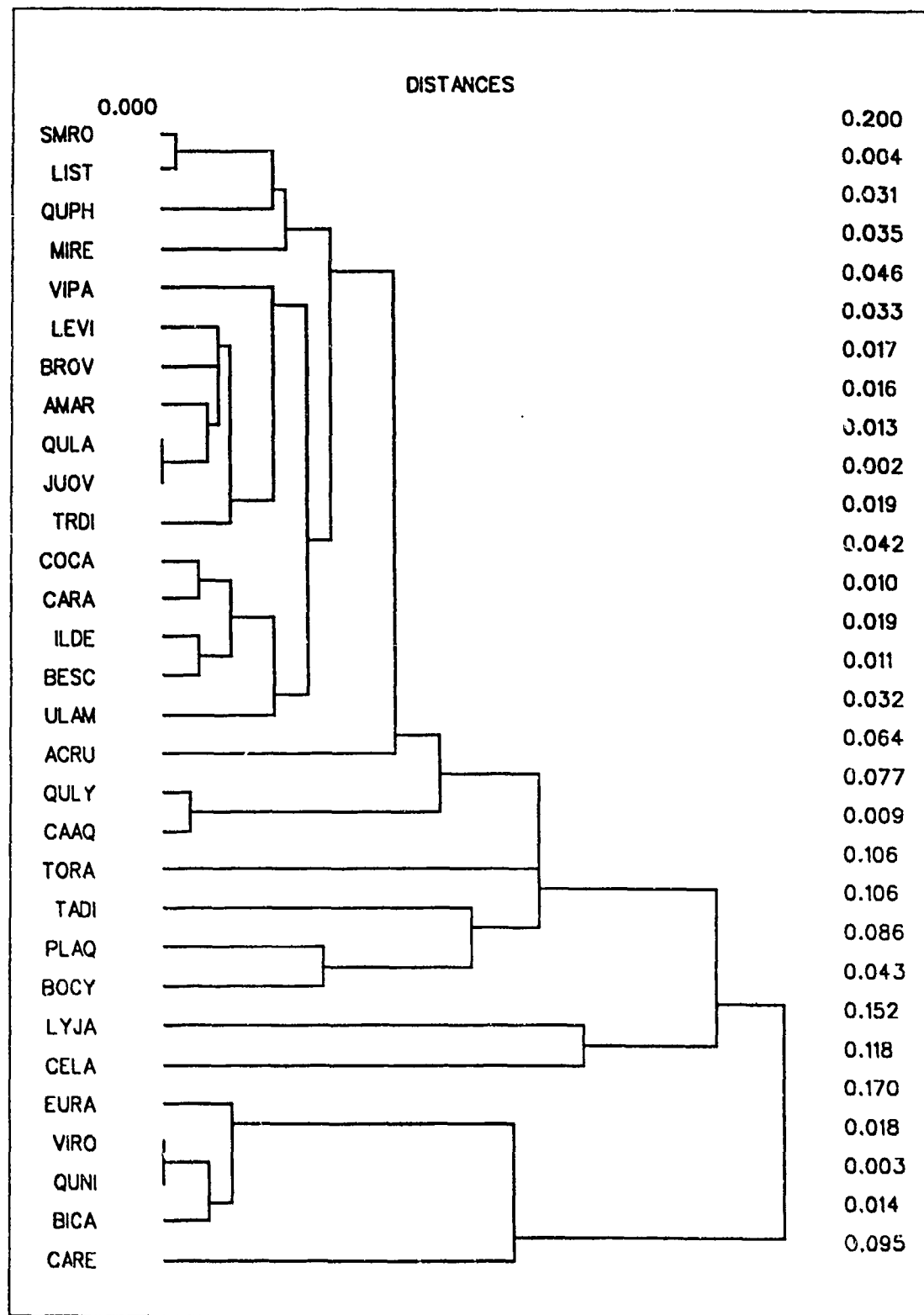


Figure 10. Cluster diagram for herbs (Distance metric is 1-Pearson correlation coefficient, single linkage method - nearest neighbor)

Table 10
Mean Importance Values for Species in Each Cluster Used in
the DFA, Arranged by Zone/Sample

Zone	TC1 ¹	TC2	TC3	TC4	TC5	VC2	VC3	VC4	VC5
2	78.77	0	0	0	0	0	0	0	0
2	70.26	0	0	0	0	0	0	0	0
2	55.12	0	0	0	0	0	0	0	0
2	91.7	8.26	8.32	0	0	64.06	0	203.9	0
2	62.38	0	0	0	0	0	0	0	0
2	83.49	21.16	9.48	5.66	0	0	103.24	0	162.5
2	73.45	6.19	0	0	0	141.17	38.76	53.5	0
2	68.41	12.58	0	0	0	112.22	32.13	0	11.33
2	58.62	32.76	0	0	0	0	41.32	0	0
2	58.12	4.19	0	0	0	0	300	0	0
2	74.53	33.22	3.34	0	0	300	0	0	0
3	29.57	39.47	0	8.4	0	101.56	63.02	33.87	0
3	30.3	47.5	0	19.12	0	68.2	47.04	0	0
3	0	50.08	26.13	0	0	12.98	65.86	8.65	0
3	0	71.81	0	0	0	100	0	0	0
3	24.37	66.92	7.92	0	0	93.14	0	4.89	0
3	22.84	84.85	22.59	0	0	51.13	16.28	5.57	0
3	99.86	25.52	6.41	0	0	82.8	45.12	0	0
3	30	47.29	11.72	0	0	53.87	32.81	18.92	0
3	0	85.22	13.67	11.78	0	19.27	28.8	22.65	58.54
3	32.72	54.74	10.42	0	0	89.33	78.78	0	53.11
3	7.39	48.01	16.18	37.94	0	4.2	34.88	0	12.78
3	39.94	56.21	14.8	15.66	0	0	233.26	0	0
3	10.06	99.1	47.87	13.23	0	0	144.56	47.53	5.97
3	44.79	43.95	17.52	0	0	130.77	0	0	0
3	11.06	48.2	36.72	0	0	0	0	0	0
4	0	15.04	65.41	31.36	0	135.02	0	28.46	23.4
4	0	6	52.66	40.82	0	76.47	5.96	7.9	59.12
4	0	72.7	41.12	20.82	0	13.16	24.22	8.55	8.83

(Continued)

¹ TC1 indicates tree cluster 1, VC2 indicates vine cluster 2.

Table 10 (Concluded)

Zone	TC1	TC2	TC3	TC4	TC5	VC2	VC3	VC4	VC5
4	5.94	40.19	66.29	48.27	0	30.2	68.16	25.77	0
4	16.64	31.88	155.17	34.4	0	73.4	79.8	0	0
4	0	8.35	52.08	72.63	0	5.46	13.51	42.44	0
4	0	0	40.72	126.62	0	30.46	28.14	28.88	0
4	0	17.68	21.24	81.27	0	5.74	25.98	5.97	76.54
4	10.3	12.76	18.17	187.41	0	40.49	13.95	9.71	81.55
4	0	55.18	33.31	35.37	0	5.21	44.58	60.2	25.9
4	0	7.69	19.56	67.09	0	0	0	16.41	84.39
4	0	69.09	27.28	27.85	14.53	9.97	58.12	6.32	0
4	0	0	42.94	31	18.46	0	125.37	0	150
4	0	28.79	56.29	0	0	44.81	22.4	88.65	0
5	0	0	22.97	76.73	0	4.34	17.4	16.49	9.3
5	0	0	26.84	64.91	0	15.28	0	10.36	51.22
5	0	5.81	13.86	64.23	0	6.84	0	14.87	73.04
5	0	6.02	39.94	28.87	0	0	39.86	9.59	155.82
6	0	0	35.05	29.44	26.42	0	0	0	150
6	0	0	10.82	21.19	53.32	0	0	27.3	136.35
6	0	0	35.32	33.28	0	0	24.69	26.87	52.85
6	0	5.66	5.8	71.55	0	0	3.75	14.2	54.37
6	0	4.61	26.58	50.91	0	5.3	0	17.08	49.18
6	0	0	11.79	15.8	34.58	0	11.21	14.04	55.3
6	0	0	6.06	12.3	36.91	0	52.25	10.44	49.67
6	0	16.54	0	20.22	69.98	0	0	0	96.96
6	0	0	0	29.17	154.4	4.35	6.12	4.35	114.03
6	0	0	0	59.44	89.43	0	0	0	0
6	0	0	0	71.67	120.16	0	0	90.37	5.84

Table 11
Predicted Hydrologic Zones (Columns) and Actual Zones (Rows)
Based on DFA Results Using Only Tree Importance Values

Actual Hydrologic Zones	Predicted Hydrologic Zones ¹					
	2	3	4	5	6	Total
2	11	0	0	0	0	11
3	1	14	0	0	0	15
4	0	2	10	2	0	14
5	0	0	0	4	0	4
6	0	0	0	3	8	11
	12	16	10	10	8	55

¹ Misclassification rate = 14.6 percent.

Table 12
Predicted Hydrologic Zones (Columns) and Actual Zones (Rows)
Based on DFA Results Using Average FTI Values for All Observed Tree Species at the Site

Actual Hydrologic Zones	Predicted Hydrologic Zones ¹					
	2	3	4	5	6	Total
2	9	2	0	0	0	11
3	0	13	2	0	0	15
4	0	2	11	1	0	14
5	0	0	2	2	0	4
6	0	0	0	1	10	11
	9	17	15	4	10	55

¹ Misclassification rate = 18.2 percent.

Table 13
Cross-Validation Results of Zone Membership Using Linear
Discriminant Function Analysis

Observation	From Zone	To Zone	Posterior Probability of Membership In Zone		
			2 5	3 6	4
1	2	2	0.9876 0.0000	0.0124 0.0000	0.0000
2	3	3	0.1759 0.0000	0.8212 0.0000	0.0029
3	4	4	0.0000 0.1019	0.0062 0.0001	0.8919
4	6	6	0.0000 0.0075	0.0000 0.9924	0.0000
5	2	2	0.9876 0.0000	0.0124 0.0000	0.0000
6	3	3	0.2436 0.0000	0.7548 0.0000	0.0016
7	4	4	0.0000 0.0361	0.0376 0.0000	0.9263
8	6	6	0.0000 0.0007	0.0000 0.9993	0.0000
9	2	2	0.9801 0.0000	0.0199 0.0000	0.0000
10	3	3	0.0137 0.0001	0.8865 0.0000	0.0997
11	4	4	0.0000 0.0526	0.0202 0.0000	0.9273
12	5	5	0.0000 0.6341	0.0000 0.0993	0.2666
13	6	6	0.0000 0.0958	0.0000 0.9016	0.0026
14	3	3	0.1244 0.0000	0.8703 0.0000	0.0052
15	4	3 ¹	0.0012 0.0025	0.5429 0.0000	0.4534
16	3	3	0.0597 0.0000	0.9245 0.0000	0.0158
17	4	4	0.0003 0.0075	0.2747 0.0000	0.7175
(Sheet 1 of 3)					
¹ Misclassified observation.					

Table 13 (Continued)					
Observation	From Zone	To Zone	Posterior Probability of Membership in Zone		
			2 5	3 6	4
18	3	3	0.0806 0.0000	0.9092 0.0000	0.0103
19	4	4	0.0000 0.1909	0.0017 0.0005	0.8069
20	2	3 ¹	0.1909 0.0000	0.8079 0.0000	0.0013
21	3	3	0.0748 0.0000	0.9138 0.0000	0.0114
22	4	4	0.0000 0.0594	0.0163 0.0000	0.9242
23	3	3	0.2436 0.0000	0.7548 0.0000	0.0016
24	4	4	0.0008 0.0036	0.4558 0.0000	0.5398
25	3	3	0.0150 0.0001	0.8945 0.0000	0.0904
26	6	6	0.0000 0.0002	0.0000 0.9998	0.0000
27	2	3 ¹	0.0205 0.0000	0.9672 0.0000	0.0124
28	3	4 ¹	0.0011 0.0027	0.4321 0.0000	0.5641
29	4	4	0.0000 0.1286	0.0039 0.0002	0.8673
30	6	5 ¹	0.0000 0.6307	0.0000 0.0044	0.3649
31	2	2	0.8970 0.0000	0.1030 0.0000	0.0000
32	3	3	0.3105 0.0000	0.6886 0.0000	0.0009
33	4	4	0.0000 0.0526	0.0202 0.0000	0.9273
34	5	4 ¹	0.0000 0.3664	0.0003 0.0060	0.6274
	4	3 ¹	0.0014 0.0021	0.5719 0.0000	0.4246
(Sheet 2 of 3)					
¹ Misclassified observation					

Table 13 (Concluded)					
Observation	From Zone	To Zone	Posterior Probability of Membership in Zone		
			2 5	3 6	4
36	5	4 ¹	0.0000 0.4502	0.0001 0.0119	0.5378
37	6	6	0.0000 0.0785	0.0000 0.9196	0.0019
38	2	2	0.9503 0.0000	0.0497 0.0000	0.0000
39	3	3	0.2436 0.0000	0.7548 0.0000	0.0016
40	4	4	0.0000 0.4057	0.0002 0.0047	0.5894
41	6	6	0.0000 0.0013	0.0000 0.9987	0.0000
42	2	2	0.9332 0.0000	0.0668 0.0000	0.0000
43	5	5	0.0000 0.6216	0.0000 0.0699	0.3085
44	6	6	0.0000 0.0013	0.0000 0.9987	0.0000
45	2	2	0.9503 0.0000	0.0497 0.0000	0.0000
46	3	4 ¹	0.0001 0.0093	0.1163 0.0000	0.8743
47	6	6	0.0000 0.0015	0.0000 0.9985	0.0000
48	2	2	0.8729 0.0000	0.1271 0.0000	0.0000
49	3	3	0.2144 0.0000	0.7835 0.0000	0.0020
50	4	4	0.0000 0.1806	0.0020 0.0005	0.8170
51	6	6	0.0000 0.0011	0.0000 0.9989	0.0000
52	2	2	0.7969 0.0000	0.2031 0.0000	0.0000
54	4	5 ¹	0.0000 0.7509	0.0000 0.0739	0.1753
(Sheet 3 of 3)					
¹ Misclassified observation					

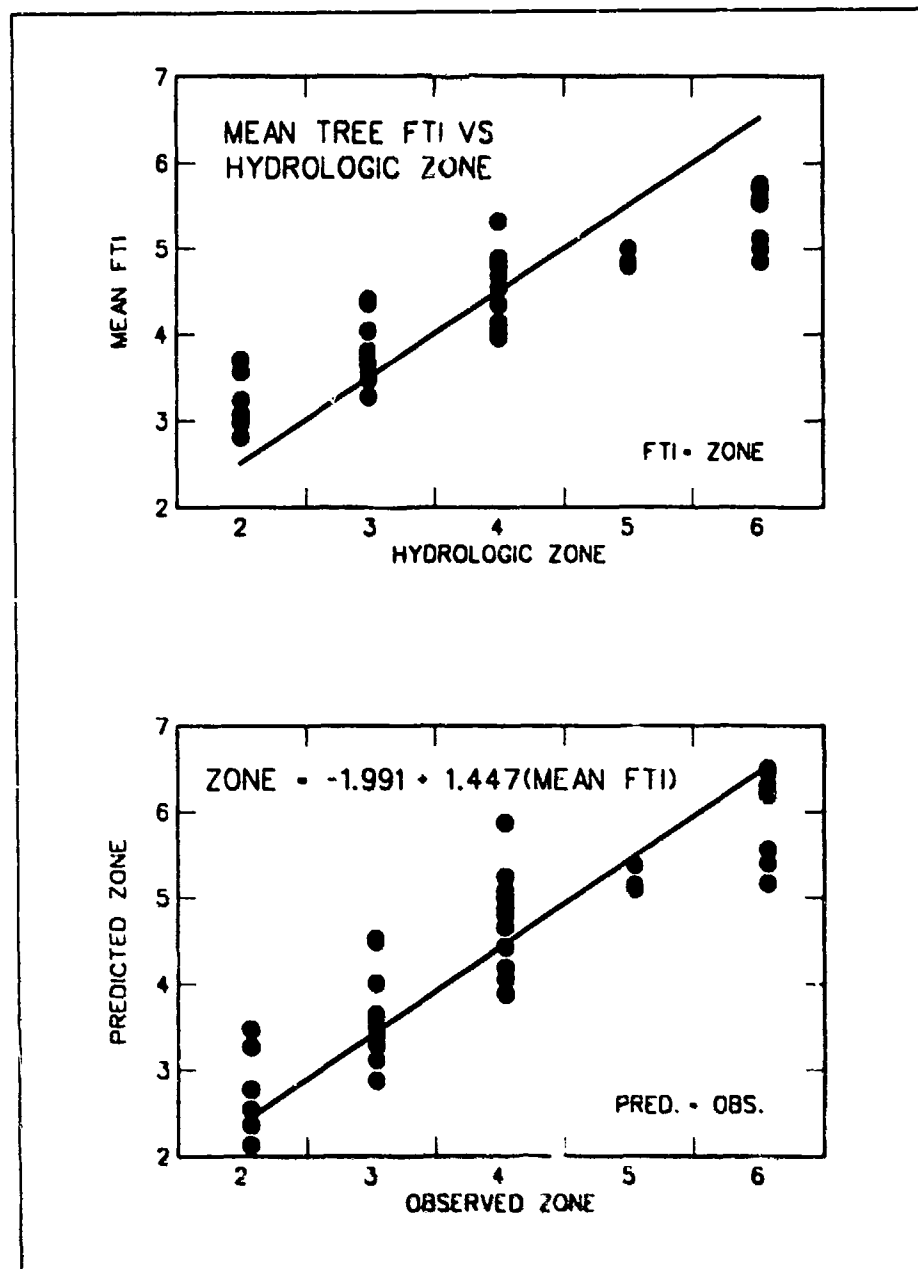


Figure 11. Mean tree FTI numbers plotted versus observed and predicted hydrologic zones for all 55 sites

Regional Variation in Species FTI Numbers

Because the 17 sites in this study occur over a broad geographic area, the possibility of regional differences in species FTI numbers was a concern. To test for possible differences, the sites were grouped into three regions: Gulf

Coast (sites 1, 2, 10, 11, 12), Mississippi Valley (sites 3 through 9), and Atlantic Coast (sites 13 through 17).

A two-factor analysis of variance (ANOVA) was used to test for differences in importance values between regions and clusters for trees. There was no significant interaction between region and cluster trees ($F = 0.71$, $p = 0.68$); therefore, importance values of species within a cluster do not differ among regions. There was a significant difference between regions ($F = 4.02$, $p = 0.019$), reflecting the fact that importance values of trees were greater in the Mississippi Valley, averaging 49.1 ± 47.6 , than the Gulf Coast (37.5 ± 37.2) and Atlantic Coast (39.3 ± 34.4) regions. A number of factors may contribute to this phenomenon, including stand maturity and localized disturbances.

Another two-factor ANOVA also was used to determine whether the predicted zone values generated were more accurate in one region or another. The absolute value of the difference between the predicted and actual zones was used as the dependent variable. There was neither an interaction ($F = 1.44$, $p = 0.18$), nor a main effect ($F = 1.54$, $p = 0.22$) involving region, thus indicating that the hydrologic zones can be predicted with equal accuracy among the specified regions.

4 Summary and Conclusions

Bottomland hardwood forests are dynamic and complex systems. Frequent flooding from adjacent streams provides the forcing function that characterizes the affected plant communities. Frequency and duration of floodwater determine the extent of anaerobic soil conditions that directly affect plant populations. Plant species adapted for life in anaerobic soil conditions are located in the topographically lowest areas subject to long duration flooding. Species composition changes as the elevational and associated moisture gradient changes from wettest to driest and reflects species adaptations to the prevailing hydrologic regimes.

Determination of a hydrologic gradient often requires extensive data gathering over a long period. However, many studies have shown that a definite relationship exists between plant species and the timing, frequency, and duration of inundation and soil saturation (Larson et al. 1981). This study was undertaken to express quantitatively the optimum position of various plant species along a hydrologic gradient.

Previous studies have estimated the location of plant species and communities along a hydrologic gradient. Various systems have been proposed that use vegetation to predict the duration and/or frequency of flooding. However, previous studies were limited to a small geographic area, the developed systems are qualitative, and vegetation data used to predict the degree of flooding for the entire southeastern United States previously have been literature-based involving many studies with varying research designs.

Vegetation data resulting from this study related four vegetation strata and three life forms occurring in 55 stands at 17 sites throughout the southeastern United States. Hydrologic regimes were calculated for a 10- to 20-year period of record for each stand. A flood tolerance index (FTI) system of weighted averages based on importance values was developed, and FTI numbers were calculated for various life stages of each species identified in the study.

Three hundred and twelve species were identified for each of 4 strata in the study including 74 tree species, 188 species of saplings and shrubs, 31 species of woody vines, and 268 species of herbs and woody seedlings. Comparison of the FTI numbers with two other systems (Hook 1984, Reed 1988) using

vegetation to estimate wetness showed general agreement among the systems, especially for mature trees.

Cluster analysis and discriminant function analysis were used to evaluate the weighted averaging technique and explore the best method for using the FTI numbers in predicting hydrologic regimes.

Tree, sapling, and vine data clustered into distinct groups. Herbaceous and shrub data did not group distinctively. Tree and vine importance values for each cluster in a zone/sample (data taken in a single zone at a site) and FTI numbers for tree data were used as independent variables for the discriminant function analyses. Tree species were found to be more useful than saplings, shrubs, vines, or herbaceous species in predicting hydrologic zones. The tree data alone using importance values provided 85 percent accuracy. Tree data alone using FTI numbers was only slightly less accurate at 82 percent. All misclassifications assigned membership to a neighboring zone. Misclassifications are understandable for two important reasons. Zone 4 contains the more facultative species because as wetness decreases, other environmental conditions begin to exert greater influence. Also, since Zone 5 is so narrow compared to other zones and most species occurring in Zone 5 occur in greater abundance in either Zone 4 or 6, very little difference in the community structure exists between the top of Zone 4 and the bottom of Zone 6.

The accuracy of these predictions may be somewhat inflated, because hydrologic zone was a parameter used to derive species FTI numbers.

There were no regional (Gulf Coast, Lower Mississippi Valley, and Atlantic Coast) differences in the accuracy of the weighted averaging and predicted values. Therefore, a single FTI number calculated for each species can be used to predict zones for the entire study area.

The implication of this study is that the calculated FTI numbers can be used to estimate hydrologic regimes in bottomland forest systems of the southeastern United States. Trees were determined to be the most reliable vegetative growth form for determining hydrologic zones. However, this study was conducted in relatively undisturbed areas. Because trees can remain for decades following hydrologic disturbance, a modification of the method using saplings and seedlings may prove to be more reliable.

Techniques used in this study to develop FTI numbers in the southeastern United States may be applicable to regions of the country that have similar types of riverine forest systems.

References

- Bailey, R. G. (1980). "Description of the ecoregions of the United States," Miscellaneous Publication No. 1391, U.S. Department of Agriculture, Washington, DC.
- Bedinger, M. S. (1971). "Forest species as indicators of flooding in the Lower White River Valley, Arkansas," U.S. Geological Survey Professional Paper 750-C, Geological Survey Research, C248-C253.
- _____. (1978). "Relation between forest species and flooding." *Wetland functions and values: The state of our understanding; Proceedings of the national symposium on wetlands*. P. E. Greeson, J. R. Clark, and J. E. Clark, ed., American Water Resources Association, Minneapolis, 427-435.
- Best, R. G., Segal, D. S., and Wolfe, C. (1990). Soil-vegetation correlations in selected wetlands and uplands of north-central Florida," Biological Report 90(9).
- Bray, J. R. (1956). "A study of natural occurrence of plant species," *Ecology* 37:21-28.
- Brinson, M. M. (1990). "Riverine forests. *Ecosystems of the world: Forested wetlands* 15, A. E. Lugo, M. Brinson, and S. Brown, ed., Elsevier, New York, 87-141.
- Broadfoot, W. M., and Williston, H. L. (1973). "Flooding effects on southern forests," *J. For.* 71:584-587.
- Brown, R. T., and Curtis, J. T. (1952). "The upland conifer-hardwood forests of northern Wisconsin," *Ecol. Monogr.* 22:217-234.
- Brown, S. (1981). "A comparison of the structure, primary productivity, and transpiration of cypress ecosystems in Florida," *Ecol. Monogr.* 51(4):403-427.

- Bruckner, W., Bowersox, T.W., and Ward, W. W. (1973). "Response of trees to flooding at the Curwensille Reservoir," Pennsylvania State University, University Park, PA.
- Cannon, W. A., and Free, E. E. (1920). *Root adaptation to deficient soil aeration*. Yearbook Vol 19, Carnegie Institution of Washington, Washington, DC.
- Chambless, L. F., and Nixon, E. S. (1975). Woody vegetation-soil relations in a bottomland forest of east Texas," *Texas Journal of Science* XXVI (3, 4), 407-416.
- Clark, J. R., and Benforado, J., ed. (1981). *Wetlands of bottomland hardwood forests*. Elsevier, New York.
- Clements, F. E. (1916). "Plant succession," Publication 242, Carnegie Institution of Washington, Washington, DC.
- Conway, V. M. (1940). "Aeration and plant growth in wet soils," *Bot. Rev.* 6:149-163.
- Curtis, J. T. (1959). *The vegetation of Wisconsin: An ordination of plant communities*. University of Wisconsin Press, Madison, WI.
- Curtis, J. T., and McIntosh, R. P. (1951). "An upland forest continuum in the prairie-forest border region of Wisconsin," *Ecology* 32:476-496.
- Daubenmire, R. (1968). *Plant communities; A textbook of plant synecology*. Harper & Row, New York.
- Dickson, R. E., Hosner, J. F., and Hosley, N. W. (1965). "The effects of four water regimes upon the growth of four bottomland tree species," *For. Sci.* 11:299-305.
- Dubinina, J. M. (1961). "Metabolism of roots under various conditions of aeration," *Soviet Plant Physiology* 8:314-322.
- Faulkner, S. P., Patrick, W. H., Jr., Parker, W. B., Gambrell, R. P., and Good, B. J. (1991). "Characterization of soil processes in bottomland hardwood wetland-nonwetland transition zones in the lower Mississippi River Valley," Contract Report WRP-91-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Gleason, H. A. (1917). "The structure and development of the plant association," *Torrey Bot. Club Bull.* 44:463-481.
- Grubb, P. J. (1977). "The maintenance of species-richness in plant communities: the importance of the regeneration niche," *Bibl. Rev.* 52:107-145.

- Hall, T. F., and Smith, G. E. (1955). "Effects of flooding on woody plants, West Sandy Dewatering Project, Kentucky Reservoir," *J. For.* 53:281-285.
- Hodges, J. D., and Switzer, G. L. (1979). Some aspects of the ecology of southern bottomland hardwoods," Journal Paper 4087, Mississippi Agricultural and Forestry Experiment Station, Stoneville, MS, 360-365.
- Hook, D. D., and Brown, C. L. (1973). "Root adaptations and relative flood tolerance of five hardwood species," *For. Sci.* 19:225-229.
- Hook, D. D., and Crawford, R. M. M., ed. (1980). *Plant life in anaerobic environments*. Ann Arbor Science Publishers, Ann Arbor, MI.
- Hook, D. D., McKee, W. H., Jr., Smith, H. K., Gregory, J., Burrell, V. G., Jr., DeVoe, M. R., Sojka, R. E., Gilbert, S., Banks, R., Stolzy, L. H., Brooks, C., Matthews, T. D., and Shear, T. H., ed. (1988). *The ecology and management of wetlands*. Timber Press, Portland, OR.
- Hook, D. D., and Scholtens, J. R. (1978). Adaptations and flood tolerance of tree species," *Plant life in anaerobic environments*. D. D. Hook and R. M. M. Crawford, ed., Ann Arbor Science Series Inc., Ann Arbor, MI, 299-311.
- Hook, D. H. (1984). "Waterlogging tolerance of lowland tree species of the south," *South. J. Appl. Forest.* 8(3):136-49.
- Hosner, J. F., and Boyce, S. G. (1962). "Tolerance to water saturated soil of various bottomland hardwoods," *For. Sci.* 8:180-186.
- Huenneke, L. F., and Sharitz, R. R. (1986). "Microsite abundance and distribution of woody seedlings in a South Carolina cypress-tupelo swamp," *American Midland Naturalist* 115(2):328-335.
- Huffman, R. T. (1980). "The relationship of flood timing and duration to variation in selected bottomland hardwood communities of southern Arkansas," Miscellaneous Paper EL-80-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Hupp, C. R., and Osterkamp, W. R. (1985). "Bottomland vegetation distribution along Passage Creek, Virginia, in relation to fluvial landforms," *Ecological Society of America* 66(3):670-681.
- Kangas, P. C. (1990). "An energy theory of landscape for classifying wetlands," *Ecosystems of the world: Forested Wetlands* 15, Elsevier, New York.

- Larson, J. S., Bedinger, M. S., Bryan, C. F., Brown, S., Huffman, R. T., Miller, E. L., Rhodes, D. G., and Touchet, B. A. (1981). "Transition from wetlands to uplands in southeastern bottomland hardwood forests," *Wetlands of bottomland hardwood forests*. J. R. Clark and J. Benforado, ed., Elsevier, New York.
- Leitman, H. M., Sohm, J. E., and Franklin, M. A. (1984). "Wetland hydrology and tree distribution of the Apalachicola River floodplain, Florida," Water-Supply Paper 2196-A, U.S. Geological Survey, Washington, D.C.
- McIntosh, R. P. (1980). "The background and some current problems of the theoretical ecology," *Synthese* 43:195-255.
- Mitsch, W. J., and Gosselink, J. G. (1986). *Wetlands*. Van Nostrand Reinhold, New York.
- Mohler, C. L. (1979). "An analysis of floodplain vegetation of the lower Neches drainage, southwest Texas, with some considerations on the use of regression and correlation in plant synecology," Dissertation, Cornell University, Dissertation Abstracts International No. 792633, Ithaca, NY.
- Patrick, W. H., Jr., Delaune, R. D. (1976). "Nitrogen and phosphorus utilization by *Spartina alterniflora* in a salt marsh in Barataria Bay, Louisiana: Estuarine," *Coast. Mar. Sci.* 4:59-64.
- Patrick, W. H., Jr., and Mikkelsen, D. S. (1971). "Plant nutrient behavior in flooded soil," *Fertilizer technology and use*, 2d ed. Soil Science Society of America, Madison, WI.
- Pearsall, W. H., and Mortimer, C. H. (1939). "Oxidation and reduction potentials in waterlogged soils, natural waters and muds," *J. Ecol.* 27:483-501.
- Ponnamperuma, F. N. (1972). "The chemistry of submerged soils," *Adv. Agron.* 24:29-96.
- Putnam, J. A., Furnival, G. M., and McKnight, J. S. (1960). "Management and inventory of southern hardwoods," Forest Service Agricultural Handbook 181, U.S. Department of Agriculture, Washington, DC.
- Reed, P. B., Jr. (1988). "Wetland plants of the United States of America 1988," U.S. Fish and Wildlife Service, St. Petersburg, FL, WELUT-88/W17.01.
- Roelle, J. E., Auble, G. T., Hamilton, D. B., Johnson, R. L., and Segelquist, C. A., ed. (1987). Results of a workshop concerning ecological zonation in bottomland hardwoods," U.S. Fish and Wildlife Service, National Ecology Center, Ft. Collins, CO, NEC-87/14.

Ter Braak, C. J. F., and Prentice, I. C. (1988). "A theory of gradient analysis," *Advances in Ecological Research* 18:271-313.

U.S. Department of Agriculture. (1982). *National list of scientific plant names*, Soil Conservation Service, Washington, DC, SCS-TP-159.

Van Der Valk, A. G. (1981). "Succession in wetlands; A Gleasonian approach," *Ecology* 62(3):688-696.

Vester, G. (1972). "The physiology of flooding tolerances in trees," *Bot. Sci. Edinb. Trans.* 41(4):556-557.

Whittaker, R. H. (1956). "Vegetation of the Great Smoky Mountains," *Ecol. Monogr.* 26:1-69.

_____. (1967). "Gradient analysis of vegetation," *Biol. Rev.* 49:207-264.

_____. (1973). "Direct gradient analysis: Techniques," *Ordination and classification of communities. Handbook of vegetation science* 5:7-31, Junk, the Hague.

_____. (1978). *Ordination of plant communities*. Junk the Hague.

Whittaker, R. H., and Niering, W. A. (1965). "Vegetation of the Santa Catalina Mountains, Arizona: A gradient analysis of the south slope," *Ecology* 46:429-452.

Appendix A

Site Descriptions and Map

Locations

Neches River (Sites 1 and 2)

Location (Neches River Basin)

These sites are located in the National Big Thicket Preserve, Jack Gore Baygall unit, 6.4 km north of Evadale in Jasper County, Texas. Reference U.S. Geological Survey (USGS) map, Silsbee, Texas, N3015-W9400/15, 1955.

Hydrology data

Twenty years of hydrology data were obtained for a staff gauge on U.S. Highway 96 bridge at Evadale. Slope correction from gauge datum to study site was determined by using a water surface profile.

General vegetation

Plant communities range from *Taxodium distichum*-*Nyssa aquatica* in deep sloughs to *Quercus alba*-*Pinus taeda* and *Fagus grandifolia* on the nearby ridges. Intermediate communities consist of *Quercus lyrata*, *Carya aquatica*, *Quercus michauxii*, *Liquidambar styraciflua*, *Ulmus americana*, and *Carpinus caroliniana*.

Soils and climate

Soils vary from the very poorly drained Angelina series in sloughs to the moderately well-drained Spruger series on ridges. Other soil series encountered were Bleakwood, Urbo, and Attoyac. Average annual rainfall in the area is 170 cm, and the average growing season is 234 days.

Delineated zones

Zones 2, 3, 4, and 6 were delineated for both sites. Zone 5 was too narrow to reliably delineate because of its position on the slope of the floodplain terrace.

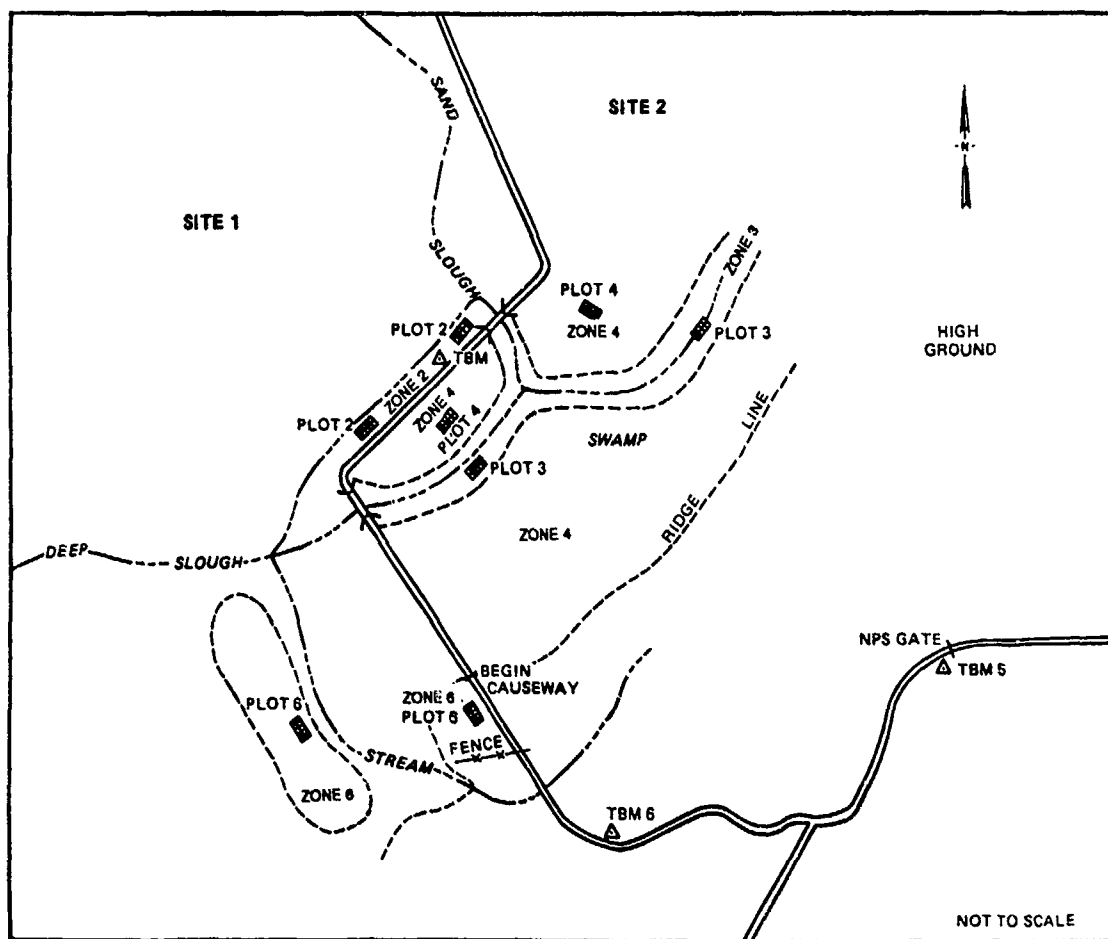


Figure A1. Neches River (sites 1 and 2)

Steele Bayou (Site 3)

Location (Yazoo River Basin)

This site is located in the Yazoo National Wildlife Refuge, 6.4 km north-east of Glen Allen in Washington County, Mississippi. Reference USGS map, Percy, Mississippi, N3300-W9052.5/7.5, 1967.

Hydrology data

Twenty years of hydrology data were obtained for a gauge on the bridge over Steele Bayou 6.4 km south of Grace, Mississippi. Slope correction from gauge datum to study site was determined by a water surface profile.

General vegetation

Plant communities ranged from a *Salix nigra-Taxodium distichum* community at lower elevations to a *Sassafras albidum-Liquidambar styraciflua-Quercus nigra* community at the highest elevation. Intermediate communities are dominated by *Planera aquatica*, *Forestiera acuminata*, *Quercus lyrata*, *Carya aquatica*, *Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer negundo*, and *Ulmus americana*.

Soils and climate

Soil series range from Sharkey at the lowest elevations to Dundee at the higher elevations. Average annual rainfall in the area is 132 cm, and the average growing season is 213 days.

Delineated zones

Zones 2 through 6 were delineated for study at this site.

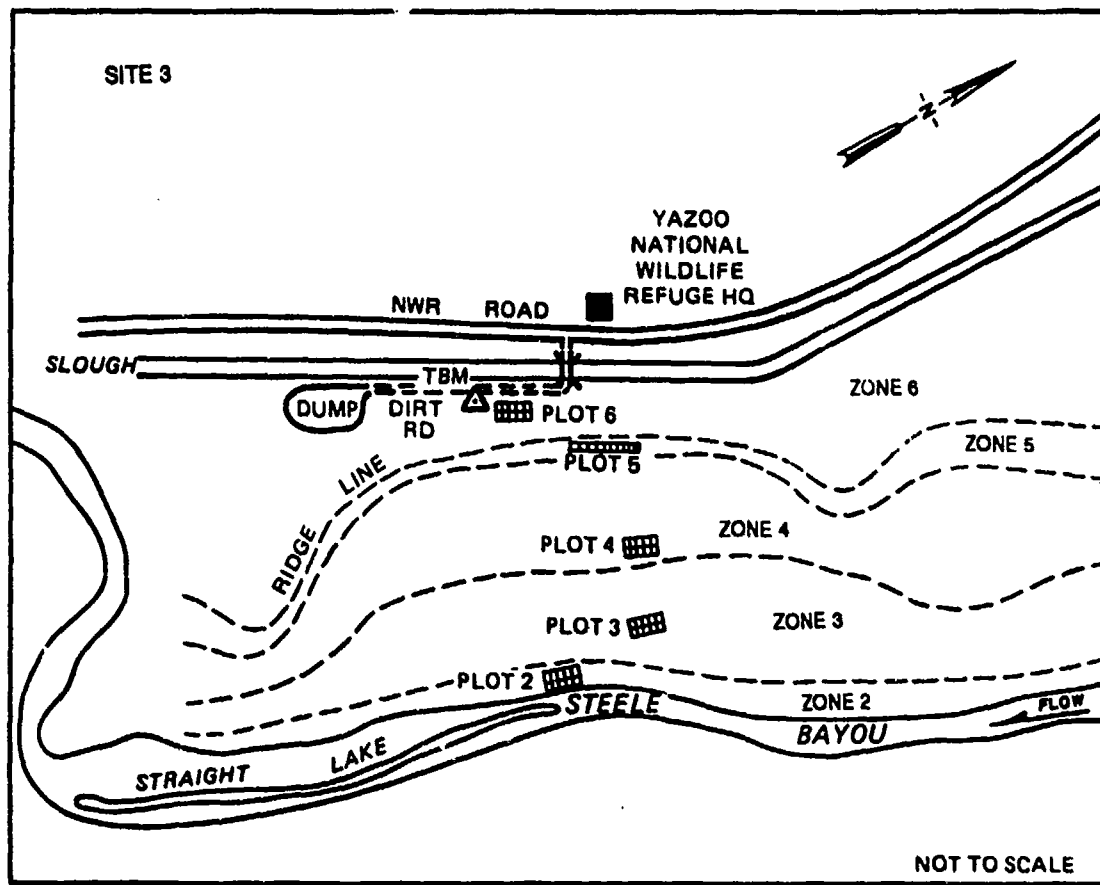


Figure A2. Steele Bayou (site 3)

Ouachita River (Sites 4 and 5)

Location (Ouachita River Basin)

These sites are located in the Felsenthal National Wildlife Refuge, 8 km west of Crossett and 0.8 km east of Felsenthal, respectively, in Union County, Arkansas. Reference USGS map, Felsenthal, Arkansas-Louisiana, N3300-W9200/15, 1981.

Hydrology data

Nineteen years of hydrology data were obtained for a gauge on a U.S. Highway 81 bridge, 8 km west of Crossett, Arkansas. A slope correction for site 5 was determined using a water surface profile. Site 4 was adjacent to the gauge, so no correction was necessary.

General vegetation

Plant communities range from a *Taxodium distichum-Cephalanthus occidentalis* dominated community in lower areas to a nearly monotypic stand of *Pinus taeda* in higher areas. Intermediate communities are dominated *Carya aquatica*, *Quercus lyrata*, *Diospyros virginiana*, *Quercus phellos*, *Quercus nuttallii*, and *Liquidambar styraciflua*.

Soils and climate

All encountered soils are in the Una series. Average annual rainfall is 140 cm, and the average growing season is 211 days.

Delineated zones

Only Zones 3 and 4 were delineated for both sites 4 and 5. Zone 2 was not used because the hydrology was not reflected by the gauge data. Zones 5 and 6 were not used because of major disturbances from recent silvicultural and agricultural practices.

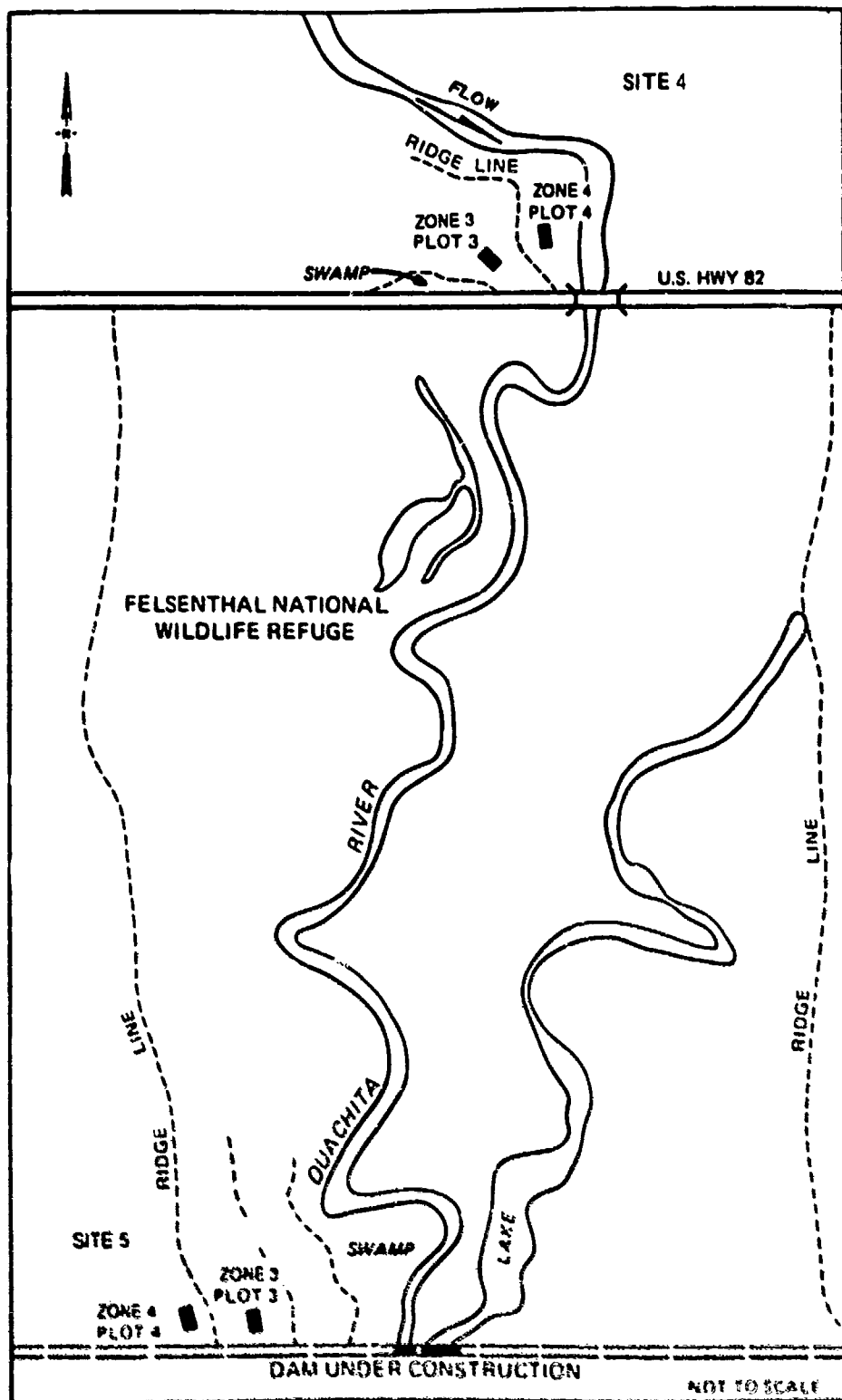


Figure A3 Ouachita River (sites 4 and 5)

Yazoo River (Site 6)

Location (Yazoo River Basin)

This site is located on the north side of the Yazoo River, 8 km west of the U.S. Highway 61 bridge and 12.0 miles north of Vicksburg, Mississippi, in Issaquena County. Reference USGS map, Long Lake, Mississippi-Louisiana, N3222.5-W9052.5/7.5, 1962.

Hydrology data

Twenty years of hydrologic zone elevations were computed by analyzing flow data from gauges on the Mississippi River at Vicksburg, Mississippi, on the Yazoo River 2.4 km east of the site, and at the Steele Bayou control structure immediately adjacent to the study site.

General vegetation

Plant communities range from *Quercus lyrata*-*Carya aquatica* at lowest elevations to a *Liquidambar styraciflua*-*Ulmus americana*-*Celtis laevigata* association at the highest elevations. Other commonly occurring species include *Ilex decidua*, *Carya illinoensis*, and *Cercis canadensis*.

Soils and climate

Soils were determined to be in the Sharkey series. Average annual rainfall is 127 cm. The average growing season is 221 days.

Delineated zones for study

Only Zones 3 and 4 were delineated for this study. Zones 2, 5, and 6 were either too narrow or too disturbed to provide reliable data.

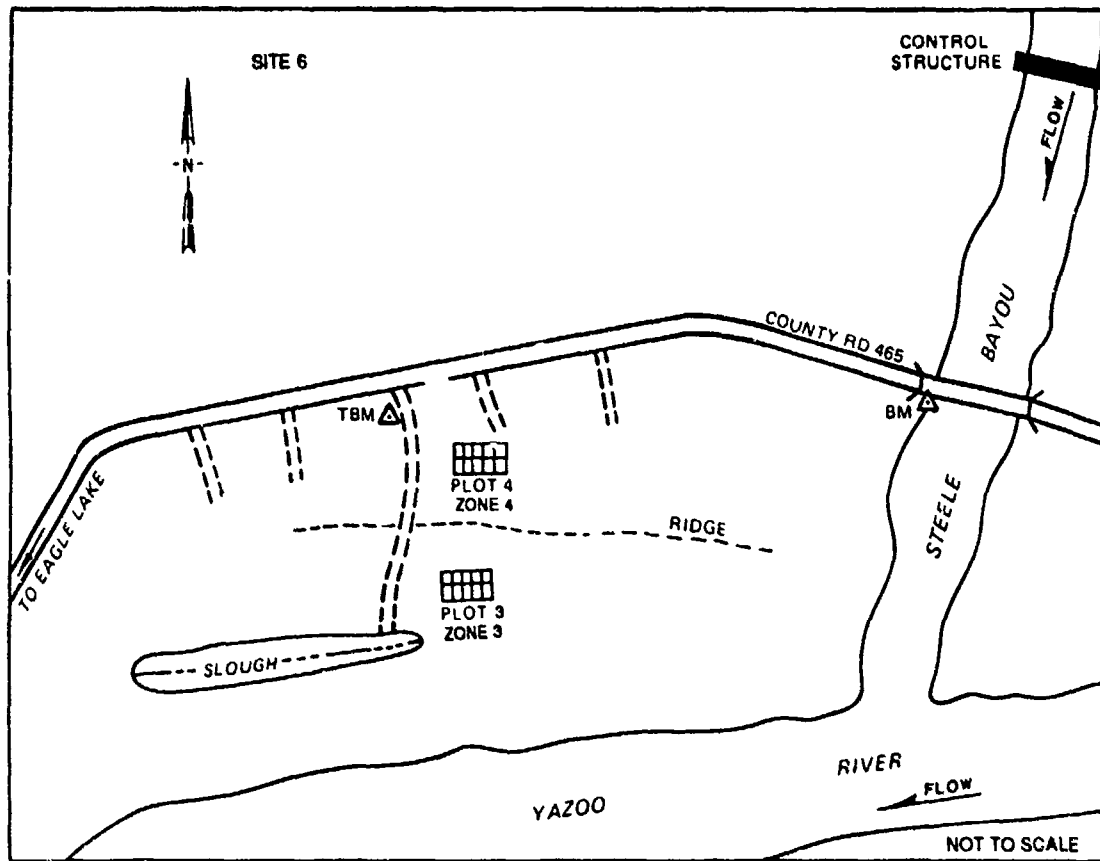


Figure A4. Yazoo River (site 6)

Big Black River (Site 7)

Location (Big Black River Basin)

The site is located on the south bank of the Big Black River adjacent to the Fisher Ferry bridge on Fisher Ferry Road, 24 km south-southeast of Vicksburg, Mississippi. The site is in Claiborne County, Mississippi. References USGS map, name N3207.5-W9045/7.5, 1963.

Hydrology data

Twenty years of hydrologic data were analyzed for a flow gauge on the U.S. Highway 80 bridge, 3.7 km east of Bovina, Mississippi. A slope correction from gauge location to site was determined by a water surface profile.

General vegetation

Plant communities range from *Taxodium distichum*-*Nyssa aquatica* at lower elevations to *Liquidambar styraciflua*-*Celtis laevigata*-*Ulmus americana* at higher elevations. Intermediate communities are dominated by *Planera aquatica*, *Carya aquatica*, *Quercus lyrata*, and *Fraxinus pennsylvanica*.

Soils and climate

Soils range from the Waverly series (depressional phase) in lowest elevations to the Faylata series at higher elevations. Average annual rainfall for this area is 132 cm, and the average growing season is 226 days.

Delineated zones

Zones 2, 3, and 4 were delineated for study. Zones 5 and 6 were not delineated because of major vegetation disturbance induced by silvicultural and agricultural practices.

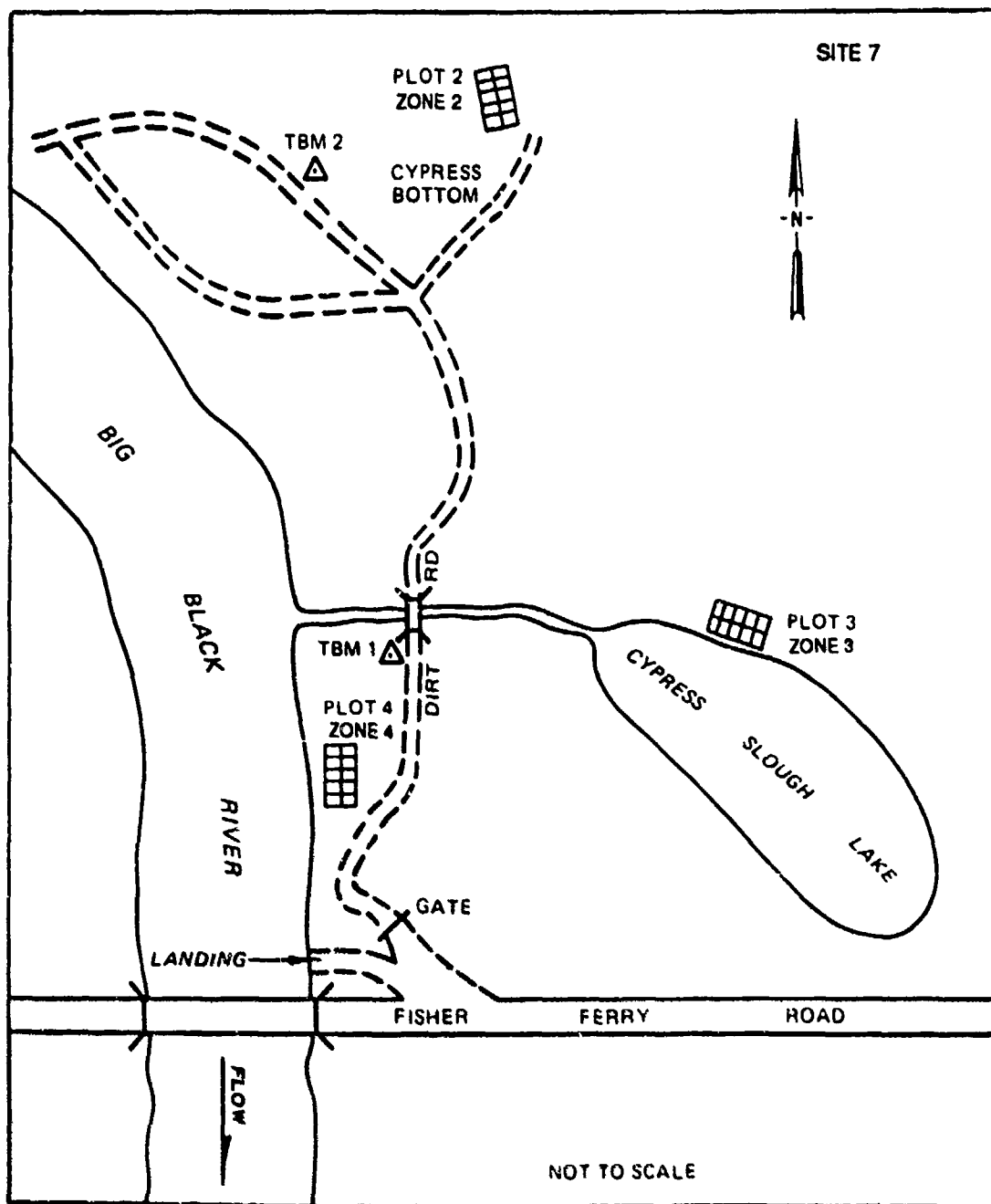


Figure A5. Big Black River (site 7)

L'Anguille River (Sites 8 and 9)

Location (L'Anguille River Basin)

Sites 8 and 9 are located on the west bank of L'Anguille River, 0.8 km east and 7.2 km southeast, respectively, of Palestine in St. Francis County, Arkansas. Reference USGS map, Marianna, Arkansas, N3445-W9045/15, 1957.

Hydrology data

Twenty years of hydrologic data were analyzed for a gauge located on the U.S. Highway 70 bridge, 0.8 km east of Palestine, Arkansas. A slope correction was computed for site 9 using a water surface profile. No slope correction was necessary for site 8 because it was adjacent to the gauge.

General vegetation

Plant communities range from *Taxodium distichum*-*Nyssa aquatica* dominated communities at the lowest elevations to a *Carya tomentosa*-*Quercus alba*-*Liquidambar styraciflua* dominated association on adjacent ridges. Intermediate communities are dominated by *Quercus lyrata*, *Carya aquatica*, *Diospyros virginiana*, *Fraxinus pennsylvanica*, and *Ulmus americana*.

Soils and climate

Soil series range from Zachary at lower elevations to Loring on adjacent ridges. Average annual rainfall is 132 cm, and the average growing season is 219 days.

Delineated zones

Zones 3 and 4 were delineated for site 8. Zones 3 and 6 were delineated for site 9. All other zones were unacceptable.

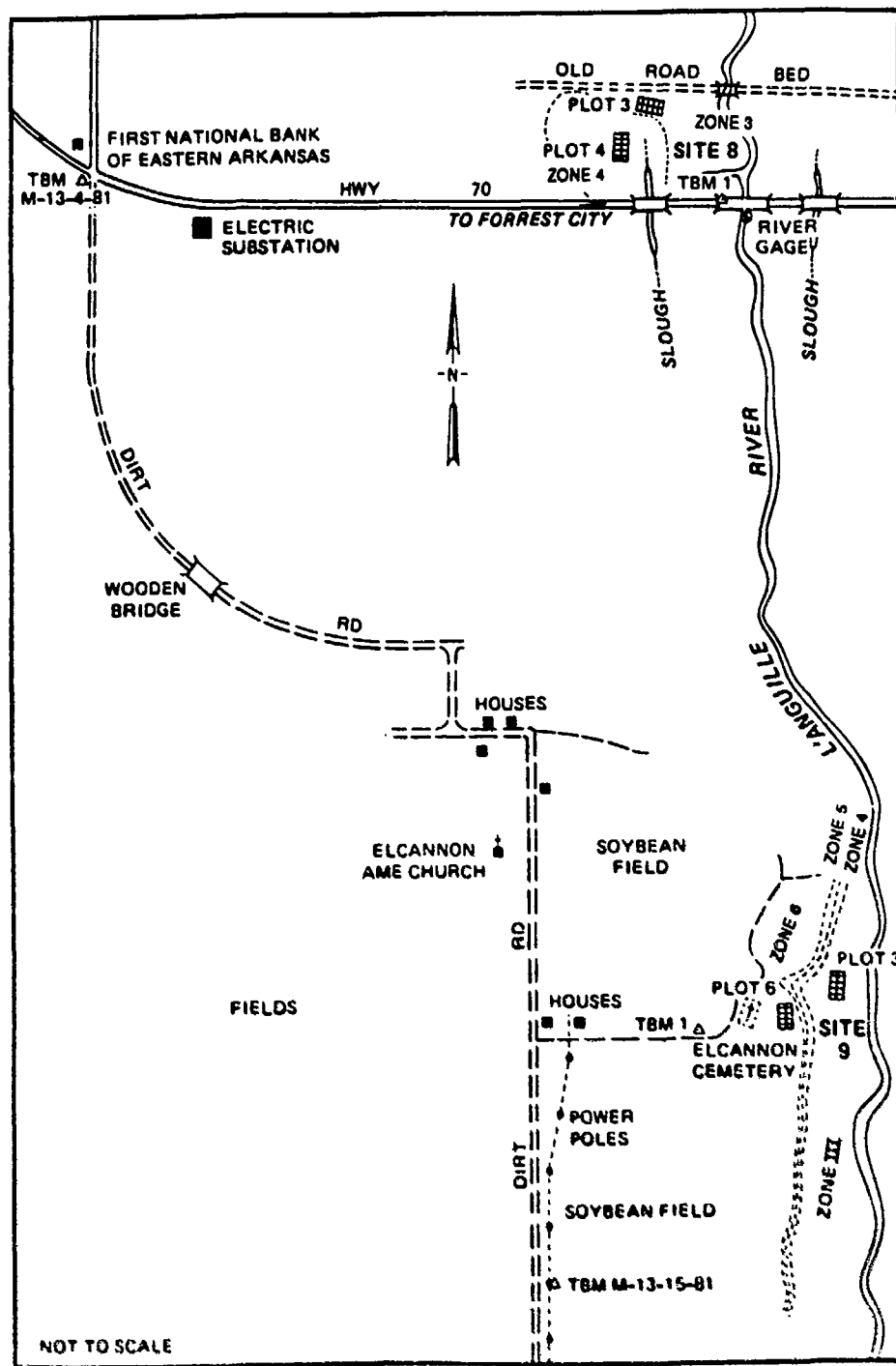


Figure A6. L'Anguille River (sites 8 and 9)

Pearl River (Site 10)

Location (Pearl River Basin)

This site is located in the Pearl River State Wildlife Management Area, 8 km north of Slidell in St. Tammany Parish, Louisiana. Reference USGS map Nicholson, Mississippi-Louisiana, N3022.5-W8937.5/7.5, 1955.

Hydrology data

Twenty years of hydrology data were analyzed for two gauges. First 10 years data were extrapolated to present gauge on the Southern Railway bridge at Pearl River, Louisiana. No slope correction was necessary because the site is adjacent to the gauge.

General vegetation

Plant communities range from *Taxodium distichum*-*Nyssa aquatica* dominated communities in sloughs to *Liquidambar styraciflua*-*Quercus nigra* dominated communities on low ridges. Intermediate communities are dominated by *Quercus laurifolia*, *Acer drummondii*, *Fraxinus pennsylvanica*, *Carpinus caroliniana*, and *Ilex opaca*.

Soils and climate

Soil series range from Rosebloom (depressional phase) in sloughs to Prentiss on ridges with Arkabutla at intermediate elevations. Average annual rainfall is 152 cm, and the average growing season is 237 days.

Delineated zones

Zones 2, 3, 4, and 6 were delineated. Zone 5 could not be reliably delineated because of topography.

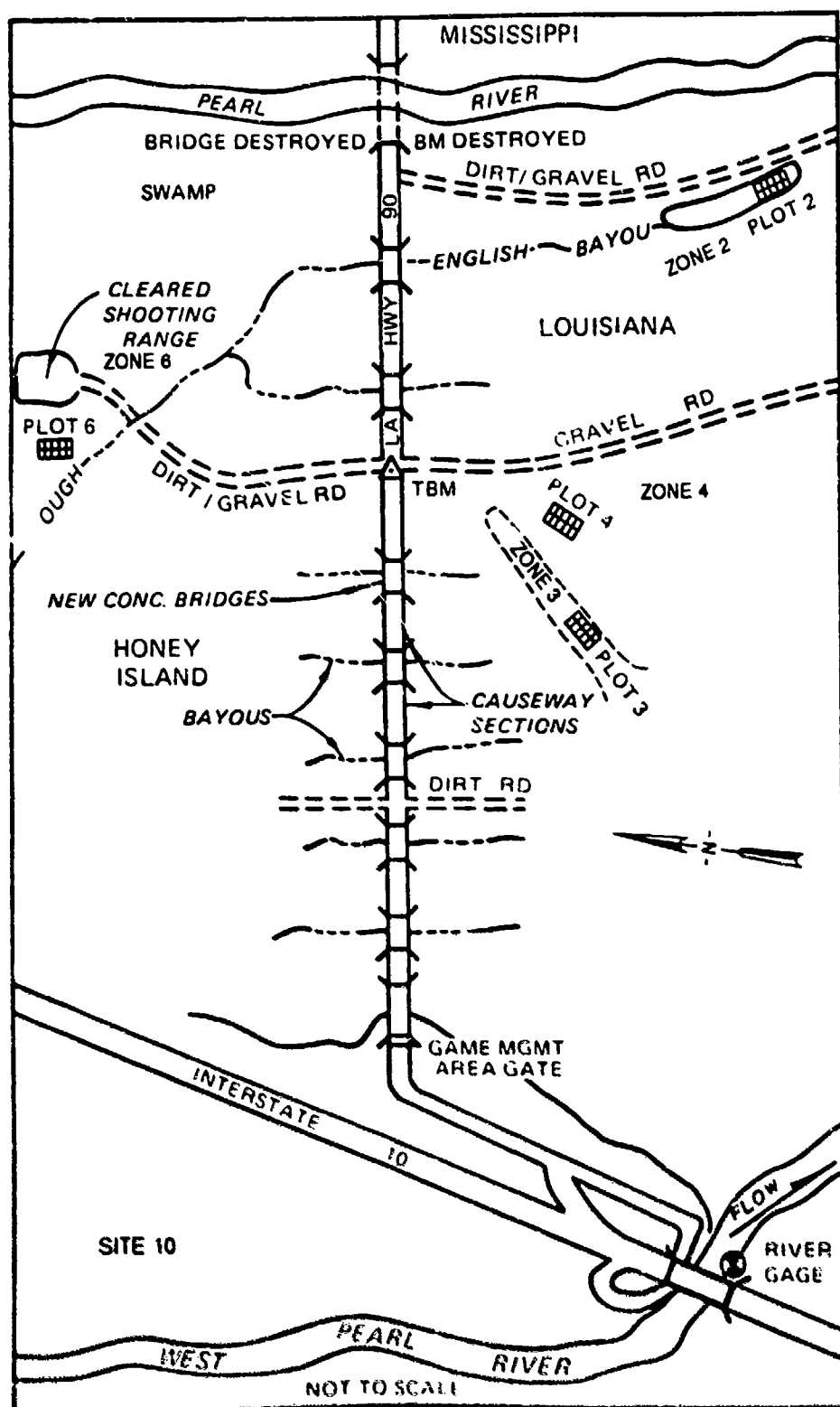


Figure A7. Pearl River (site 10)

Apalachicola River (Sites 11 and 12)

Location

Site 11 is located on the west bank of the Apalachicola River, immediately south of the Florida Highway 20 bridge, 1.6 km east of Blountstown in Calhoun County, Florida. Site 12 is located on the east bank of the river, 4.8 km north of Bristol in Liberty County, Florida. Reference USGS maps Blountstown, Florida, N3022.5-W8500/7.5, 1945, and Bristol, Florida, N3022.5-W8452.5/7.5, 1945, respectively.

Hydrology data

Twenty years of hydrology data for site 11 were analyzed for a gauge located 0.8 km south of Highway 20 bridge at the Neal Lumber Company Landing. Hydrology data for site 12 were analyzed from data from a previous study (Leitman et al. 1984).

General vegetation

Vegetation for both sites ranges from *Nyssa aquatica* dominated swamps at lower elevations to *Nyssa sylvatica*-*Juglans nigra*-*Sassafras albidum* dominated associations at higher elevations. Intermediate plant communities consist of *Fraxinus caroliniana*, *Gleditsia aquatica*, *Quercus lyrata*, *Carya aquatica*, *Ulmus americana*, *Melia azederach*, *Celtis laevigata*, and *Quercus nigra*.

Soils and climate

Soil series range from Bibb at lower elevation to Ochlochonee at higher elevations. Soil series occurring at intermediate elevations were Chastain, Enoree, Jena, and Chewacla. Average annual rainfall is 137 cm, and the average growing season is 267 days.

Delineated zones

Zones delineated for site 11 were 2, 3, 4, and 5. Essentially all of Zone 6 has been developed for agriculture. Zones delineated for site 12 were 4, 5, and 6. The hydrology of Zones 2 and 3 had been altered by an extensive network of beaver dams and was not reliable.

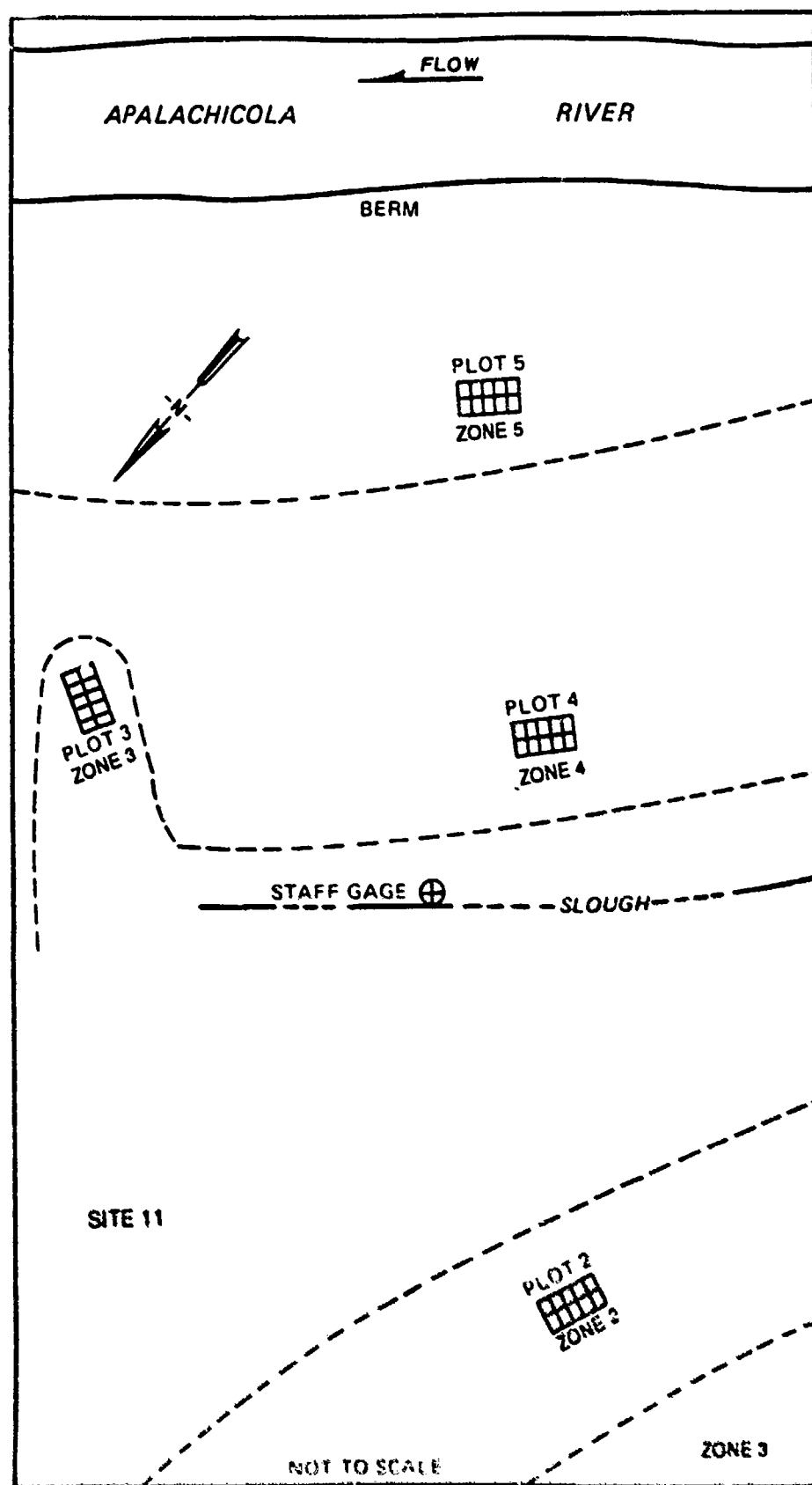


Figure A8. Apalachicola River (site 11)

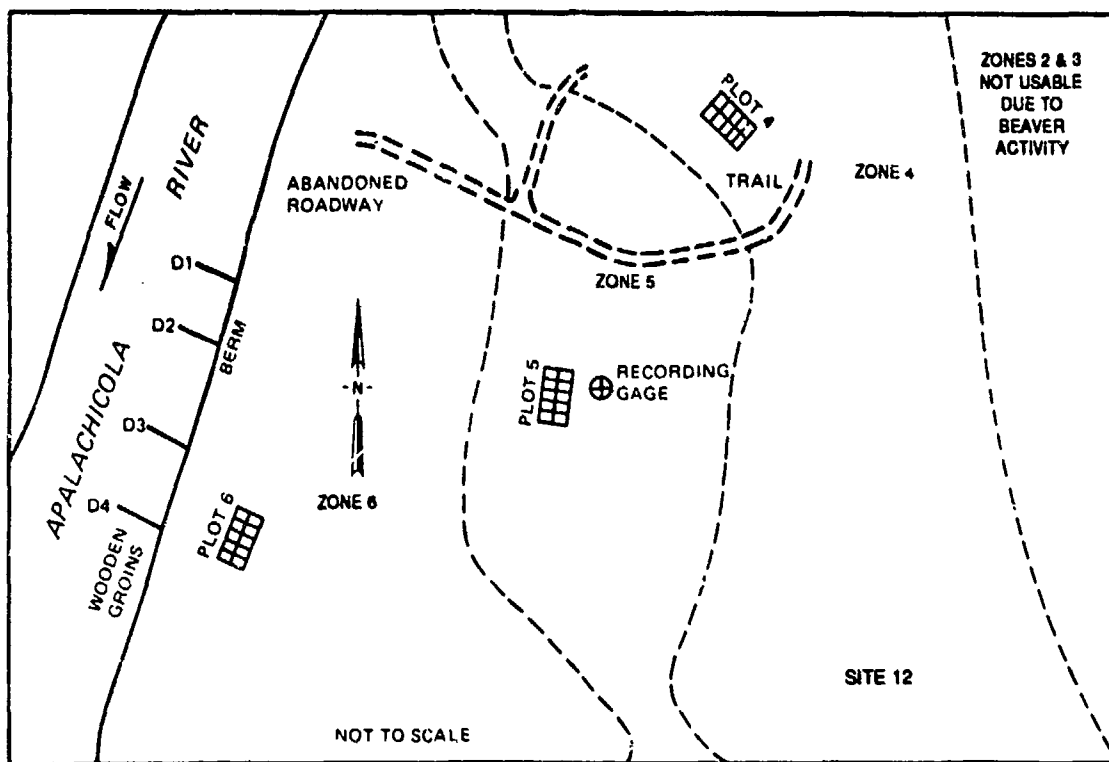


Figure A9. Apalachicola River (site 12)

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Ocmulgee River (Site 13)

Location (Ocmulgee River Basin)

This site is located across the river from Lumber City, and adjacent to the east side of Southern Railway and U.S. Highway 23 and 341 in Jeff Davis County, Georgia. Reference USGS map, Lumber City, Georgia, N3152.5-W8237.5/7.5, 1971.

Hydrology data

Twenty years of hydrology data were analyzed for a gauge on the U.S. Highway 23 and 341 bridge adjacent to the site. No slope correction was necessary.

General vegetation

The plant communities range from *Taxodium distichum*-*Nyssa aquatica* communities at the lowest elevations to a *Carya tomentosa*-*Quercus alba*-*Pinus glabra* dominated association at the higher elevations. Intermediate communities consist of *Planera aquatica*, *Quercus lyrata*, *Carya aquatica*, *Ulmus americana*, *Liquidambar styraciflua*, *Quercus phellos*, *Carpinus caroliniana*, and *Quercus nigra*.

Soils and climate

The soil series range from Bibb in the lowest areas to Riverview at the highest elevations. The Chastain series occurs at intermediate elevations. Average annual rainfall in this area is 117 cm, and the average growing season is 232 days.

Designated zones

Zones 2, 3, 4, and 6 were delineated for study. Zone 5 was too narrow to provide reliable data.

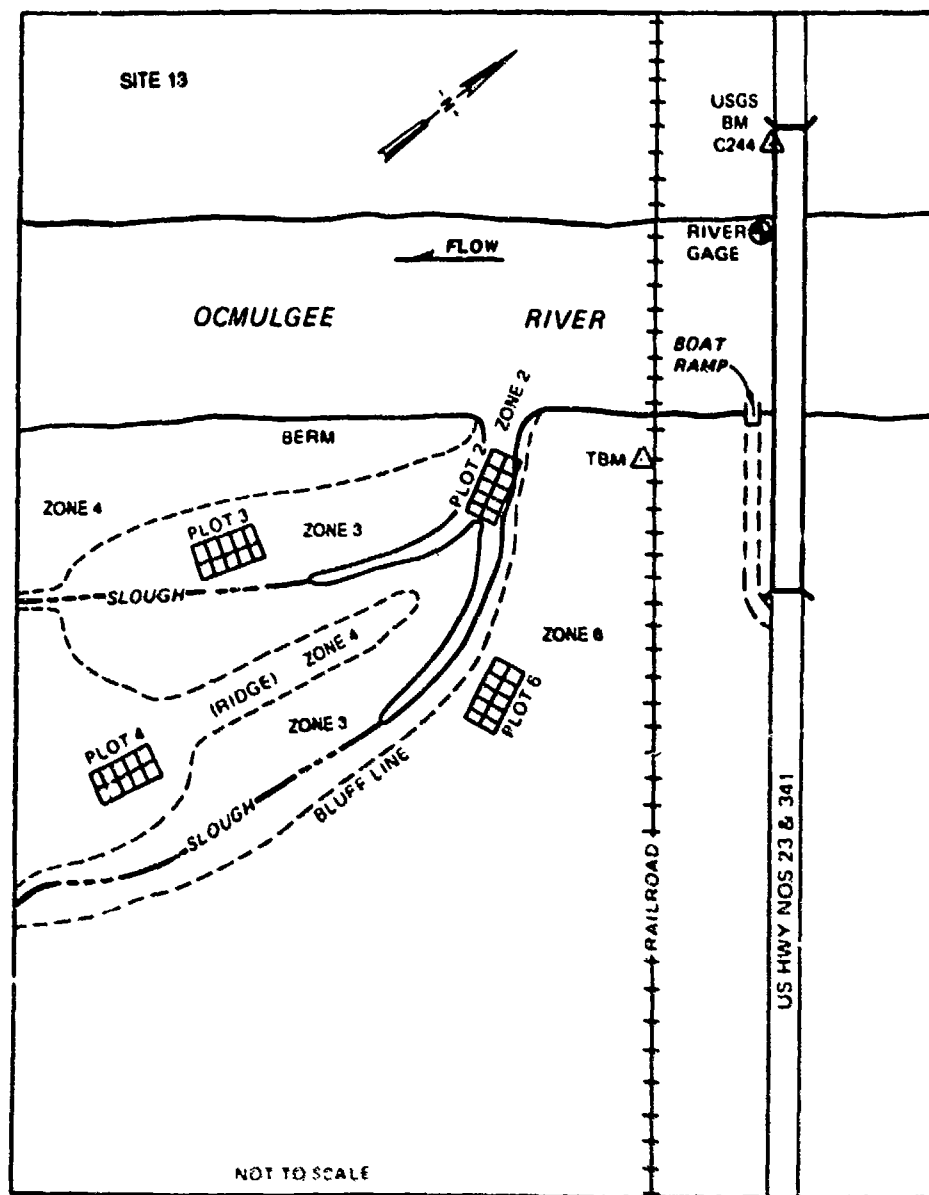


Figure A10. Ocmulgee River (site 13)

Altamaha River (Site 14)

Location (Altamaha River basin)

This site is located in the northeast quadrant at the intersection of U.S. Highway 1 and the Altamaha River, 50 km north of Baxley in Toombs County, Georgia. Reference USGS map, Baxley NE, Georgia, N3152.5-W8215/7.5, 1970.

Hydrology data

Twelve years of hydrology data were analyzed for a gauge on the U.S. Highway 1 bridge adjacent to the site. No slope correction was necessary.

General vegetation

Plant communities range from *Taxodium distichum*-*Nyssa aquatica* at lowest elevations to a *Juniperus virginiana*-*Quercus stellata*-*Carya tomentosa*-*Pinus taeda* community at highest elevations. Intermediate communities are dominated by *Fraxinus pennsylvanica*, *Quercus michauxii*, *Quercus phellos*, and *Carpinus caroliniana*.

Soils and climate

Soils range from the Osier series in lowest elevations to the Riverview series at highest elevations. The Chewacla series occurs at intermediate elevations. Average annual rainfall is 117 cm, and the average growing season is 232 days.

Designated zones

Zones delineated for this study site were 2, 5, and 6. Zones 3 and 4 had ridge and swale topography which prevented separating them reliably.

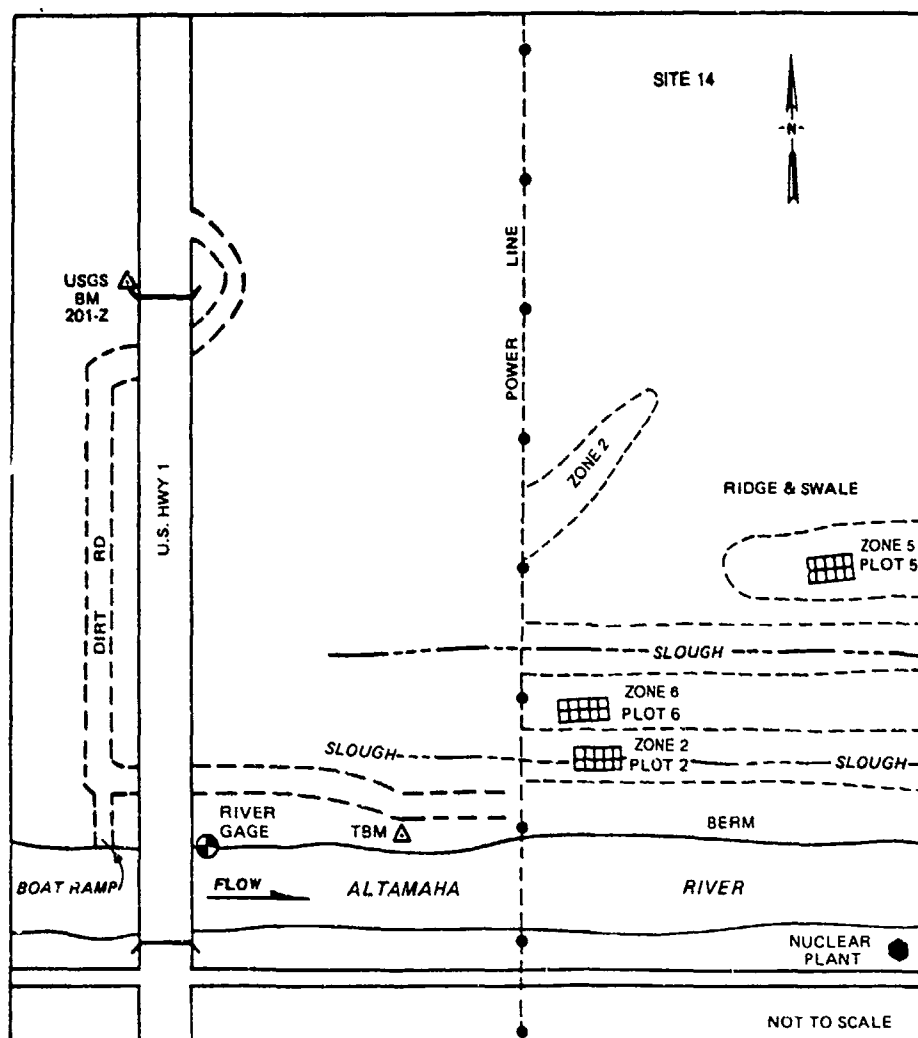


Figure A11. Altamaha River (site 14)

Edisto River (Site 15)

Location (Edisto River Basin)

This site is in Givhans Ferry State Park, north and west of South Carolina Highway 61 bridge, 4.8 km west of Givhans in Colleton County, South Carolina. Reference USGS map, Maple Cane Swamp, South Carolina, N3300-W8022.5/7.5, 1979.

Hydrology data

Twenty years of hydrology data were analyzed for a gauge on the South Carolina Highway 61 bridge adjacent to the site. No slope correction was necessary at this site.

General vegetation

Plant communities range from *Taxodium distichum*-*Nyssa aquatica*-*Fraxinus caroliniana* at lowest elevations to a *Pinus taeda*-*Quercus virginiana*-*Quercus nigra* dominated community at highest elevation. Species in communities at intermediate elevations include *Quercus lyrata*, *Quercus laurifolia*, *Planera aquatica*, *Liquidambar styraciflua*, *Quercus nigra*, and *Carpinus caroliniana*.

Soils and climate

Soil series range from Osier at lowest elevations to Chipley at highest elevations. The Torhunta soil series occurs at intermediate elevations. Average annual rainfall is 132 cm, and the average growing season is 213 days.

Delineated zones

Zones 2, 3, 4, and 6 were delineated, but Zone 5 was too narrow due to its topographic position.

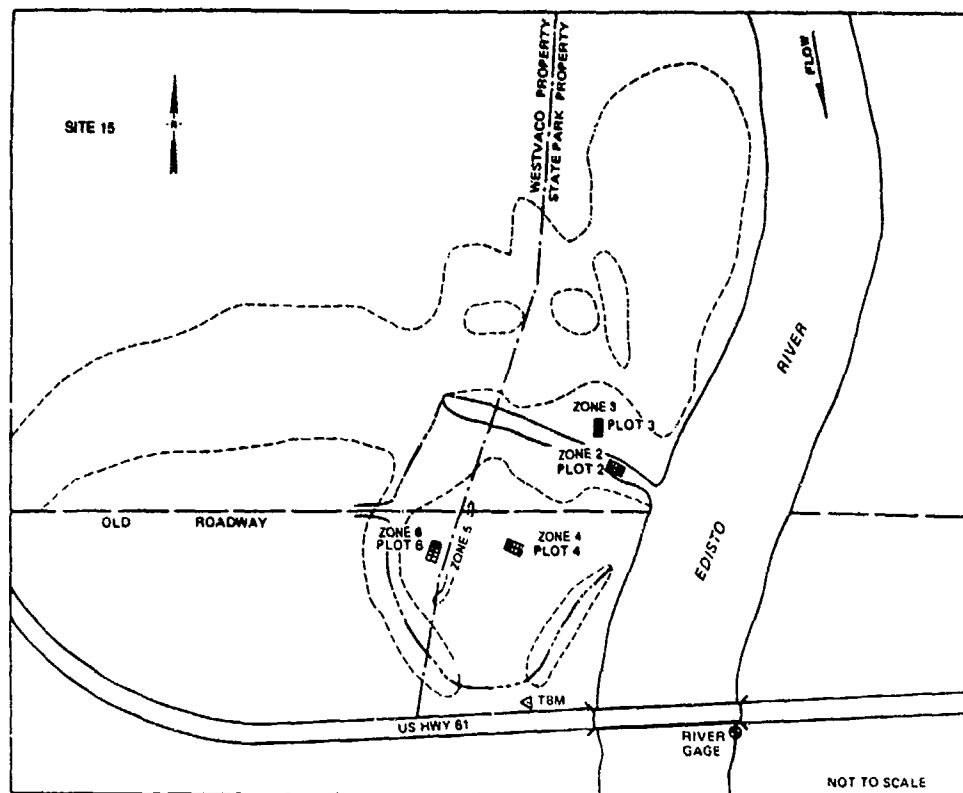


Figure A12. Edisto River (site 15)

Lynches River (Site 16)

Location (Lynches River Basin)

This site is located in Lynches River State Park, 1.6 km south of Effingham in Florence County, South Carolina. Reference USGS map, Florence West, South Carolina, N3400-W7945/15, 1940.

Hydrology data

Twenty years of hydrology data were analyzed for a gauge on the bridge on U.S. Highway 52, 1.6 km south of Effingham. A slope correction from gauge to site was determined by a water surface profile.

General vegetation

Plant communities range from *Taxodium distichum*-*Nyssa aquatica* at the lowest elevations to *Quercus falcata*-*Quercus stellata*-*Carya tomentosa* at higher elevations. Species occurring in communities at intermediate elevations include *Quercus lyrata*, *Quercus laurifolia*, *Liquidambar styraciflua*, and *Quercus phellos*.

Soils and climate

Soil series range from Chastain at lowest elevations to Chipley at highest elevations, with the Wehadkee series at intermediate elevations. Average annual rainfall is 107 cm, and the average growing season is 237 days.

Delineated zones

Zones 2, 3, and 6 were delineated for study. Zones 4 and 5 were too narrow to delineate because of their topographic positions.

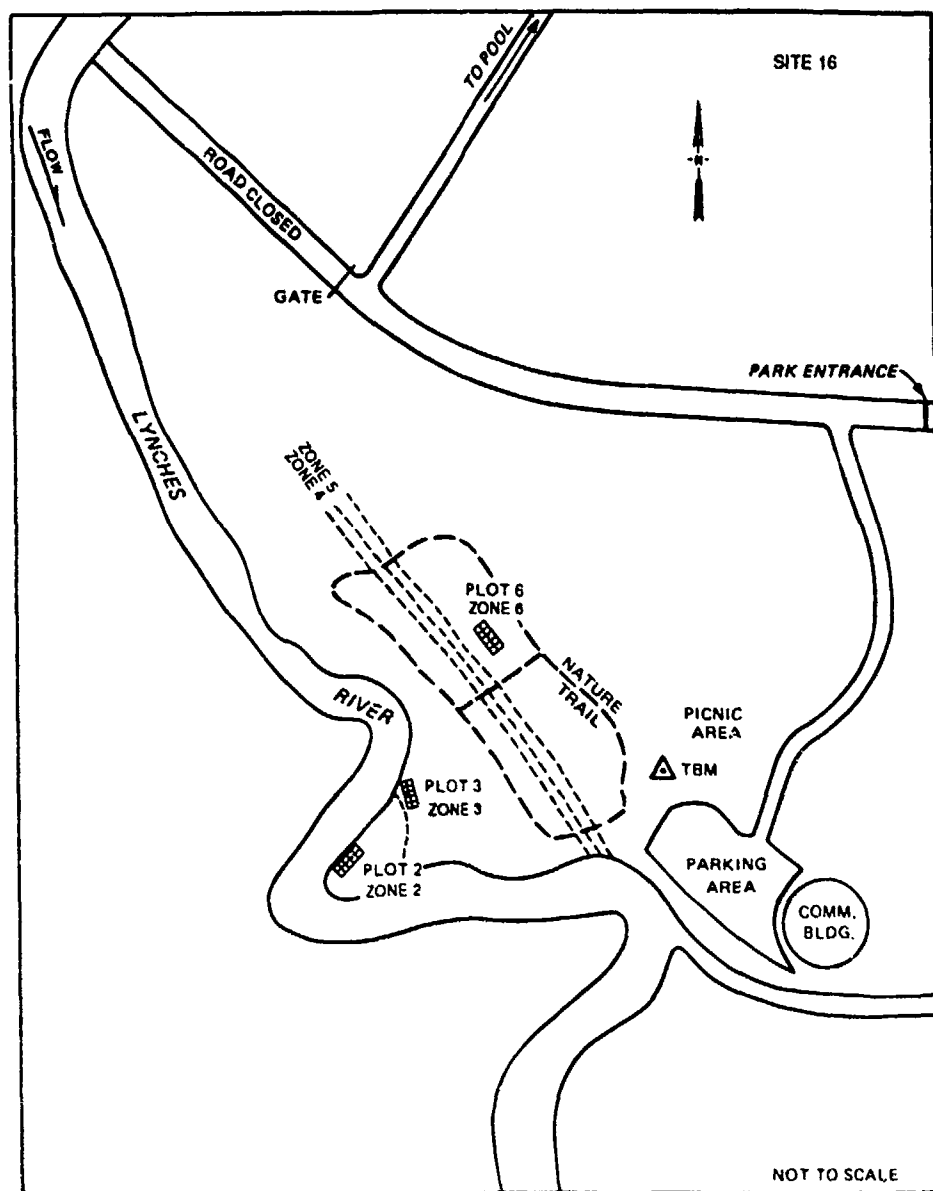


Figure A13. Lynch River (site 16)

Waccamaw River (Site 17)

Location (Waccamaw River Basin)

This site is located 3.2 km southeast of Longs in Horry County, South Carolina. Reference USGS map, Longs, South Carolina-North Carolina, N3352.5-W7837.5/7.5, 1947.

Hydrology data

Twenty years of hydrology data were analyzed for a gauge on the bridge on State Highway 9, 3.4 km southeast of Longs, South Carolina. No slope correction was necessary.

General vegetation

Plant communities range from a *Fraxinus caroliniana* dominated swamp at the lowest elevation to a *Pinus taeda-Quercus nigra-Liquidambar styraciflua* dominated community at the highest elevation. Vegetation dominated by *Quercus laurifolia*, *Magnolia virginiana*, *Acer rubrum*, loblolly bay, *Ilex opaca*, *Quercus phellos*, and *Quercus michauxii* occurs at intermediate elevations.

Soils and climate

Soils range from the very poorly drained Rutledge series at the lowest elevations to the moderately well-drained Chipley series at highest elevation. Soils at intermediate elevations include the Rembert and Leon series. Average annual rainfall is 107 cm, and the average growing season is 248 days.

Delineated zones

Zones 2, 3, 4, and 6 were delineated for this site. Zone 5 was too narrow to delineate because of its topographic position.

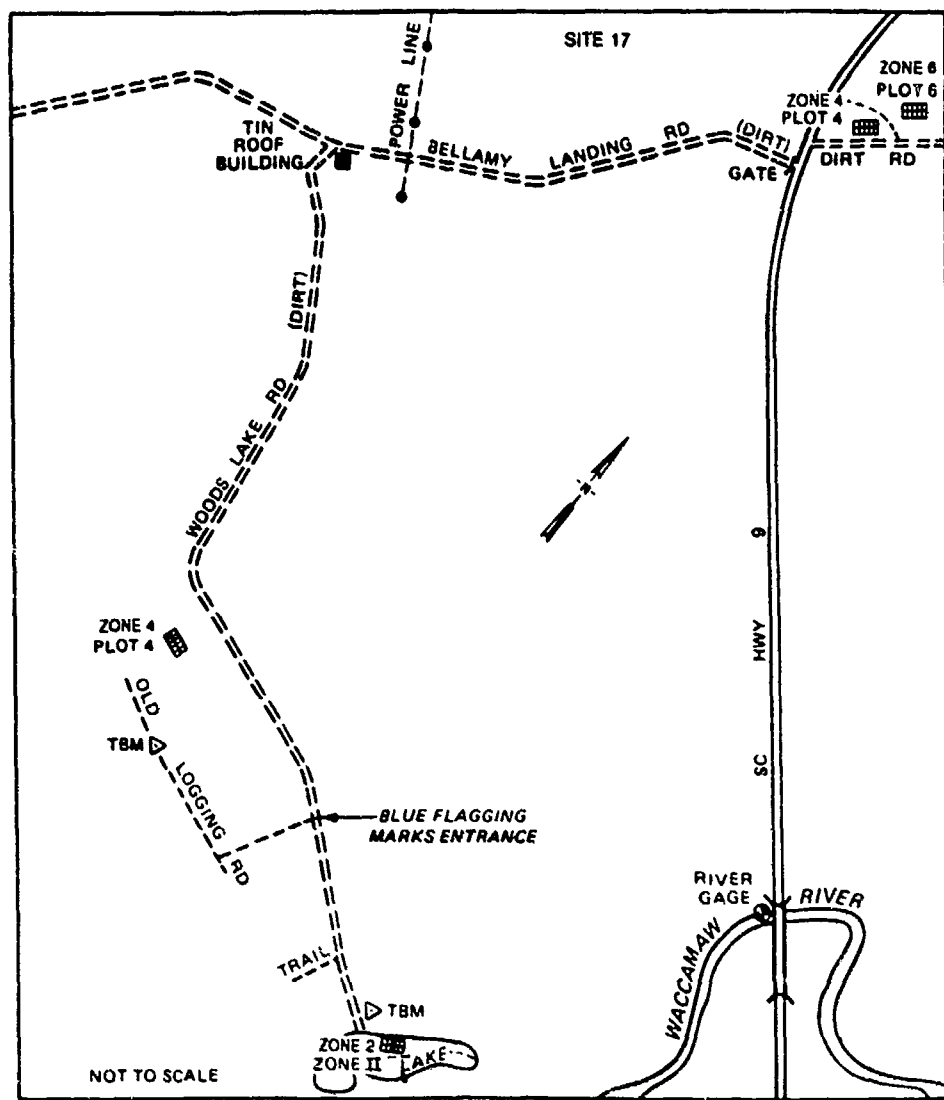


Figure A14. Waccamaw River (site 17)

Appendix B

Guide for Computer Program for Analyzing Hydrologic Data

Introduction

Program development

The FORTRAN computer program was developed to streamline hydrologic data manipulation for hydrologic zone boundary determinations.

Overview of program capabilities

The program defines the lower limits of four hydrologic zone boundaries, enabling determination of five zones. Recognizing the inherent variability of some input parameters, the program allows input of a range of parameters values, thus yielding a range of boundary values. The program reads either standard formatted U.S. Geological Survey (USGS) flow rate or Corps of Engineers stage data.

Basis for Hydrologic Zone Delineation

Definitions

Hydrologic zones. The program assumes the following definitions for hydrologic zone boundaries:

<u>Zone</u>	<u>Definition</u>
2	Soil inundated or saturated on average greater than 75 percent of the growing season.
3	Soil inundated or saturated on average between 75 and 25 percent of the growing season.

<u>Zone</u>	<u>Definition</u>
4	Soil inundated or saturated on average between 25 and 12.5 percent of the growing season.
5	Soil inundated or saturated on average between 12.5 and 5 percent of the growing season.
6	Soil inundated or saturated on average less than 5 percent of the growing season.

Inundation. Inundation is defined as the physical overtopping of the soil by the adjacent stream water surface.

Saturation. A soil is saturated when it will no longer absorb water without losing an equal amount.

Growing season. The growing season is defined as the average frostfree period. It is the period between the last average occurrence of 32° F in the spring, and the first average occurrence of 32° F in the fall.

Separation of Data into Growing Seasons

The program used the starting and ending dates of the growing season and the daily flow rates or daily stage data at each site for a period of 10 to 20 years as input. Henceforth, the terms "flow rate" and "stage" are interchangeable, depending on the form of input data.

The program read flow rate data into a matrix FL(I,J), where I is an index designating year, and J designated the Julian date. For example, FL(3,3) designated the flow rate of January 3 of the third year of data and FL(3,33) designated February 2 of the third year. Two matrices, K5GS(I) and K12GS(I), were created that contained Julian dates of the beginning and end of the growing season in each year I. These dates varied because of leap years.

The program then created two more matrices: FLGS(I,J) and NDGS(I). FLGS(I,J) contained flow rates in year I, on date J from the beginning of the growing season. For example, FLGS(2,3) designated the flow rate on the third day of the growing season in the second year of data. NDGS(I) is the number of days in the growing season of the Ith year. Again, the number of days varied because of leap years.

Computation of Days Inundated

Computation of days inundated at a given flow rate proceeded as follows:

- a. Growing season flow rates for the entire entered record were ranked from highest to lowest. This procedure was accomplished by

transferring all data in the FLGS(I,J) matrix into a single subscripted matrix RANK(K), and then the program ranked the data in RANK using a bubble sorting routine. RANK(1) represented the greatest flow rate for the entire record. RANK(NQ) was the lowest flow rate, where NQ was the total number of growing season flow rates in the entire record.

- b. The number of days a given flow rate was exceeded (i.e., effecting inundation above that flow rate) within the growing season record was equal to the flow rate's ranking. A flow rate in RANK(10) was equalled or exceeded 10 times within the historic record and corresponded to 10 days of inundation.

Computation of Days Saturated

General. The model for the program was a simplified water balance. The soil root zone for wetland plant species was considered to be a water bucket where:

- a. Depth of the bucket was the critical depth of the saturated zone (e.g., 25 cm).
- b. When water overtopped the bucket (i.e., during inundation), the bucket filled at a rate PKW (inches/hour).
- c. When inundation ceased, the bucket drained at a rate PKD (inches/hour).
- d. DEVAPR inches of water were lost daily out the top of the bucket by evapotranspiration.
- e. When the bucket was partially full (i.e., not empty or overtopped by inundation), a day of saturation was counted.

Inputs. The following inputs were required for computing days of saturation:

- a. PKD = rate of percolation of water through the soil column, which was estimated from soil conservation service county soil surveys.
- b. PKW = rate at which inundation restores the soil zone to full saturation (inches/hour) *(Note. PKW is different from PKD when the underlying soil layer was less porous than the upper soil layer. The soil would wet at the permeability rate of the upper layer, but would drain at the permeability rate of the underlying soil layer).*
- c. CDSZ = critical depth of the saturated zone, which was the depth of wetland plant root zone (10 in. or 26.4 cm).

- d. DEVAPR = average daily evapotranspiration rate for the site (inches/day).

Discussion. This model has no pretense of absolute accuracy; it does not include rainfall, contributions of water from upslope drainage, residual soil moisture held by soil after gravity drainage, and possibly other sources of water.

Program algorithm, for a "fixed" flow rate. The following describes the program algorithm for a "fixed" flow rate (used at each zone boundary) for computation of days saturated:

- a. For each year, the program started at CDSZ/24*PKW days before the growing season, with an empty "bucket," and used the general scheme described above to find the depth of water in the root zone at the start of the growing season. A flow rate in the record greater than the "fixed" flow rate filled the "bucket," while a lesser flow rate drained the "bucket."
- b. For each year, the program then checked each growing season flow rate versus the "fixed" flow rate using this starting water depth and either filled or drained the bucket as appropriate. Each day when the bucket was partially full counts as a day saturated.
- c. Days saturated for each year were added into a single total for that "fixed" flow rate.
- d. A flowchart showing program logic for computation of days saturated is provided in Figure B1.

Computation of Frequency of Inundation

Frequency of inundation was not used in defining hydrologic zone boundaries. However, it was used for discussion purposes.

Frequency of inundation for a given flow rate was determined by:

- a. Counting the number of growing seasons in the historic record during which the flow rate for a particular hydrologic zone was exceeded at least once for a minimum of seven days.
- b. Dividing the total number of years in the record into "a," and multiplying by 100.

For example: A flow rate of 20,000 cubic feet per second (560 meters per second) is exceeded in only two growing seasons of a 20-year record. This flow rate has a frequency of inundation of $2/20 \times 100 = 10$ percent.

Computation of Parameters in Tabular Output

Tabular output appeared as follows:

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Boundary	Days	Duration	Freq	Days	Days	Duration
Flowrate	Inun- Dated	Inundated	Inun- Dated	Saturated	Plus Days Inundated	Saturated and Inundated
38852.	33.	4.3	100.0	5.	38.	5.0

All of the above have already been explained except columns (3), (6) and (7).

a. Column 3 - Duration inundated = $\frac{\text{days inundated}}{\text{total growing season}} \times 100.$

b. Column 6 - Days saturated plus days inundated = Columns 2 + 5.

c. Column 7 -

$$\frac{\text{Duration saturated and inundated}}{\text{total growing season days}} = \frac{\text{days inundated} + \text{days saturated}}{\text{total growing season days}} \times 100.$$

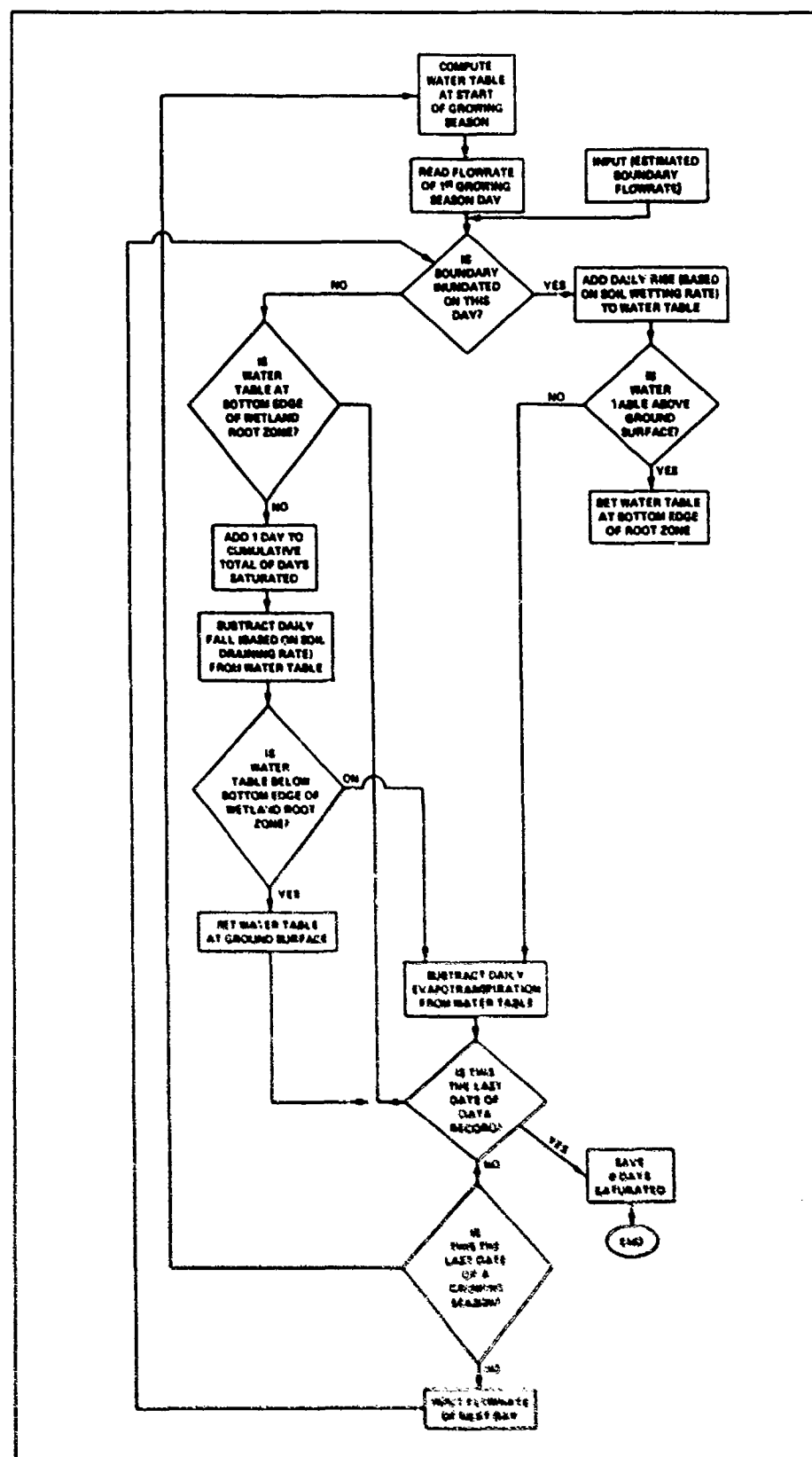


Figure B1. Program logic for computation of days saturated

Example Summary Table of
Boundary Flowrates

<u>Zone V</u>	<u>Zone IV</u>	<u>Zone III</u>	<u>Zone II</u>
155.	144.	128.	63.

NSMGS= 3 NSDGS= 3 NEMGS=11 NEDGS=11 PK_v=0.90000 PKD=0.90000
CDSZ=10.0 DEVAP=.200

<u>Boundary Flowrate</u>	<u>Days Inun- Dated</u>	<u>Duration Inundated</u>	<u>Freq Inun- Dated</u>	<u>Days Saturated</u>	<u>Days Saturated Plus Days Inundated</u>	<u>Duration Saturated and Inundated</u>
155.	22.	4.3	100.0	2.	24.	4.7
144.	48.	9.4	100.0	7.	55.	10.8
128.	116.	22.8	100.0	11.	127.	25.0
63.	375.	73.8	100.0	11.	386.	76.0

Appendix C

Hydrograph for Steele Bayou

(Site 3)

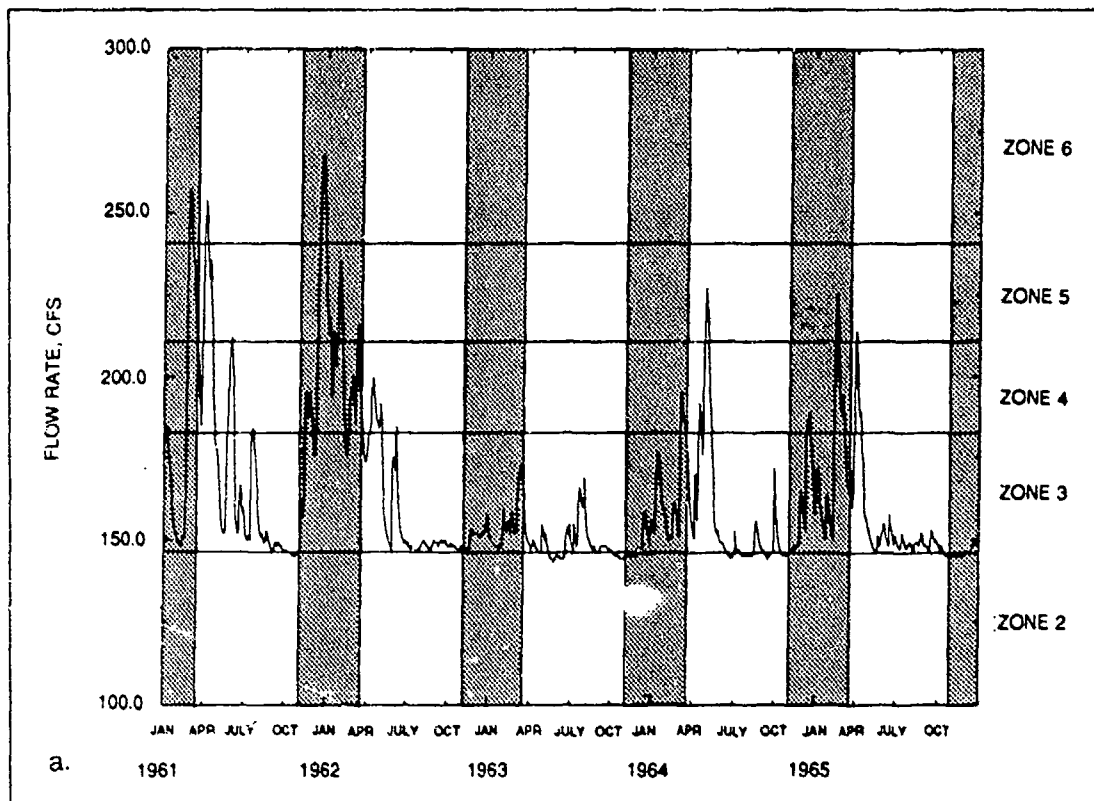


Figure C1. Hydrograph for Steele Bayou (site 3): the shaded areas represent the nongrowing season, a:1961-1965, b:1966-1970, c:1971-1975, and d:1976-1980 (Sheet 1 of 4)

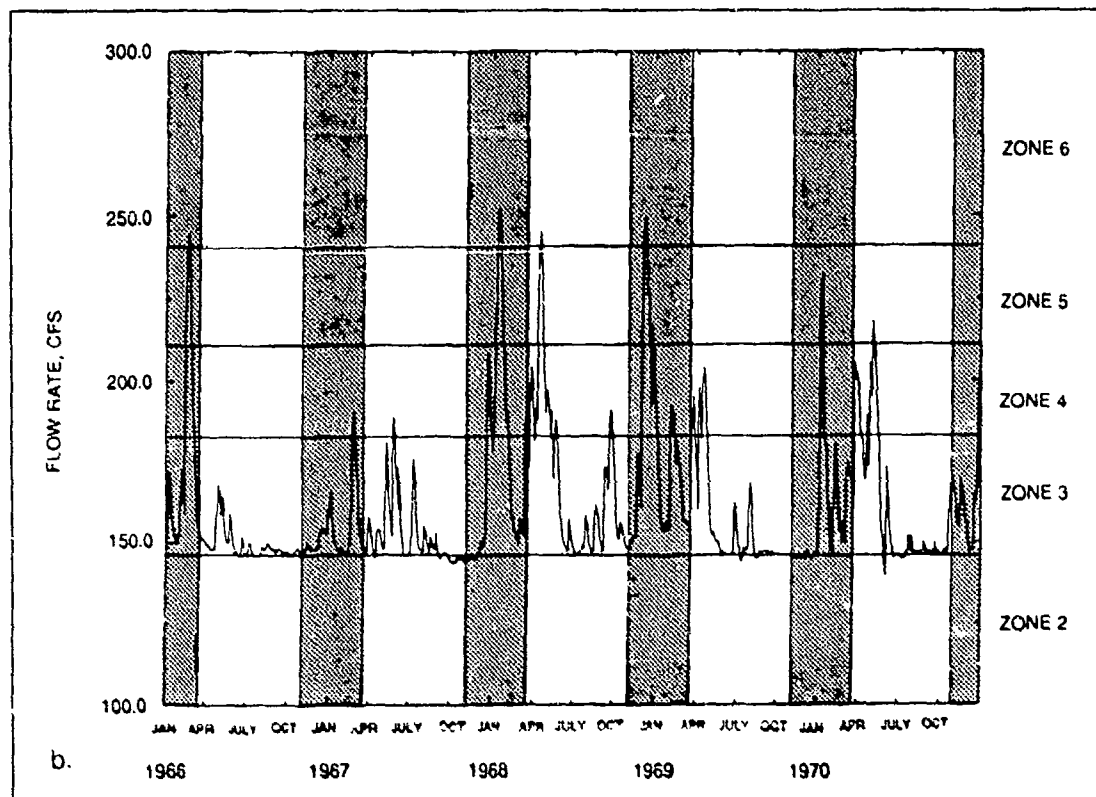
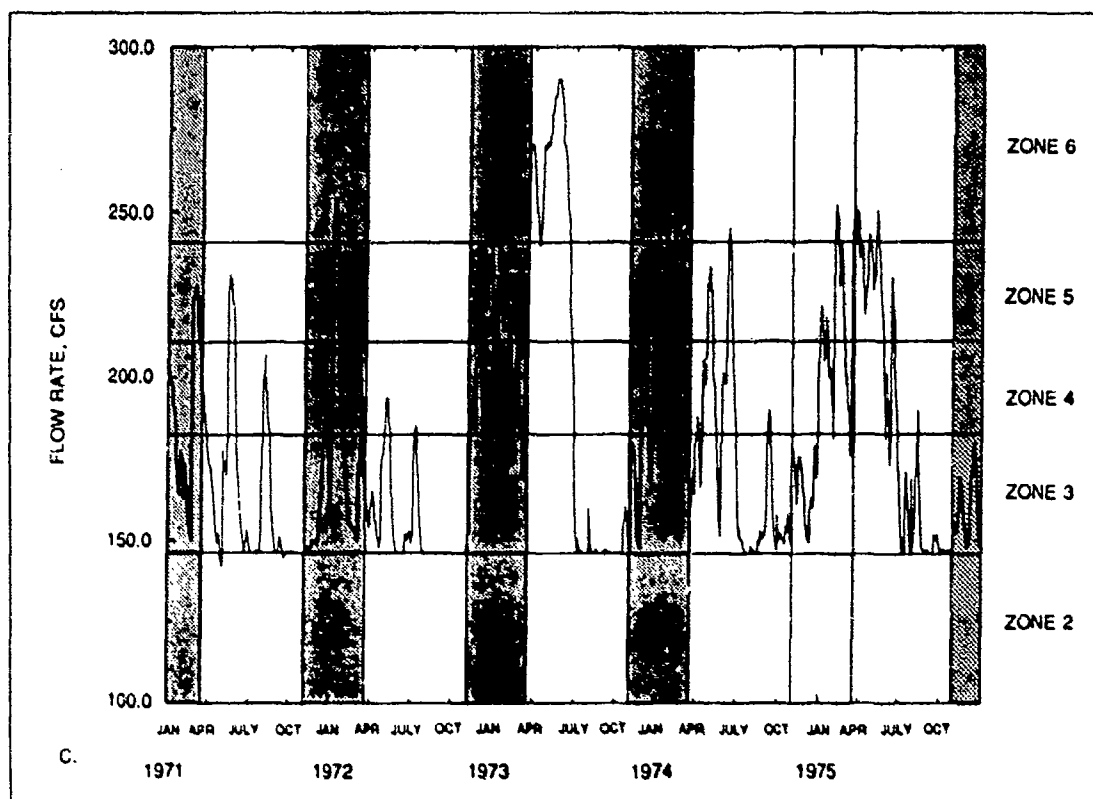


Figure C1. (Sheet 2 of 4)



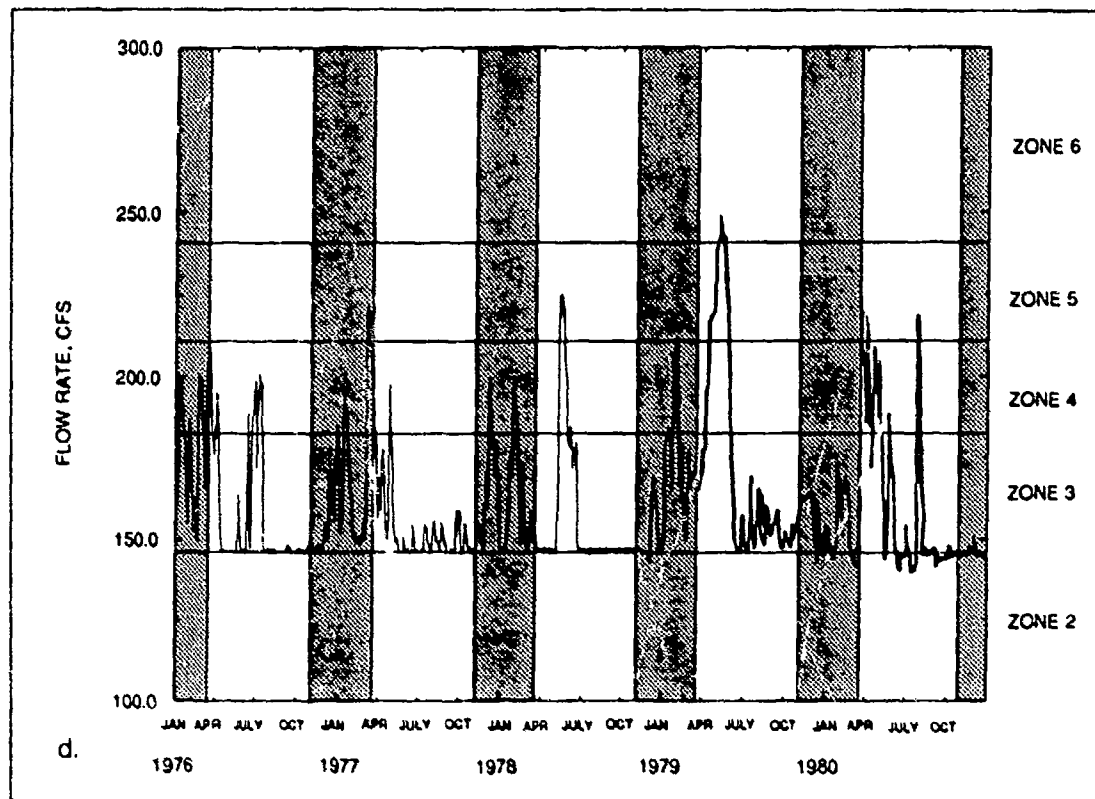


Figure C1. (Sheet 4 of 4)

Appendix D

Importance Values for Species by Zone and Vegetation Layer

Table D1
Importance Values for Species Occurring at Site 1, Arranged by Zone and Vegetation Layer

<u>Species¹</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Taxodium distichum</i>	31.8	44.0	42.2	118.0
<i>Nyssa aquatica</i>	31.8	16.7	49.2	97.8
<i>Planera aquatica</i>	18.2	31.8	7.3	57.3
<i>Fraxinus caroliniana</i>	13.6	6.0	0.9	20.5
<i>Cephalanthus occidentalis</i>	<u>4.6</u>	<u>1.5</u>	<u>0.4</u>	<u>6.4</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Planera aquatica</i>	45.4	47.0	49.7	142.1
<i>Cephalanthus occidentalis</i>	27.3	29.4	24.1	80.8
<i>Fraxinus caroliniana</i>	18.2	17.7	19.7	55.6
<i>Taxodium distichum</i>	<u>9.1</u>	<u>5.9</u>	<u>6.5</u>	<u>21.5</u>
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
None present				
<u>Herbs and Woody Seedlings</u>				
<i>Styrax americana</i>	33.3	--	33.4	66.7
<i>Planera aquatica</i>	33.4	--	33.3	66.7
<i>Cephalanthus occidentalis</i>	<u>33.3</u>	--	<u>33.3</u>	<u>66.6</u>
	100.0		100.0	200.0
<u>Zone 1</u>				
<u>Trees</u>				
<i>Quercus lyrata</i>	17.8	13.6	25.6	57.0
<i>Quercus laurifolia</i>	8.9	6.8	25.1	40.8
<i>Carya aquatica</i>	11.7	9.1	18.2	39.0
<i>Diospyros virginiana</i>	11.7	18.1	5.8	35.6
<i>Fraxinus caroliniana</i>	14.8	15.9	3.9	34.6
<i>Planera aquatica</i>	11.7	11.4	5.1	28.2
<i>Taxodium distichum</i>	11.7	11.4	2.9	26.0
<i>Acer drummondii</i>	5.9	9.1	10.0	25.0

(Sheet 1 of 5)

¹ No FTI numbers were calculated for plants not identified by species.

Table D1 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Liquidambar styraciflua</i>	2.9	2.3	3.2	8.4
<i>Gleditsia aquatica</i>	2.9	2.3	0.2	5.4
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Acer drummondii</i>	9.1	29.1	21.1	59.3
<i>Ilex decidua</i>	12.1	16.9	21.1	50.1
<i>Planera aquatica</i>	15.2	12.3	14.7	42.2
<i>Taxodium distichum</i>	18.3	10.8	10.6	39.7
<i>Fraxinus caroliniana</i>	12.1	12.3	13.2	37.6
<i>Cephalanthus occidentalis</i>	12.1	6.2	8.1	26.4
<i>Styrax americana</i>	12.1	7.7	6.0	25.8
<i>Crataegus viridis</i>	6.0	3.1	3.1	12.2
<i>Carpinus caroliniana</i>	3.0	1.6	2.1	6.7
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Brunnichia cirrhosa</i>	106.6	33.3	36.9	36.4
<i>Vitis palmata</i>	33.3	26.3	36.4	96.5
<i>Ampelopsis arborea</i>	25.0	21.0	17.0	63.0
<i>Smilax rotundifolia</i>	8.4	15.8	9.7	33.9
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Justicia ovata</i>	26.7	..	42.4	69.1
<i>Quercus laurifolia</i>	18.4	..	27.5	45.9
<i>Planera aquatica</i>	8.3	..	4.6	12.9
<i>Fraxinus caroliniana</i>	10.3	..	2.4	12.7
<i>Brunnichia cirrhosa</i>	4.1	..	8.3	12.4
<i>Diodia virginiana</i>	6.1	..	4.1	10.2
<i>Carya aquatica</i>	6.1	..	4.1	10.2
<i>Saururus cernuus</i>	2.0	..	3.0	5.0
<i>Vitis palmata</i>	2.0	..	0.4	2.4
<i>Ulmus americana</i>	2.0	..	0.4	2.4
<i>Smilax walteri</i>	2.0	..	0.4	2.4
<i>Smilax sp.</i>	2.0	..	0.4	2.4
<i>Crataegus viridis</i>	2.0	..	0.4	2.4
<i>Carex sp.</i>	2.0	..	0.4	2.4
<i>Ampelopsis arborea</i>	2.0	..	0.4	2.4
<i>Acalypha gracilens</i>	2.0	..	0.4	2.4
<i>Acer drummondii</i>	2.0	..	0.4	2.4
	100.0	..	100.0	200.0
<u>Zone 4</u>				
<u>Trees</u>				
<i>Carpinus caroliniana</i>	37.1	30.1	21.1	108.3

(Sheet 2 of 5)

Table D1 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Liquidambar styraciflua</i>	14.8	19.2	35.8	69.8
<i>Ulmus americana</i>	11.1	5.8	5.8	22.7
<i>Quercus michauxii</i>	3.7	1.9	12.1	17.7
<i>Quercus laurifolia</i>	3.7	1.9	10.3	15.9
<i>Diospyros virginiana</i>	7.4	5.8	1.8	15.0
<i>Nyssa sylvatica</i>	7.4	5.8	1.3	14.5
<i>Quercus lyrata</i>	3.7	1.9	8.6	14.2
<i>Crataegus viridis</i>	7.4	3.8	1.0	12.2
<i>Ilex opaca</i>	3.7	3.8	2.2	9.7
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Ilex decidua</i>	38.8	63.1	64.8	166.7
<i>Carpinus caroliniana</i>	37.7	21.7	22.6	72.0
<i>Nyssa sylvatica</i>	11.1	4.3	5.1	20.5
<i>Sebastiania fruticosa</i>	5.6	4.3	1.4	11.3
<i>Quercus lyrata</i>	5.6	2.2	2.5	10.3
<i>Crataegus viridis</i>	5.6	2.2	2.5	10.3
<i>Ilex opaca</i>	5.6	2.2	1.1	8.9
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis palmata</i>	50.0	37.5	47.5	135.0
<i>Toxicodendron radicans</i>	14.3	43.7	31.7	89.7
<i>Bignonia capreolata</i>	14.3	9.4	8.9	32.6
<i>Berchemia scandens</i>	14.3	6.3	7.9	28.5
<i>Vitis rotundifolia</i>	7.1	3.1	4.0	14.2
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Justicia ovata</i>	10.7	..	18.0	28.7
<i>Bignonia capreolata</i>	10.7	..	15.0	26.7
<i>Quercus laurifolia</i>	5.8	..	9.5	15.3
<i>Mitchella repens</i>	5.0	..	9.6	14.6
<i>Carpinus caroliniana</i>	7.9	..	9.6	12.6
<i>Toxicodendron radicans</i>	5.0	..	6.6	11.6
<i>Ulmus americana</i>	7.2	..	2.9	10.1
<i>Crataegus viridis</i>	4.3	..	3.3	7.6
<i>Viola sp.</i>	3.5	..	1.8	5.3
<i>Liquidambar styraciflua</i>	3.5	..	1.5	5.0
<i>Aristolochia serpentaria</i>	3.5	..	1.5	5.0
<i>Lysimachia radicans</i>	1.6	..	3.6	5.0
<i>Saxifraga virginica</i>	2.1	..	2.4	4.5
<i>Vitis palmata</i>	2.8	..	1.2	4.0
<i>Dichanthelium coccineum</i>	2.8	..	1.2	4.0
<i>Asplenium arborescens</i>	1.6	..	2.1	3.5
<i>Viola missouriensis</i>	2.1	..	0.9	3.0

(Sheet 3 of 5)

Table D1 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Quercus lyrata</i>	2.0	--	0.9	3.0
<i>Aster lateriflorus</i>	2.1	--	0.9	3.0
<i>Trachelospermum difforme</i>	0.7	--	1.8	2.5
<i>Justicia americana</i>	0.7	--	1.8	2.5
<i>Campsis radicans</i>	0.7	--	1.8	2.5
<i>Quercus michauxii</i>	1.4	--	0.6	2.0
<i>Oxalis stricta</i>	1.4	--	0.6	2.0
<i>Ilex opaca</i>	1.4	--	0.6	2.0
<i>Eupatorium</i> sp.	1.4	--	0.6	2.0
<i>Celtis laevigata</i>	1.4	--	0.6	2.0
<i>Acer rubrum</i>	1.4	--	0.6	2.0
<i>Thuonia gigantea</i>	0.7	--	0.3	1.0
<i>Smilax bona-nox</i>	0.7	--	0.3	1.0
<i>Sebastiania fruticosa</i>	0.7	--	0.3	1.0
<i>Nyssa aquatica</i>	0.7	--	0.3	1.0
<i>Mikania scandens</i>	0.7	--	0.3	1.0
<i>Botrychium biternatum</i>	0.7	--	0.3	1.0
<i>Acalypha gracilens</i>	0.7	--	0.3	1.0
<i>Acer drummondii</i>	0.7	--	0.3	1.0
	100.0		100.0	200.0

Zone 6

Trees

<i>Liquidambar styraciflua</i>	18.6	20.7	11.5	50.8
<i>Carpinus caroliniana</i>	18.6	20.7	3.4	42.7
<i>Quercus nigra</i>	9.3	6.9	18.6	34.8
<i>Quercus falcata</i> var. <i>pagodifolia</i>	9.3	6.9	14.3	30.5
<i>Ostrya virginiana</i>	11.5	13.9	3.0	28.4
<i>Quercus phellos</i>	4.7	3.4	19.3	27.4
<i>Pinus taeda</i>	4.7	3.4	16.3	24.4
<i>Ilex opaca</i>	7.0	8.6	5.2	20.8
<i>Quercus alba</i>	7.0	6.9	6.0	19.9
<i>Nyssa sylvatica</i>	4.7	5.2	1.5	11.4
<i>Morus rubra</i>	2.3	1.7	0.5	4.5
<i>Cornus florida</i>	2.3	1.7	0.4	4.4
	100.0	100.0	100.0	100.0

Saplings and Shrubs

<i>Carpinus caroliniana</i>	11.2	10.1	16.6	99.9
<i>Ostrya virginiana</i>	27.8	21.1	27.8	78.9
<i>Ilex opaca</i>	11.1	16.2	12.2	46.0
<i>Liquidambar styraciflua</i>	11.1	11.1	8.4	31.1
<i>Nyssa sylvatica</i>	5.6	10.0	8.5	24.1

(Sheet 4 of 5)

Table D1 (Concluded)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Cornus florida</i>	5.6	3.3	4.1	13.0
<i>Aralia spinosa</i>	5.6	3.3	1.9	10.8
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	66.7	75.0	75.0	216.7
<i>Bignonia capreolata</i>	33.3	25.0	25.0	83.3
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Quercus nigra</i>	17.8	--	27.3	45.1
<i>Bignonia capreolata</i>	5.1	--	12.3	17.4
<i>Toxicodendron radicans</i>	5.0	--	4.4	13.4
<i>Parthenocissus quinquefolia</i>	6.4	--	3.1	9.5
<i>Mitchella repens</i>	3.8	--	5.1	8.9
<i>Carpinus caroliniana</i>	5.1	--	2.5	7.6
<i>Pinus taeda</i>	2.6	--	4.5	7.1
<i>Smilax rotundifolia</i>	3.8	--	1.9	5.7
<i>Quercus phellos</i>	3.8	--	1.9	5.7
<i>Dichanthelium commutatum</i>	3.8	--	1.9	5.7
<i>Ilex opaca</i>	3.8	--	1.9	5.7
<i>Carex sp.</i>	3.8	--	1.9	5.7
<i>Vitis rotundifolia</i>	1.3	--	3.9	5.2
<i>Rubus sp.</i>	1.3	--	3.9	5.2
<i>Ilex vomitoria</i>	1.3	--	3.9	5.2
<i>Ascyrum hypericoides</i>	1.3	--	3.9	5.2
<i>Carex sp.</i>	1.3	--	3.9	5.2
<i>Viburnum dentatum</i>	2.6	--	1.3	3.9
<i>Ostrya virginiana</i>	2.6	--	1.3	3.9
<i>Opismenus hirtellus</i>	2.6	--	1.3	3.9
<i>Berchemia scandens</i>	2.6	--	1.3	3.9
<i>Vaccinium elliotii</i>	1.3	--	0.6	1.9
<i>Appelanus albidus</i>	1.3	--	0.6	1.9
<i>Quercus falcata</i> var <i>pagodifolia</i>	1.3	--	0.6	1.9
<i>Quercus alba</i>	1.3	--	0.6	1.9
<i>Prunus serotina</i>	1.3	--	0.6	1.9
<i>Nyssa sylvatica</i>	1.3	--	0.6	1.9
<i>Ilex coriacea</i>	1.3	--	0.6	1.9
<i>Crataegus marshallii</i>	1.3	--	0.6	1.9
<i>Chasmanthium sessiliflorum</i>	1.3	--	0.6	1.9
<i>Chasmanthium laxum</i>	1.3	--	0.6	1.9
<i>Arundinaria gigantea</i>	1.3	--	0.6	1.9
	100.0		100.0	300.0

(Sheet 5 of 5)

Table D2
Importance Values for Species Occurring at Site 2, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Nyssa aquatica</i>	36.0	30.9	73.4	140.3
<i>Taxodium distichum</i>	28.0	41.9	21.9	91.8
<i>Planera aquatica</i>	20.0	20.0	3.8	43.8
<i>Fraxinus caroliniana</i>	8.0	3.6	0.5	12.1
<i>Cephalanthus occidentalis</i>	<u>8.0</u>	<u>3.6</u>	<u>0.4</u>	<u>12.0</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Planera aquatica</i>	44.4	54.5	38.4	137.3
<i>Cephalanthus occidentalis</i>	33.3	27.3	34.2	94.8
<i>Fraxinus caroliniana</i>	<u>22.3</u>	<u>18.2</u>	<u>37.4</u>	<u>67.9</u>
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
None present				
<u>Herbs and Woody Seedlings</u>				
None present				
<u>Zone 3</u>				
<u>Trees</u>				
<i>Acer drummondii</i>	13.8	30.9	23.9	68.6
<i>Fraxinus caroliniana</i>	20.7	21.8	8.0	50.5
<i>Quercus laurifolia</i>	10.3	90.1	28.4	47.8
<i>Quercus lyrata</i>	17.3	12.7	17.5	57.5
<i>Taxodium distichum</i>	13.8	10.9	2.5	27.2
<i>Carya aquatica</i>	10.3	5.5	10.3	26.1
<i>Liquidambar styraciflua</i>	6.9	3.6	8.6	19.1
<i>Planera aquatica</i>	<u>6.9</u>	<u>5.5</u>	<u>0.8</u>	<u>13.2</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Fraxinus caroliniana</i>	25.9	35.5	40.5	101.9
<i>Acer drummondii</i>	19.3	21.7	22.7	63.7
<i>Styrax americana</i>	12.9	16.1	11.8	40.8
<i>Cephalanthus occidentalis</i>	12.9	7.5	9.4	29.8
<i>Cornus foemina</i>	3.2	8.6	9.8	21.6
<i>Taxodium distichum</i>	12.9	4.3	2.7	19.7
<i>Sapium sebiferum</i>	6.5	7.1	1.2	9.8
<i>Carya aquatica</i>	3.2	1.1	1.3	5.6

(Sheet 1 of 5)

Table D2 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Planera aquatica</i>	3.2 100.0	1.1 100.0	0.6 100.0	4.9 300.0
<u>Woody Vines</u>				
<i>Vitis palmata</i>	37.5	33.3	40.2	111.0
<i>Campsis radicans</i>	25.0	33.3	48.2	106.5
<i>Ampelopsis arborea</i>	35.0	22.3	9.8	57.1
<i>Brunnichia cirrhosa</i>	12.5 100.0	11.1 100.0	1.8 100.0	25.4 300.0
<u>Herbs and Woody Seedlings</u>				
<i>Quercus laurifolia</i>	21.1	--	40.8	61.9
<i>Justicia ovata</i>	21.0	--	13.7	34.7
<i>Saururus cernuus</i>	8.1	--	12.6	20.7
<i>Lysimachia radicans</i>	8.1	--	6.2	14.3
<i>Quercus lyrata</i>	8.1	--	4.1	12.2
<i>Smilax walteri</i>	3.2	--	6.6	9.8
<i>Styrax americana</i>	4.8	--	3.3	8.1
<i>Brunnichia cirrhosa</i>	4.8	--	3.3	8.1
<i>Leersia</i> sp.	1.6	--	2.5	4.1
<i>Ampelopsis arborea</i>	1.6	--	2.5	4.1
<i>Fraxinus caroliniana</i>	3.2	--	0.8	4.0
<i>Vitis palmata</i>	1.6	--	0.4	2.0
<i>Toxicodendron radicans</i>	1.6	--	0.4	2.0
<i>Diodia virginiana</i>	1.6	--	0.4	2.0
<i>Crataegus viridis</i>	1.6	--	0.4	2.0
<i>Cephalanthus occidentalis</i>	1.6	--	0.4	2.0
<i>Campsis radicans</i>	1.6	--	0.4	2.0
<i>Aster</i> sp.	1.6	--	0.4	2.0
<i>Asclepias perennis</i>	1.6	--	0.4	2.0
<i>Acer drummondii</i>	1.6 100.0	--	0.4 100.0	2.0 200.0

Zone 4Trees

<i>Carpinus caroliniana</i>	10.0	51.1	11.6	92.0
<i>Liquidambar styraciflua</i>	10.0	23.6	29.4	83.0
<i>Quercus michauxii</i>	10.1	6.9	26.9	43.9
<i>Nyssa sylvatica</i>	6.7	2.8	23.5	32.0
<i>Ulmus americana</i>	3.3	2.6	6.7	12.3
<i>Ilex decidua</i>	6.7	4.2	0.6	11.5
<i>Ilex opaca</i>	3.3	2.9	1.4	7.5
<i>Acer drummondii</i>	3.3	2.8	0.8	6.9
<i>Carya aquatica</i>	3.3	1.4	0.4	5.1
<i>Crataegus viridis</i>	3.3 100.0	1.4 100.0	0.2 100.0	4.9 300.0

(Sheet 2 of 5)

Table D2 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Saplings and Shrubs</u>				
<i>Carpinus caroliniana</i>	49.9	61.8	64.9	176.6
<i>Ilex decidua</i>	38.9	34.0	32.4	105.3
<i>Crataegus viridis</i>	5.6	2.1	2.0	9.7
<i>Sebastiania fruticosa</i>	5.6	2.1	0.7	8.4
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis palmata</i>	32.2	19.3	24.9	76.4
<i>Berchemia scandens</i>	22.6	29.6	18.8	71.0
<i>Toxicodendron radicans</i>	9.7	27.4	25.4	62.5
<i>Vitis rotundifolia</i>	19.4	17.0	22.7	59.1
<i>Campsis radicans</i>	9.7	4.5	5.0	129.2
<i>Cocculus carolinus</i>	3.2	1.1	1.6	5.9
<i>Ampelopsis arborea</i>	3.2	1.1	1.6	5.9
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Berchemia scandens</i>	15.2	-	25.0	40.2
<i>Mitchella repens</i>	8.2	--	13.8	22.0
<i>Vitis palmata</i>	9.6	--	7.5	17.1
<i>Sebastiania fruticosa</i>	4.2	--	11.9	16.1
<i>Justicia ovata</i>	6.9	--	8.9	15.8
<i>Toxicodendron radicans</i>	6.9	--	4.4	11.3
<i>Ulmus americana</i>	5.6	--	1.7	7.3
<i>Smilax walteri</i>	5.6	--	1.7	7.3
<i>Quercus laurifolia</i>	5.6	--	12.7	7.3
<i>Quercus michauxii</i>	2.8	--	3.1	5.9
<i>Nyssa sylvatica</i>	2.8	--	3.1	5.9
<i>Carpinus caroliniana</i>	4.2	--	1.3	5.5
<i>Aster sp.</i>	4.2	--	1.3	5.5
<i>Vernonia gigantea</i>	1.4	--	2.7	4.1
<i>Lysimachia radicans</i>	1.4	--	2.7	4.1
<i>Diodia virginiana</i>	1.4	--	2.7	4.1
<i>Bignonia capreolata</i>	1.4	--	2.7	4.1
<i>Liquidambar styraciflua</i>	2.8	--	0.9	3.7
<i>Celtis laevigata</i>	2.8	--	0.9	3.7
<i>Viola missouriensis</i>	1.4	--	0.4	1.8
<i>Polygonum virginianum</i>	1.4	--	0.4	1.8
<i>Parthenocissus quinquefolia</i>	1.4	--	0.4	1.8
<i>Campsis radicans</i>	1.4	--	0.4	1.8
<i>Betrychium sp.</i>	1.4	--	0.4	1.8
	100.0		100.0	200.0
<u>Zone 6</u>				
<u>Trees</u>				
<i>Ostrya virginiana</i>	24.9	46.2	9.8	80.9

(Sheet 3 of 5)

Table D2 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Fagus grandifolia</i>	9.4	7.7	32.4	49.5
<i>Quercus alba</i>	12.5	13.5	16.2	42.2
<i>Quercus nigra</i>	9.4	5.8	11.1	26.3
<i>Pinus taeda</i>	9.4	5.8	10.5	25.7
<i>Ilex opaca</i>	12.5	7.7	3.0	23.2
<i>Cornus florida</i>	9.4	5.7	0.7	15.8
<i>Liquidambar styraciflua</i>	6.3	3.8	4.0	14.1
<i>Carya glabra</i>	3.2	1.9	6.5	11.5
<i>Quercus phellos</i>	3.1	1.9	5.8	10.8
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Vaccinium elliotii</i>	16.4	30.8	18.3	65.5
<i>Ilex opaca</i>	14.4	17.1	13.7	45.2
<i>Ostrya virginiana</i>	14.4	11.4	18.1	43.9
<i>Ilex vomitoria</i>	6.1	8.0	6.6	20.7
<i>Cornus florida</i>	8.2	4.5	7.5	20.2
<i>Vaccinium arboreum</i>	6.1	4.5	6.5	17.1
<i>Nyssa sylvatica</i>	4.1	4.5	6.5	15.1
<i>Chionanthus virginicus</i>	6.1	3.4	3.8	13.3
<i>Quercus phellos</i>	4.1	2.3	3.9	10.3
<i>Liquidambar styraciflua</i>	4.1	2.3	1.0	7.4
<i>Fagus grandifolia</i>	2.0	2.3	2.9	7.2
<i>Symplocos tinctoria</i>	2.0	2.3	1.4	5.7
<i>Sassafras albidum</i>	2.0	1.2	2.0	5.1
<i>Carpinus caroliniana</i>	2.0	1.1	2.0	5.1
<i>Acer rubrum</i>	2.0	1.1	2.0	5.1
<i>Quercus laurifolia</i>	2.0	1.1	1.6	4.7
<i>Aralia spinosa</i>	2.0	1.1	1.6	4.7
<i>Quercus alba</i>	2.0	1.1	0.6	3.7
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	11.4	77.8	81.0	230.2
<i>Coleseum sempervirens</i>	14.3	11.1	17.1	42.5
<i>Smilax rotundifolia</i>	14.3	11.1	1.9	27.3
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Mitchella repens</i>	11.8	..	19.5	31.3
<i>Quercus nigra</i>	13.8	..	15.7	29.5
<i>Smilax pumila</i>	8.8	..	15.3	24.1
<i>Sebastiania fruticosa</i>	5.9	..	9.0	14.9
<i>Chasmanthium laxum</i>	5.9	..	9.0	14.9
<i>Carex</i> sp.	5.0	..	4.4	9.4
<i>Ostrya virginiana</i>	6.8	..	2.0	8.8
<i>Vitis rotundifolia</i>	6.0	..	2.9	7.9

(Sheet 4 of 5)

Table D2 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Dichanthelium commutatum</i>	4.0	--	2.6	6.6
<i>Ilex vomitoria</i>	2.0	--	4.5	6.5
<i>Smilax rotundifolia</i>	5.0	--	1.4	6.4
<i>Carya glabra</i>	3.0	--	2.3	5.3
<i>Diospyros virginiana</i>	1.0	--	1.8	2.8
<i>Chasmanthium sessiliflorum</i>	1.0	--	1.8	2.8
<i>Aralia spinosa</i>	1.0	--	1.8	2.8
<i>Vaccinium arboreum</i>	2.0	--	0.6	2.6
<i>Quercus phellos</i>	2.0	--	0.6	2.6
<i>Callicarpa americana</i>	2.0	--	0.6	2.6
<i>Bignonia capreolata</i>	2.0	--	0.6	2.6
<i>Acer rubrum</i>	2.0	--	0.6	2.6
<i>Viburnum dentatum</i>	1.0	--	0.3	1.3
<i>Sassafras albidum</i>	1.0	--	0.3	1.3
<i>Toxicodendron radicans</i>	1.0	--	0.3	1.3
<i>Prunus umbellata</i>	1.0	--	0.3	1.3
<i>Paspalum</i> sp.	1.0	--	0.3	1.3
<i>Liquidambar styraciflua</i>	1.0	--	0.3	1.3
<i>Fagus grandifolia</i>	1.0	--	0.3	1.3
<i>Crataegus marshalli</i>	1.0	--	0.3	1.3
<i>Chionanthus virginicus</i>	1.0	--	0.3	1.3
<i>Aristolochia serpentaria</i>	1.0	--	0.3	1.3
	100.0		100.0	200.0

(Sheet 5 of 5)

Table D3
Importance Values for Species Occurring at Site 3, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Salix nigra</i>	76.9	94.6	97.1	268.6
<i>Cephalanthus occidentalis</i>	7.7	3.6	1.5	12.8
<i>Taxodium distichum</i>	7.7	0.9	1.0	9.6
<i>Planera aquatica</i>	<u>7.7</u>	<u>0.9</u>	<u>0.4</u>	<u>9.0</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Salix nigra</i>	62.6	88.3	93.2	244.1
<i>Planera aquatica</i>	18.8	3.2	2.2	24.2
<i>Forestiera acuminata</i>	6.2	6.5	3.9	16.6
<i>Cephalanthus occidentalis</i>	6.2	1.3	0.5	8.0
<i>Taxodium distichum</i>	<u>6.2</u>	<u>0.7</u>	<u>0.2</u>	<u>7.1</u>
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Ipomoea wrightii</i>	46.1	75.5	73.6	195.2
<i>Ipomoea lacunosa</i>	30.8	15.6	17.8	64.2
<i>Cardiospermum halicacabum</i>	<u>23.1</u>	<u>8.9</u>	<u>8.6</u>	<u>40.6</u>
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Forestiera acuminata</i>	9.9	--	19.1	29.0
<i>Ipomoea wrightii</i>	5.3	--	17.2	22.5
<i>Cardiospermum halicacabum</i>	6.7	--	11.5	18.2
<i>Boehmeria cylindrica</i>	9.3	--	7.5	16.8
<i>Aster simplex</i>	7.3	--	5.5	12.8
<i>Cyperus erythrorhizos</i>	5.3	--	6.0	11.3
<i>Anaxarthus rudis</i>	5.3	--	6.0	11.3
<i>Planera aquatica</i>	6.7	--	2.6	9.3
<i>Azalypha rhomboidea</i>	6.0	--	2.6	8.6
<i>Ricciocarpus natans</i>	5.3	--	2.1	7.4
<i>Cephalanthus occidentalis</i>	4.0	--	1.5	5.5
<i>Campsis radicans</i>	2.0	--	3.5	5.5
<i>Paspalum fluitans</i>	2.7	--	2.4	5.1
<i>Rorippa islandica</i>	3.3	--	1.3	4.6
<i>Ipomoea lacunosa</i>	1.3	--	1.9	3.2
<i>Sesbania exaltata</i>	2.0	--	0.8	2.8
<i>Melothria pendula</i>	2.0	--	0.8	2.8
<i>Diodia virginiana</i>	2.0	--	0.8	2.8
<i>Vitis palmata</i>	0.7	--	1.6	2.3
<i>Polygonum hydropiperoides</i>	1.3	--	0.5	1.8

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Table D3 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Justicia ovata</i>	1.3	--	0.5	1.8
<i>Echinodorus cordifolius</i>	1.3	--	0.5	1.8
<i>Commelina communis</i>	1.3	--	0.5	1.8
<i>Taxodium distichum</i>	0.7	--	0.3	1.0
<i>Spermacoce glabra</i>	0.7	--	0.3	1.0
<i>Sida</i> sp.	0.7	--	0.3	1.0
<i>Salix nigra</i>	0.7	--	0.3	1.0
<i>Paspalum urvillei</i>	0.7	--	0.3	1.0
<i>Nyssa aquatica</i>	0.7	--	0.3	1.0
<i>Ludwigia decurrens</i>	0.7	--	0.3	1.0
<i>Heliotropium indicum</i>	0.7	--	0.3	1.0
<i>Eragrostis hypnoides</i>	0.7	--	0.3	1.0
<i>Celtis laevigata</i>	0.7	--	0.3	1.0
<i>Brunnichia cirrhosa</i>	0.7	--	0.3	1.0
	100.0		100.0	200.0

Zone 3Trees

<i>Forestiera acuminata</i>	27.7	32.8	20.3	80.8
<i>Carya aquatica</i>	20.7	20.7	28.7	70.1
<i>Acer negundo</i>	17.3	24.1	3.1	44.5
<i>Quercus lyrata</i>	17.3	8.6	18.0	43.9
<i>Celtis laevigata</i>	3.4	5.2	24.2	32.8
<i>Gleditsia aquatica</i>	3.4	1.7	3.9	9.0
<i>Fraxinus pennsylvanica</i>	3.4	3.5	0.9	7.8
<i>Planera aquatica</i>	3.4	1.7	0.5	5.6
<i>Diospyros virginiana</i>	3.4	1.7	0.4	5.5
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Acer negundo</i>	29.2	40.6	45.4	115.2
<i>Forestiera acuminata</i>	25.0	25.3	20.2	70.5
<i>Fraxinus pennsylvanica</i>	20.9	23.1	20.9	64.9
<i>Celtis laevigata</i>	12.5	6.6	7.6	26.7
<i>Carya aquatica</i>	8.3	3.3	4.4	16.0
<i>Ulmus americana</i>	4.1	1.1	1.5	6.7
	100.0	100.0	100.0	300.0

Woody Vines

<i>Cocculus carolinus</i>	40.0	40.0	26.4	106.4
<i>Toxicodendron radicans</i>	10.0	18.8	39.0	67.8
<i>Ampelopsis arborea</i>	20.0	17.5	14.5	52.0
<i>Vitis riparia</i>	10.0	13.8	15.4	39.2

(Sheet 2 of 8)

Table D3 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Brunnichia cirrhosa</i>	10.0	6.2	2.7	18.9
<i>Parthenocissus quinquefolia</i>	5.0	2.5	1.2	8.7
<i>Trachelospermum difforme</i>	<u>5.0</u>	<u>1.2</u>	<u>0.8</u>	<u>7.0</u>
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Forestiera acuminata</i>	34.1	--	34.4	68.5
<i>Cocculus carolinus</i>	17.0	--	21.6	38.6
<i>Vitis riparia</i>	10.6	--	7.7	18.3
<i>Cephalanthus occidentalis</i>	2.1	--	11.5	13.6
<i>Brunnichia cirrhosa</i>	6.4	--	6.2	12.6
<i>Ampelopsis arborea</i>	4.3	--	5.4	9.7
<i>Acalypha rhomboidea</i>	4.3	--	5.4	9.7
<i>Sida</i> sp.	4.3	--	1.5	5.8
<i>Boehmeria cylindrica</i>	4.3	--	1.5	5.8
<i>Sassafras albidum</i>	2.1	--	0.8	2.9
<i>Ipomoea lacunosa</i>	2.1	--	0.8	2.9
<i>Celtis laevigata</i>	2.1	--	0.8	2.9
<i>Amaranthus rudis</i>	2.1	--	0.8	2.9
<i>Acer rubrum</i>	<u>2.1</u>	--	<u>0.8</u>	<u>2.9</u>
	100.0		100.0	200.0
<u>Zone 4</u>				
<u>Trees</u>				
<i>Quercus lyrata</i>	29.4	20.8	84.2	134.4
<i>Acer negundo</i>	35.2	54.1	11.2	100.5
<i>Liquidambar styraciflua</i>	11.8	8.3	0.7	20.8
<i>Ulmus americana</i>	5.9	4.2	2.3	12.4
<i>Carya aquatica</i>	5.9	4.2	1.0	11.1
<i>Morus rubra</i>	5.9	4.2	0.3	10.4
<i>Fraxinus pennsylvanica</i>	<u>5.9</u>	<u>4.2</u>	<u>0.3</u>	<u>10.4</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Carya aquatica</i>	24.3	43.7	35.8	103.8
<i>Acer negundo</i>	21.2	33.3	41.7	96.2
<i>Ulmus americana</i>	12.1	6.3	5.8	24.2
<i>Celtis laevigata</i>	12.1	6.3	5.6	24.0
<i>Fraxinus pennsylvanica</i>	12.1	4.8	6.0	22.9
<i>Liquidambar styraciflua</i>	6.1	2.4	2.0	10.5
<i>Acer drummondii</i>	6.1	1.6	1.6	9.3
<i>Cornus drummondii</i>	3.0	0.8	0.9	4.7
<i>Quercus lyrata</i>	<u>3.0</u>	<u>0.8</u>	<u>0.6</u>	<u>4.4</u>
	100.0	100.0	100.0	300.0

(Sheet 3 of 8)

Table D3 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	31.1	72.5	92.0	195.6
<i>Cocculus carolinus</i>	21.9	14.1	3.1	39.1
<i>Trachelospermum difforme</i>	12.5	4.8	0.7	18.0
<i>Berchemia scandens</i>	9.4	2.6	1.5	13.5
<i>Ampelopsis arborea</i>	6.3	2.2	0.9	9.4
<i>Vitis rotundifolia</i>	6.3	1.3	1.2	8.8
<i>Brunnichia cirrhosa</i>	6.3	1.7	0.3	8.3
<i>Campsis radicans</i>	3.1	0.4	0.2	3.7
<i>Smilax rotundifolia</i>	3.1	0.4	0.1	3.6
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Toxicodendron radicans</i>	29.8	--	74.3	104.1
<i>Cocculus carolinus</i>	14.9	--	9.2	24.1
<i>Ampelopsis arborea</i>	12.8	--	6.0	18.8
<i>Trachelospermum difforme</i>	8.5	--	2.1	10.6
<i>Brunnichia cirrhosa</i>	8.5	--	2.1	10.6
<i>Ilex decidua</i>	4.3	--	1.1	5.4
<i>Clematis virginiana</i>	4.3	--	1.1	5.4
<i>Celtis laevigata</i>	4.3	--	1.1	5.4
<i>Vitis rotundifolia</i>	2.1	--	0.5	2.6
<i>Ulmus americana</i>	2.1	--	0.5	2.6
<i>Smilax rotundifolia</i>	2.1	--	0.5	2.6
<i>Cephalanthus occidentalis</i>	2.1	--	0.5	2.6
<i>Campsis radicans</i>	2.1	--	0.5	2.6
<i>Berchemia scandens</i>	2.0	--	0.5	2.6
	100.0		100.0	200.0
<u>Zone 5</u>				
<u>Trees</u>				
<i>Liquidambar styraciflua</i>	31.7	34.5	68.5	134.7
<i>Carya illinoensis</i>	18.2	20.7	16.7	55.6
<i>Celtis laevigata</i>	18.2	20.7	4.9	43.8
<i>Quercus shumardii</i>	9.1	6.9	6.1	22.1
<i>Quercus nigra</i>	9.1	6.9	2.7	18.7
<i>Ulmus americana</i>	9.1	6.9	0.9	16.9
<i>Acer negundo</i>	4.6	3.4	0.2	8.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Cornus drummondii</i>	21.6	59.2	58.3	139.1
<i>Ilex decidua</i>	17.4	15.3	15.9	48.6
<i>Celtis laevigata</i>	15.2	6.4	7.2	28.8
<i>Ulmus americana</i>	15.2	5.1	5.8	26.1
<i>Acer negundo</i>	6.5	6.4	6.0	18.9

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Table D3 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Cercis canadensis</i>	6.5	1.9	1.5	9.9
<i>Crataegus viridis</i>	4.4	1.9	2.4	8.7
<i>Fraxinus pennsylvanica</i>	4.4	1.3	0.9	6.6
<i>Liquidambar styraciflua</i>	4.4	1.3	0.7	6.4
<i>Acer rubrum</i>	2.2	0.6	1.0	3.8
<i>Quercus shumardii</i>	2.2	0.6	0.3	3.1
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	29.7	82.5	89.6	201.8
<i>Campsis radicans</i>	18.5	3.4	1.6	23.5
<i>Berchemia scandens</i>	14.8	5.1	1.1	21.0
<i>Vitis riparia</i>	11.1	2.8	3.5	17.4
<i>Vitis rotundifolia</i>	11.1	1.7	0.9	13.7
<i>Parthenocissus quinquefolia</i>	7.4	2.8	1.8	12.0
<i>Ampelopsis cordata</i>	3.7	1.1	1.4	6.2
<i>Brunnichia cirrhosa</i>	3.7	0.6	0.1	4.4
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Toxicodendron radicans</i>	11.7	--	37.3	49.0
<i>Viola floridana</i>	7.1	--	11.9	19.0
<i>Berchemia scandens</i>	4.5	--	9.9	14.4
<i>Ulmus americana</i>	8.4	--	3.9	12.3
<i>Ampelopsis arborea</i>	3.8	--	8.5	12.3
<i>Celtis laevigata</i>	6.5	--	3.3	9.8
<i>Acer negundo</i>	4.5	--	1.5	6.0
<i>Parthenocissus quinquefolia</i>	2.6	--	3.1	5.7
<i>Campsis radicans</i>	2.6	--	3.1	5.7
<i>Vitis rotundifolia</i>	3.8	--	1.3	5.1
<i>Ageratina altissima</i>	3.8	--	3.1	5.7
<i>Liquidambar styraciflua</i>	3.3	--	0.9	3.5
<i>Cornus drummondii</i>	1.3	--	2.7	4.0
<i>Clematis viorna</i>	2.6	--	0.9	3.5
<i>Aster simplex</i>	2.6	--	0.9	3.5
<i>Acalypha rhomboidea</i>	2.6	--	0.9	3.5
<i>Smilax rotundifolia</i>	2.0	--	0.6	2.6
<i>Sanicula canadensis</i>	2.0	--	0.6	2.6
<i>Oxalis stricta</i>	2.0	--	0.6	2.6
<i>Geum canadense</i>	2.0	--	0.6	2.6
<i>Boehmeria cylindrica</i>	2.0	--	0.6	2.6
<i>Vitis sp.</i>	1.3	--	0.4	1.7
<i>Quercus shumardii</i>	1.3	--	0.4	1.7
<i>Polygonum virginianum</i>	1.3	--	0.4	1.7
<i>Ilex decidua</i>	1.3	--	0.4	1.7
<i>Eupatorium serotinum</i>	1.3	--	0.4	1.7
<i>Brunnichia cirrhosa</i>	1.3	--	0.4	1.7

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Table D3 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Vitis riparia</i>	0.7	--	0.2	0.9
<i>Vernonia gigantea</i>	0.7	--	0.2	0.9
Unknown	0.7	--	0.2	0.9
<i>Trachelospermum difforme</i>	0.7	--	0.2	0.9
<i>Rubus trivialis</i>	0.7	--	0.2	0.9
<i>Quercus phellos</i>	0.7	--	0.2	0.9
<i>Quercus nigra</i>	0.7	--	0.2	0.9
<i>Dichanthelium commutatum</i>	0.7	--	0.2	0.9
<i>Mikania scandens</i>	0.7	--	0.2	0.9
<i>Platanthera flava</i>	0.7	--	0.2	0.9
<i>Fraxinus pennsylvanica</i>	0.7	--	0.2	0.9
<i>Forestiera acuminata</i>	0.7	--	0.2	0.9
<i>Clematis virginiana</i>	0.7	--	0.2	0.9
<i>Carex</i> sp.	0.7	--	0.2	0.9
<i>Aster</i> sp.	0.7	--	0.2	0.9
	100.0		100.0	200.0

Zone 6Trees

<i>Sassafras albidum</i>	33.3	45.4	36.6	115.3
<i>Acer negundo</i>	14.3	15.2	22.0	51.5
<i>Liquidambar styraciflua</i>	19.0	18.2	3.2	40.4
<i>Quercus nigra</i>	4.8	3.0	18.4	26.2
<i>Celtis laevigata</i>	4.8	3.0	11.4	19.2
<i>Cercis canadensis</i>	9.5	6.1	2.1	17.7
<i>Quercus falcata</i> var. <i>pagodifolia</i>	9.5	6.1	0.6	16.2
<i>Carya illinoensis</i>	4.8	3.0	5.7	13.5
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Acer negundo</i>	10.5	43.3	36.2	90.0
<i>Liquidambar styraciflua</i>	14.8	13.8	18.4	47.0
<i>Sambucus canadensis</i>	11.9	11.9	9.6	33.4
<i>Ulmus americana</i>	13.3	8.4	9.3	31.0
<i>Ilex decidua</i>	7.5	5.4	6.4	19.3
<i>Cercis canadensis</i>	7.5	3.8	5.2	16.5
<i>Aralia spinosa</i>	7.5	4.2	4.6	16.3
<i>Callicarpa americana</i>	6.0	2.7	2.2	10.9
<i>Quercus falcata</i> var. <i>pagodifolia</i>	6.0	1.5	2.0	9.5
<i>Celtis laevigata</i>	4.5	1.5	1.8	7.8
<i>Diospyros virginiana</i>	3.0	0.8	1.2	5.0
<i>Fraxinus pennsylvanica</i>	1.5	1.1	0.8	3.4
<i>Morus rubra</i>	1.5	0.4	1.0	2.9
<i>Cornus drummondii</i>	1.5	0.4	0.6	2.5

(Sheet 6 of 8)

Table D3 (Continued)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Quercus nigra</i>	1.5	0.4	0.4	2.3
<i>Ulmus crassifolia</i>	1.5	0.4	0.3	2.2
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	26.5	69.2	71.7	167.4
<i>Vitis rotundifolia</i>	26.5	13.6	12.7	52.8
<i>Vitis riparia</i>	26.5	8.0	11.5	46.0
<i>Parthenocissus quinquefolia</i>	14.7	8.4	3.8	26.9
<i>Cocculus carolinus</i>	2.9	0.4	0.2	3.5
<i>Campsis radicans</i>	2.9	0.4	0.1	3.4
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Toxicodendron radicans</i>	8.9	--	30.4	39.3
<i>Sanicula canadensis</i>	9.4	--	18.6	28.0
<i>Ageratina altissima</i>	9.9	--	13.8	23.7
<i>Viola floridana</i>	9.4	--	7.9	17.3
<i>Geum canadense</i>	9.4	--	6.1	15.5
<i>Galium circaeazans</i>	6.8	--	2.9	9.7
<i>Vernonia gigantea</i>	4.2	--	4.2	8.4
<i>Polygonum virginianum</i>	3.2	--	2.6	5.8
<i>Acer negundo</i>	3.2	--	2.2	5.4
<i>Vitis rotundifolia</i>	3.6	--	1.5	5.1
<i>Platanthera flava</i>	2.3	--	1.9	5.1
<i>Parthenocissus quinquefolia</i>	2.6	--	1.3	3.9
<i>Ulmus americana</i>	3.2	--	0.5	3.7
<i>Smallanthus uvedalia</i>	2.2	--	1.3	3.5
<i>Oxalis stricta</i>	2.2	--	0.3	2.5
<i>Carya illinoensis</i>	1.6	--	0.3	1.9
<i>Smilax glauca</i>	1.0	--	0.2	1.2
<i>Rubus trivialis</i>	1.0	--	0.2	1.2
<i>Quercus nigra</i>	1.0	--	0.2	1.2
<i>Lactuca sp.</i>	1.0	--	0.2	1.2
<i>Ampelamus albidus</i>	1.0	--	0.2	1.2
<i>Cercis canadensis</i>	1.0	--	0.2	1.2
<i>Campsis radicans</i>	1.0	--	0.2	1.2
<i>Botrychium virginianum</i>	1.0	--	0.2	1.2
<i>Aralia spinosa</i>	1.0	--	0.2	1.2
<i>Phytolacca americana</i>	1.0	--	0.2	1.2
<i>Viola sp.</i>	0.5	--	0.5	1.0
<i>Cornus drummondii</i>	0.5	--	0.5	1.0
<i>Trachelospermum difforme</i>	0.5	--	0.1	0.6
<i>Smilax rotundifolia</i>	0.5	--	0.1	0.6
<i>Sambucus canadensis</i>	0.5	--	0.1	0.6
<i>Rubus sp.</i>	0.5	--	0.1	0.6
<i>Quercus shumardii</i>	0.5	--	0.1	0.6

(Sheet 7 of 8)

Table D3 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Parietaria pensylvanica</i>	0.5	--	0.1	0.6
<i>Galium aparine</i>	0.5	--	0.1	0.6
<i>Erigeron philadelphicus</i>	0.5	--	0.1	0.6
<i>Elytraria caroliniensis</i>	0.5	--	0.1	0.6
<i>Cocculus carolinus</i>	0.5	--	0.1	0.6
<i>Aster simplex</i>	0.5	--	0.1	0.6
<i>Acalypha rhomboidea</i>	0.5	--	0.1	0.6
	100.0		100.0	200.0

(Sheet 6 of 8)

Table D4
Importance Values for Species Occurring at Site 4, Arranged by Zone and
Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 3</u>				
<u>Trees</u>				
<i>Carya aquatica</i>	33.3	29.1	59.6	122.0
<i>Quercus lyrata</i>	25.0	32.7	23.1	80.8
<i>Diospyros virginiana</i>	25.0	14.6	5.7	45.3
<i>Forestiera acuminata</i>	12.5	20.0	6.7	39.2
<i>Gleditsia aquatica</i>	4.2	3.6	4.9	12.7
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Forestiera acuminata</i>	20.7	40.7	43.3	104.7
<i>Quercus lyrata</i>	27.6	17.2	19.8	64.6
<i>Diospyros virginiana</i>	17.2	12.5	13.8	43.5
<i>Planera aquatica</i>	13.8	15.6	10.4	39.8
<i>Carya aquatica</i>	6.9	6.2	7.1	20.2
<i>Cephalanthus occidentalis</i>	10.4	6.2	3.3	19.9
<i>Crataegus viridis</i>	3.4	1.6	2.3	7.3
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis palmata</i>	53.4	35.0	52.8	141.2
<i>Brunnichia cirrhosa</i>	33.3	59.8	44.6	137.7
<i>Trachelospermum difforme</i>	13.3	5.2	2.6	21.1
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Quercus lyrata</i>	28.6	..	34.6	63.2
<i>Brunnichia cirrhosa</i>	14.3	..	26.1	40.4
<i>Panicum rigidulum</i>	5.7	..	13.2	18.9
<i>Planera aquatica</i>	8.6	..	6.3	14.9
<i>Forestiera acuminata</i>	10.0	..	3.9	13.9
<i>Trachelospermum difforme</i>	8.6	..	3.4	12.0
<i>Diodia virginiana</i>	7.1	..	2.8	9.9
<i>Taxodium distichum</i>	5.7	..	2.2	7.9
<i>Acalypha rhomboidea</i>	4.3	..	1.7	6.0
<i>Carya aquatica</i>	1.4	..	1.1	4.9
<i>Cephalanthus occidentalis</i>	2.9	..	1.1	4.0
<i>Vitis palmata</i>	1.4	..	0.6	2.0
<i>Styrax americana</i>	1.4	..	0.6	2.0
	100.0	..	100.0	300.0

(Sheet 1 of 3)

Table D4 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Zone 4</u>				
<u>Trees</u>				
<i>Quercus phellos</i>	16.7	16.3	33.3	66.3
<i>Carya aquatica</i>	16.7	18.6	22.5	57.8
<i>Quercus lyrata</i>	20.0	27.8	8.9	56.7
<i>Liquidambar styraciflua</i>	13.3	11.7	23.3	48.3
<i>Quercus nuttallii</i>	20.0	16.3	10.8	47.1
<i>Crataegus viridis</i>	6.7	4.7	0.5	11.9
<i>Diospyros virginiana</i>	3.3	2.3	0.4	6.0
<i>Planera aquatica</i>	3.3	2.3	0.3	5.9
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Styrax americana</i>	20.4	58.7	46.7	125.8
<i>Ilex decidua</i>	18.2	15.6	24.0	57.8
<i>Quercus lyrata</i>	11.4	8.0	10.6	30.0
<i>Quercus nuttallii</i>	9.1	5.4	6.5	21.0
<i>Diospyros virginiana</i>	11.4	4.3	3.5	19.2
<i>Planera aquatica</i>	6.8	1.6	2.9	11.3
<i>Cephalanthus occidentalis</i>	6.8	1.6	1.1	9.5
<i>Crataegus viridis</i>	4.5	1.1	1.8	7.4
<i>Cornus foemina</i>	4.5	1.1	1.0	6.6
<i>Quercus phellos</i>	2.3	1.6	1.1	5.0
<i>Forestiera acuminata</i>	2.3	0.5	0.4	3.2
<i>Carya aquatica</i>	2.3	0.5	0.4	3.2
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis riparia</i>	22.5	24.8	34.6	81.9
<i>Trachelospermum difforme</i>	20.0	33.7	17.7	70.9
<i>Ampelopsis arborea</i>	15.0	21.4	18.0	54.4
<i>Berchemia scandens</i>	15.0	9.7	19.6	44.3
<i>Campsis radicans</i>	7.5	3.4	4.9	15.8
<i>Vitis palmata</i>	7.5	2.1	3.0	12.6
<i>Smilax bona-nox</i>	5.0	1.4	0.9	7.3
<i>Brunnichia cirrhosa</i>	5.0	1.4	0.6	7.0
<i>Smilax glauca</i>	2.5	2.1	1.2	5.8
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Liquidambar styraciflua</i>	10.2	..	11.3	24.0
<i>Campsis radicans</i>	6.9	..	14.1	22.4
<i>Styrax americana</i>	8.1	..	14.1	22.4
<i>Ampelopsis arborea</i>	4.8	..	14.1	18.9
<i>Berchemia scandens</i>	9.0	..	5.5	14.5
<i>Dioclea multiflora</i>	4.8	..	6.6	11.6

(Sheet 2 of 3)

Table D4 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Trachelospermum difforme</i>	6.2	--	4.3	10.5
<i>Ilex decidua</i>	6.9	--	3.0	9.9
<i>Vitis palmata</i>	5.5	--	4.0	9.5
<i>Quercus phellos</i>	4.8	--	3.7	8.5
<i>Brunnichia cirrhosa</i>	5.5	--	2.4	7.9
<i>Quercus nuttallii</i>	4.8	--	2.1	6.9
<i>Diodia virginiana</i>	4.8	--	2.1	6.9
<i>Smilax glauca</i>	2.8	--	1.2	4.0
<i>Forestiera acuminata</i>	2.8	--	1.2	4.0
<i>Acalypha rhomboidea</i>	2.8	--	1.2	4.0
<i>Vitis riparia</i>	2.1	--	0.9	3.0
<i>Rubus trivialis</i>	1.4	--	0.6	2.0
<i>Planera aquatica</i>	1.4	--	0.6	2.0
<i>Smilax rotundifolia</i>	0.7	--	0.3	1.0
<i>Smilax bona-nox</i>	0.7	--	0.3	1.0
<i>Panicum rigidulum</i>	0.7	--	0.3	1.0
<i>Geum canadense</i>	0.7	--	0.3	1.0
<i>Crataegus viridis</i>	0.7	--	0.3	1.0
<i>Cocculus carolinus</i>	0.7	--	0.3	1.0
	100.0		100.0	200.0

(Sheet 3 of 3)

Table D5
Importance Values for Species Occurring at Site 5, Arranged by Zone and
Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 3</u>				
<u>Trees</u>				
<i>Carya aquatica</i>	45.0	54.4	37.2	136.6
<i>Quercus lyrata</i>	25.0	18.2	41.6	84.8
<i>Forestiera acuminata</i>	15.0	20.5	3.2	38.7
<i>Taxodium distichum</i>	5.0	2.3	17.1	24.4
<i>Quercus phellos</i>	5.0	2.3	0.6	7.9
<i>Diospyros virginiana</i>	5.0	2.3	0.3	7.6
	10.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Amorpha fruticosa</i>	16.1	28.6	22.1	66.8
<i>Cephalanthus occidentalis</i>	13.2	15.5	14.3	43.0
<i>Forestiera acuminata</i>	11.8	12.6	16.4	40.8
<i>Diospyros virginiana</i>	13.2	10.9	14.1	38.2
<i>Carya aquatica</i>	10.3	7.21	11.7	29.2
<i>Crataegus viridis</i>	11.8	8.1	6.3	26.2
<i>Planera aquatica</i>	5.9	5.9	4.7	16.5
<i>Styrax americana</i>	5.9	4.5	3.6	14.0
<i>Ilex decidua</i>	5.9	3.6	2.3	11.8
<i>Quercus phellos</i>	4.4	2.7	3.5	10.6
<i>Quercus lyrata</i>	1.5	0.4	1.0	2.9
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Trachelospermum difforme</i>	31.3	71.3	59.7	162.3
<i>Brunnichia cirrhosa</i>	31.3	13.1	17.5	61.9
<i>Vitis palmata</i>	24.9	13.6	16.7	55.2
<i>Campsis radicans</i>	9.4	1.6	4.7	15.7
<i>Berchemia scandens</i>	1.1	0.4	1.4	4.9
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Quercus lyrata</i>	11.7	..	21.8	33.5
<i>Arundinaria gigantea</i>	10.7	..	22.5	33.2
<i>Trachelospermum difforme</i>	11.7	..	16.4	28.1
<i>Brunnichia cirrhosa</i>	8.3	..	5.7	14.0
<i>Amorpha fruticosa</i>	7.7	..	5.5	13.2
<i>Carya aquatica</i>	7.1	..	5.3	12.4
<i>Forestiera acuminata</i>	5.9	..	4.7	10.6
<i>Cephalanthus occidentalis</i>	5.3	..	3.7	9.0
<i>Planera aquatica</i>	5.9	..	1.9	7.8
<i>Ilex decidua</i>	4.7	..	1.5	6.2

(Sheet 1 of 3)

Table D5 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Crataegus viridis</i>	3.0	--	3.0	6.0
<i>Gampsis radicans</i>	2.4	--	1.8	4.2
<i>Vitis palmata</i>	2.4	--	0.8	3.2
<i>Leersia oryzoides</i>	2.4	--	0.8	3.2
<i>Styrax americana</i>	1.8	--	0.6	2.4
<i>Diospyros virginiana</i>	0.6	--	1.2	1.8
<i>Quercus phellos</i>	1.2	--	0.4	1.6
<i>Panicum rigidulum</i>	1.2	--	0.4	1.6
<i>Clematis</i> sp.	1.2	--	0.4	1.6
<i>Carex torta</i>	1.2	--	0.4	1.6
<i>Spermacoce glabra</i>	0.6	--	0.2	0.8
<i>Mimosa strigillosa</i>	0.6	--	0.2	0.8
<i>Liquidambar styraciflua</i>	0.6	--	0.2	0.8
<i>Diodia virginiana</i>	0.6	--	0.2	0.8
<i>Bidens frondosa</i>	0.6	--	0.2	0.8
<i>Berchemia scandens</i>	0.6	--	0.2	0.8
	100.0		100.0	200.0

Zone 4Trees

<i>Quercus phellos</i>	37.1	47.2	70.8	155.1
<i>Liquidambar styraciflua</i>	14.8	11.1	8.5	34.4
<i>Quercus nuttallii</i>	14.8	11.1	8.0	33.9
<i>Carya aquatica</i>	11.1	11.1	9.7	31.9
<i>Taxodium distichum</i>	7.4	8.3	0.9	16.6
<i>Bumelia lycioides</i>	7.4	5.6	1.6	14.6
<i>Crataegus viridis</i>	7.4	5.6	0.5	13.5
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Forestiera acuminata</i>	33.2	59.1	64.6	156.9
<i>Planera aquatica</i>	27.8	15.4	11.5	54.7
<i>Diospyros virginiana</i>	11.1	10.3	13.0	34.4
<i>Crataegus viridis</i>	11.1	5.1	5.1	21.3
<i>Amorpha fruticosa</i>	5.6	5.1	2.2	12.9
<i>Taxodium distichum</i>	5.6	2.5	2.5	10.6
<i>Styrax americana</i>	5.6	2.5	1.1	9.2
	100.0	100.0	100.0	300.0

Woody Vines

<i>Vitis palmata</i>	42.8	53.4	51.6	147.8
<i>Vitis riparia</i>	28.6	13.3	37.9	79.8
<i>Brunnichia cirtiosa</i>	14.3	20.0	6.3	40.6
<i>Trachelospermum difforme</i>	14.3	13.3	4.2	31.8
	100.0	100.0	100.0	300.0

(Sheet 2 of 3)

Table D5 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Herbs and Woody Seedlings</u>				
<i>Quercus phellos</i>	21.7	--	37.6	59.3
<i>Brunnichia cirrhosa</i>	17.1	--	14.6	31.7
<i>Quercus nuttallii</i>	10.3	--	13.6	23.9
<i>Arundinaria gigantea</i>	9.3	--	6.3	15.5
<i>Trachelospermum difforme</i>	8.0	--	3.4	11.4
<i>Vitis palmata</i>	4.5	--	4.4	8.9
<i>Diodia virginiana</i>	4.5	--	1.9	6.4
<i>Styrax americana</i>	3.4	--	1.4	4.8
<i>Crataegus viridis</i>	3.4	--	1.4	4.8
<i>Amorpha fruticosa</i>	3.4	--	1.4	4.8
<i>Vitis riparia</i>	1.1	--	3.0	4.1
<i>Planera aquatica</i>	1.1	--	3.0	4.1
<i>Cephalanthus occidentalis</i>	1.1	--	3.0	4.1
<i>Smilax rotundifolia</i>	2.3	--	1.0	3.3
<i>Liquidambar styraciflua</i>	2.3	--	1.0	3.3
<i>Trifolium</i> sp.	1.1	--	3.0	4.1
<i>Lespedeza</i> sp.	1.1	--	0.5	1.6
<i>Ilex decidua</i>	1.1	--	0.5	1.6
<i>Carex joorii</i>	1.1	--	0.5	1.6
<i>Boehmeria cylindrica</i>	1.1	--	0.5	1.6
<i>Bidens frondosa</i>	1.1	--	0.5	1.6
	100.0		100.0	200.0

(Sheet 3 of 3)

Table D6
Importance Values for Species Occurring at Site 6, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 3</u>				
<u>Trees</u>				
<i>Quercus lyrata</i>	44.5	57.2	55.4	157.1
<i>Carya aquatica</i>	27.8	17.8	28.6	74.2
<i>Forestiera acuminata</i>	11.1	10.7	1.5	23.3
<i>Planera aquatica</i>	11.1	10.7	1.0	22.8
<i>Celtis laevigata</i>	5.5	3.6	13.5	22.6
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Celtis laevigata</i>	30.0	42.8	42.8	115.6
<i>Fraxinus pennsylvanica</i>	35.0	32.1	28.0	95.1
<i>Forestiera acuminata</i>	10.0	14.3	20.3	44.6
<i>Taxodium distichum</i>	10.0	5.4	4.5	19.9
<i>Planera aquatica</i>	5.0	1.8	2.4	9.2
<i>Ilex decidua</i>	5.0	1.8	1.0	7.8
<i>Cephalanthus occidentalis</i>	5.0	1.8	1.0	7.8
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Campsis radicans</i>	27.1	49.4	50.8	127.3
<i>Trachelospermum difforme</i>	18.9	18.5	14.3	51.7
<i>Brunnichia cirrhosa</i>	18.9	16.4	15.2	50.5
<i>Ampelopsis arborea</i>	13.5	6.2	8.2	27.9
<i>Cocculus carolinus</i>	10.8	6.8	7.2	24.8
<i>Vitis riparia</i>	5.4	1.3	1.0	7.7
<i>Berchemia scandens</i>	2.7	0.7	2.2	5.6
<i>Toxicodendron radicans</i>	2.7	0.7	1.1	4.5
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Campsis radicans</i>	11.7	--	40.7	52.4
<i>Clematis crispa</i>	10.2	--	11.8	22.0
<i>Brunnichia cirrhosa</i>	8.8	--	12.6	21.4
<i>Boehmeria cylindrica</i>	10.9	--	6.2	17.1
<i>Ampelopsis arborea</i>	6.6	--	8.5	15.1
<i>Vitis riparia</i>	8.0	--	7.0	15.0
<i>Trachelospermum difforme</i>	8.0	--	4.6	12.6
<i>Planera aquatica</i>	8.8	--	1.9	10.7
<i>Quercus lyrata</i>	4.4	--	1.2	5.6
<i>Leersia virginica</i>	3.6	--	0.5	4.1
<i>Forestiera acuminata</i>	3.6	--	0.5	4.1
<i>Celtis laevigata</i>	2.2	--	0.9	3.1

(Sheet 1 of 3)

Table D6 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Cocculus carolinus</i>	1.5	--	0.8	2.3
<i>Asclepias perennis</i>	1.5	--	0.8	2.3
<i>Urtica chamaedryoides</i>	1.5	--	0.2	1.7
<i>Toxicodendron radicans</i>	1.5	--	0.2	1.7
<i>Cephalanthus occidentalis</i>	1.5	--	0.2	1.7
<i>Bidens discolor</i>	0.5	--	0.2	1.7
<i>Vitis coccinea</i>	0.7	--	0.7	1.4
<i>Taxodium distichum</i>	0.7	--	0.1	0.8
<i>Senecio glabellus</i>	0.7	--	0.1	0.8
<i>Fraxinus pennsylvanica</i>	0.7	--	0.1	0.8
<i>Carya aquatica</i>	0.7	--	90.1	0.8
<i>Bidens cernua</i>	0.7	--	0.1	0.8
	100.0		100.0	200.0
<u>Zone 4</u>				
<u>Trees</u>				
<i>Liquidambar styraciflua</i>	15.5	13.8	43.4	72.7
<i>Celtis laevigata</i>	23.1	30.6	6.8	60.5
<i>Acer negundo</i>	23.1	25.0	6.6	54.7
<i>Ulmus americana</i>	15.4	13.9	11.8	41.1
<i>Carya illinoensis</i>	7.7	5.5	27.0	40.2
<i>Cercis canadensis</i>	3.8	2.8	2.2	8.8
<i>Quercus lyrata</i>	3.8	2.8	1.7	8.3
<i>Cornus drummondii</i>	3.8	2.8	0.3	6.9
<i>Ilex decidua</i>	3.8	2.8	0.2	6.8
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Celtis laevigata</i>	21.4	37.7	37.9	97.0
<i>Ulmus americana</i>	11.9	18.9	22.0	52.8
<i>Acer negundo</i>	14.3	12.3	14.9	41.5
<i>Fraxinus pennsylvanica</i>	11.9	4.7	2.9	19.5
<i>Ilex decidua</i>	9.5	4.7	3.7	17.9
<i>Crataegus viridis</i>	9.5	5.7	2.7	17.9
<i>Liquidambar styraciflua</i>	4.8	5.7	6.5	17.0
<i>Carya illinoensis</i>	7.1	3.8	4.1	15.0
<i>Acer rubrum</i>	2.4	3.8	3.3	9.5
<i>Cornus drummondii</i>	2.4	0.9	1.2	4.5
<i>Quercus phellos</i>	2.4	0.9	0.4	3.7
<i>Cornus foemina</i>	2.4	0.9	0.4	3.7
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Parthenocissus quinquefolia</i>	15.6	44.7	36.8	97.1
<i>Smilax rotundifolia</i>	17.3	22.7	8.5	48.5
<i>Toxicodendron radicans</i>	10.3	11.0	20.2	41.5

(Sheet 2 of 3)

Table D6 (Concluded)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Vitis cinerea</i>	10.3	4.8	15.1	30.2
<i>Berchemia scandens</i>	10.3	4.8	6.5	21.6
<i>Smilax hispida</i>	10.3	3.4	4.4	18.1
<i>Ampelopsis arborea</i>	8.7	2.4	4.5	15.6
<i>Cocculus carolinus</i>	6.9	2.4	2.3	11.6
<i>Brunnichia cirrhosa</i>	5.2	1.4	0.6	7.2
<i>Trachelospermum difforme</i>	1.7	1.4	0.6	3.7
<i>Smilax bona-nox</i>	1.7	0.7	0.2	2.6
<i>Campsis radicans</i>	1.7	0.3	0.3	2.3
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Toxicodendron radicans</i>	8.5	--	24.0	32.5
<i>Smilax rotundifolia</i>	18.3	--	13.7	32.0
<i>Parthenocissus quinquefolia</i>	11.3	--	20.7	32.0
<i>Urtica chamaedryoides</i>	11.3	--	14.3	25.6
<i>Clematis crispa</i>	14.2	--	4.8	19.0
<i>Rubus trivialis</i>	4.2	--	3.9	8.1
<i>Cocculus carolinus</i>	4.2	--	3.9	8.1
<i>Boehmeria cylindrica</i>	4.2	--	3.9	8.1
<i>Brunnichia cirrhosa</i>	2.8	--	3.5	6.3
<i>Senecio glabellus</i>	4.2	--	1.4	5.6
<i>Acalypha rhomboidea</i>	4.2	--	1.4	5.6
<i>Aster simplex</i>	2.8	--	1.0	3.8
<i>Ulmus americana</i>	1.4	--	0.5	1.9
<i>Trachelospermum difforme</i>	1.4	--	0.5	1.9
<i>Smilax hispida</i>	1.4	--	0.5	1.9
<i>Morus rubra</i>	1.4	--	0.5	1.9
<i>Leersia virginica</i>	1.4	--	0.5	1.9
<i>Ilex decidua</i>	1.4	--	0.5	1.9
<i>Celtis laevigata</i>	1.4	--	0.5	1.9
	100.0		100.0	200.0

(Sheet 3 of 3)

Table D7
Importance Values for Species Occurring at Site 7, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Taxodium distichum</i>	50.0	62.6	79.1	191.7
<i>Nyssa aquatica</i>	25.0	21.9	20.0	66.9
<i>Planera aquatica</i>	10.0	6.2	0.4	16.6
<i>Ulmus americana</i>	5.0	3.1	0.2	8.3
<i>Celtis laevigata</i>	5.0	3.1	0.2	8.3
<i>Forestiera acuminata</i>	5.0	3.1	0.1	8.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Styrax americana</i>	16.7	50.0	55.5	122.2
<i>Cephalanthus occidentalis</i>	33.3	25.0	20.4	78.7
<i>Itea virginica</i>	33.3	16.7	11.1	61.1
<i>Taxodium distichum</i>	16.7	8.3	13.0	38.0
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Berchemia scandens</i>	25.0	83.4	95.5	203.9
<i>Brunnichia cirrhosa</i>	50.0	11.1	3.0	64.1
<i>Campsis radicans</i>	25.0	5.5	1.5	32.0
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Boehmeria cylindrica</i>	14.4	--	28.1	42.5
<i>Onoclea sensibilis</i>	3.8	--	24.6	28.4
<i>Taxodium distichum</i>	17.2	--	10.9	28.1
<i>Planera aquatica</i>	12.5	--	4.2	16.7
<i>Forestiera acuminata</i>	12.5	--	4.2	16.7
<i>Nyssa aquatica</i>	9.6	--	4.9	14.5
<i>Cephalanthus occidentalis</i>	3.8	--	4.6	8.4
<i>Brunnichia cirrhosa</i>	3.8	--	3.0	6.8
<i>Saururus cernuus</i>	1.9	--	4.0	5.9
<i>Campsis radicans</i>	2.9	--	2.6	5.5
<i>Asclepias perennis</i>	12.9	--	2.3	4.2
<i>Vitis vulpina</i>	2.9	--	1.0	3.9
<i>Leersia sp.</i>	1.0	--	2.0	3.0
<i>Quercus lyrata</i>	1.9	--	0.6	2.5
<i>Leersia virginica</i>	1.9	--	0.6	2.5
<i>Triadenum walteri</i>	1.0	--	0.3	1.3
<i>Trachelospermum difforme</i>	1.0	--	0.3	1.3
<i>Styrax americana</i>	1.0	--	0.3	1.3

(Sheet 1 of 5)

Table D7 (Continued)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Smilax rotundifolia</i>	1.0	--	0.3	1.3
<i>Pluchea camphorata</i>	1.0	--	0.3	1.3
<i>Nyssa sylvatica</i>	1.0	--	0.3	1.3
<i>Carya aquatica</i>	1.0	--	0.3	1.3
<i>Berchemia scandens</i>	1.0	--	0.3	1.3
	100.0		100.0	200.0
<u>Zone 3</u>				
<u>Trees</u>				
<i>Planera aquatica</i>	38.6	66.0	52.9	157.5
<i>Taxodium distichum</i>	15.4	9.4	17.5	42.3
<i>Forestiera acuminata</i>	19.2	11.3	2.9	33.4
<i>Quercus lyrata</i>	7.7	3.8	16.5	28.0
<i>Carya aquatica</i>	7.7	3.8	3.7	15.2
<i>Acer saccharinum</i>	3.8	1.9	4.6	10.3
<i>Crataegus viridis</i>	3.8	1.9	1.2	6.9
<i>Celtis laevigata</i>	3.8	1.9	0.7	6.4
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Forestiera acuminata</i>	25.0	36.7	47.3	109.0
<i>Taxodium distichum</i>	16.7	28.3	23.7	68.7
<i>Cephalanthus occidentalis</i>	20.7	16.7	11.3	48.7
<i>Planera aquatica</i>	16.7	8.3	6.4	31.4
<i>Acer saccharinum</i>	8.3	3.3	4.5	16.1
<i>Nyssa aquatica</i>	4.2	3.3	2.3	9.8
<i>Celtis laevigata</i>	4.2	1.7	3.4	9.3
<i>Salix nigra</i>	4.2	1.7	1.1	7.0
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Brunnichia cirrhosa</i>	36.8	58.7	56.0	151.5
<i>Cocculus carolinus</i>	15.8	27.3	24.4	67.5
<i>Vitis riparia</i>	15.8	3.3	3.7	22.8
<i>Ampelopsis cordata</i>	10.5	4.1	7.8	22.4
<i>Wisteria frutescens</i>	5.3	3.3	6.2	14.8
<i>Trachelospermum difforme</i>	10.5	2.5	1.1	14.1
<i>Campsis radicans</i>	5.3	0.8	0.8	6.9
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Leersia virginica</i>	10.4	--	19.0	29.4
<i>Planera aquatica</i>	14.8	--	8.4	23.2
<i>Brunnichia cirrhosa</i>	10.4	--	7.2	17.6
<i>Commelina virginica</i>	4.4	--	11.3	15.7
<i>Leersia sp.</i>	6.0	--	7.8	13.8

(Sheet 2 of 5)

Table D7 (Continued)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Aster</i> sp.	6.0	--	6.9	12.9
<i>Saururus cernuus</i>	4.4	--	8.5	12.9
<i>Taxodium distichum</i>	5.1	--	3.6	8.7
<i>Forestiera acuminata</i>	5.1	--	2.5	7.6
<i>Onoclea sensibilis</i>	3.7	--	3.2	6.9
<i>Lindernia dubia</i>	3.7	--	2.1	5.8
<i>Cocculus carolinus</i>	2.9	--	2.1	5.0
<i>Justicia ovata</i>	2.2	--	2.8	5.0
<i>Echinodorus cordifolius</i>	2.2	--	2.8	5.0
<i>Quercus lyrata</i>	2.9	--	0.8	3.7
<i>Boehmeria cylindrica</i>	2.9	--	0.8	3.7
<i>Cephalanthus occidentalis</i>	2.2	--	0.6	2.8
<i>Carya aquatica</i>	2.2	--	0.6	2.8
<i>Trachelospermum difforme</i>	0.7	--	1.3	2.0
<i>Smilax rotundifolia</i>	0.7	--	1.3	2.0
<i>Pluchea camphorata</i>	0.7	--	1.3	2.0
<i>Lysimachia radicans</i>	0.7	--	1.3	2.0
<i>Hibiscus laevis</i>	0.7	--	1.3	2.0
<i>Celtis laevigata</i>	0.7	--	1.3	2.0
<i>Acer rubrum</i>	1.5	--	0.4	1.9
<i>Spilanthes americana</i>	0.7	--	0.2	0.9
<i>Toxicodendron radicans</i>	0.7	--	0.2	0.9
<i>Asclepias perennis</i>	0.7	--	0.2	0.9
<i>Ammannia coccinea</i>	0.7	--	0.2	0.9
	100.0		100.0	200.0

Zone 4Trees

<i>Liquidambar styraciflua</i>	21.8	28.2	76.6	126.6
<i>Celtis laevigata</i>	39.2	48.7	6.5	94.4
<i>Fraxinus pennsylvanica</i>	13.0	7.7	10.6	31.3
<i>Ulmus americana</i>	13.0	7.7	1.2	21.9
<i>Acer negundo</i>	8.7	5.1	1.5	15.3
<i>Acer saccharinum</i>	4.3	2.6	3.6	10.5
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Celtis laevigata</i>	52.5	82.0	86.0	220.5
<i>Planera aquatica</i>	15.8	9.0	6.5	31.3
<i>Ulmus americana</i>	15.8	4.5	4.5	24.8
<i>Quercus lyrata</i>	5.3	1.5	1.4	8.2
<i>Fraxinus pennsylvanica</i>	5.3	1.5	0.8	7.6
<i>Forestiera acuminata</i>	5.3	1.5	0.8	7.6
	100.0	100.0	100.0	300.0

(Sheet 3 of 5)

Table D7 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	11.5	31.9	60.1	103.5
<i>Smilax rotundifolia</i>	17.3	20.5	14.2	52.0
<i>Cocculus carolinus</i>	19.3	19.0	11.1	49.4
<i>Trachelospermum difforme</i>	17.3	11.1	4.3	32.7
<i>Brunnichia cirrhosa</i>	15.5	8.7	4.1	28.3
<i>Smilax hispida</i>	5.8	3.6	2.3	11.7
<i>Campsis radicans</i>	3.8	2.0	1.3	7.1
<i>Ampelopsis arborea</i>	3.8	1.6	1.6	7.0
<i>Smilax bona-nox</i>	3.8	1.2	0.7	5.7
<i>Wisteria frutescens</i>	1.9	0.4	0.3	2.6
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Cocculus carolinus</i>	8.2	--	9.7	17.9
<i>Leersia virginica</i>	7.7	--	11.5	19.2
<i>Aster sp.</i>	5.4	--	13.1	18.5
<i>Commelina virginica</i>	5.8	--	13.8	19.6
<i>Brunnichia cirrhosa</i>	5.4	--	7.8	13.2
<i>Boehmeria cylindrica</i>	6.7	--	6.2	12.9
<i>Trachelospermum difforme</i>	6.7	--	5.3	12.0
<i>Toxicodendron radicans</i>	5.4	--	4.3	9.7
<i>Campsis radicans</i>	3.4	--	6.1	9.5
<i>Leersia sp.</i>	4.8	--	4.2	9.0
<i>Smilax rotundifolia</i>	5.4	--	3.1	8.5
<i>Spermacoce glabra</i>	4.4	--	1.7	6.1
<i>Ampelopsis arborea</i>	2.9	--	1.9	4.8
<i>Vitis vulpina</i>	2.9	--	1.3	4.2
<i>Planera aquatica</i>	2.0	--	1.7	3.7
<i>Acer rubrum</i>	2.9	--	0.7	3.6
<i>Viola sp.</i>	2.0	--	0.5	2.5
<i>Smilax hispida</i>	1.5	--	1.0	2.5
<i>Cardiospermum halicacabum</i>	1.5	--	1.0	2.5
<i>Smilax bona-nox</i>	1.5	--	0.4	1.9
<i>Onoclea sensibilis</i>	1.5	--	0.	1.9
<i>Celtis laevigata</i>	1.5	--	0.4	1.9
<i>Vitis riparia</i>	1.0	--	0.2	1.2
<i>Polygonum hydropiperoides</i>	1.0	--	0.2	1.2
<i>Mikania scandens</i>	1.0	--	0.2	1.2
<i>Iva annua</i>	1.0	--	0.2	1.2
<i>Passiflora lutea</i>	0.5	--	0.7	1.2
<i>Justicia ovata</i>	0.5	--	0.7	1.2
<i>Brunnichia cirrhosa</i>	0.5	--	0.7	1.2
<i>Ulmus americana</i>	0.5	--	0.1	0.6
<i>Taxodium distichum</i>	0.5	--	0.1	0.6
<i>Solanum carolinense</i>	1.5	--	0.1	0.6
<i>Smilax glauca</i>	0.5	--	0.1	0.6

(Sheet 4 of 5)

Table D7 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Pluchea camphorata</i>	0.5	--	0.1	0.6
<i>Melothria pendula</i>	0.5	--	0.1	0.6
<i>Matelea gonocarpa</i>	0.5	--	0.1	0.6
<i>Cephalanthus occidentalis</i>	0.5	--	0.1	0.6
<i>Cayaponia quinqueloba</i>	0.5	--	0.1	0.6
<i>Aristolochia serpentaria</i>	<u>0.5</u>	--	<u>0.1</u>	<u>0.6</u>
	100.0		100.0	200.0

(Sheet 5 of 5)

Table D8
Importance Values for Species Occurring at Site 8, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 3</u>				
<u>Trees</u>				
<i>Planera aquatica</i>	21.8	29.7	10.2	61.7
<i>Quercus lyrata</i>	13.0	16.7	31.0	60.7
<i>Forestiera acuminata</i>	13.0	19.0	5.3	37.3
<i>Carya aquatica</i>	15.2	9.5	9.1	33.8
<i>Salix nigra</i>	8.7	4.8	19.3	32.8
<i>Taxodium distichum</i>	10.9	7.1	9.9	27.9
<i>Gleditsia aquatica</i>	4.3	4.8	10.2	19.3
<i>Fraxinus pennsylvanica</i>	8.7	4.8	2.1	15.6
<i>Acer saccharinum</i>	2.2	2.4	2.1	6.7
<i>Ulmus americana</i>	2.2	1.2	0.8	4.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Planera aquatica</i>	52.9	44.5	51.4	148.8
<i>Forestiera acuminata</i>	35.3	48.1	42.9	126.3
<i>Fraxinus pennsylvanica</i>	11.8	7.4	5.7	24.9
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Campsis radicans</i>	50.0	50.0	69.2	169.2
<i>Brunnichia cirrhosa</i>	50.0	50.0	30.8	130.8
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Forestiera acuminata</i>	43.7	..	32.9	76.6
<i>Cephalanthus occidentalis</i>	12.4	..	34.0	46.4
<i>Planera aquatica</i>	18.8	..	14.2	33.0
<i>Brunnichia cirrhosa</i>	18.8	..	14.2	33.0
<i>Vitis palmata</i>	6.3	..	4.7	11.0
	100.0		100.0	200.0
<u>Zone 4</u>				
<u>Trees</u>				
<i>Quercus phellos</i>	28.7	14.1	16.2	99.0
<i>Quercus lyrata</i>	17.8	14.9	28.1	60.8
<i>Fraxinus pennsylvanica</i>	17.8	21.3	10.8	49.9
<i>Quercus muhlenbergii</i>	10.7	10.4	6.0	27.1
<i>Ulmus americana</i>	10.7	6.4	1.0	20.1
<i>Carya aquatica</i>	7.1	8.5	1.9	19.5

(Continued)

Table D8 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 3</u>				
<u>Trees</u>				
<i>Quercus lyrata</i>	28.5	39.6	26.4	94.5
<i>Fraxinus pennsylvanica</i>	14.3	20.7	24.2	59.2
<i>Carya aquatica</i>	17.8	13.2	9.5	40.5
<i>Ulmus americana</i>	17.8	13.2	9.1	40.1
<i>Quercus palustris</i>	7.2	5.7	12.9	25.8
<i>Taxodium distichum</i>	3.6	1.9	5.6	11.1
<i>Quercus phellos</i>	3.6	1.9	5.3	10.8
<i>Diospyros virginiana</i>	3.6	1.9	4.4	9.9
<i>Gleditsia aquatica</i>	<u>3.6</u>	<u>1.9</u>	<u>2.6</u>	<u>8.1</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Forestiera acuminata</i>	50.0	50.0	70.0	170.0
<i>Cephalanthus occidentalis</i>	<u>50.0</u>	<u>50.0</u>	<u>30.0</u>	<u>130.0</u>
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
None present				
<u>Herbs and Woody Seedlings</u>				
<i>Leersia</i> sp.	23.5	--	65.1	88.6
<i>Forestiera acuminata</i>	20.7	--	6.5	27.2
<i>Leersia virginica</i>	5.6	--	10.2	15.8
<i>Vitis palmata</i>	9.7	--	5.3	15.0
<i>Planera aquatica</i>	9.7	--	3.0	12.7
<i>Asclepias perennis</i>	5.6	--	1.7	7.3
<i>Ageratina altissima</i>	4.2	--	1.3	5.5
<i>Clematis crispa</i>	4.2	--	1.3	5.5
<i>Acalypha rhomboidea</i>	2.8	--	1.3	4.1
<i>Quercus lyrata</i>	2.8	--	0.9	3.7
<i>Carya aquatica</i>	2.8	--	0.9	3.7
<i>Brunnichia cirrhosa</i>	2.8	--	0.9	3.7
<i>Ulmus americana</i>	1.4	--	0.4	1.8
<i>Parthenocissus quinquefolia</i>	1.4	--	0.4	1.8
<i>Lysimachia radicans</i>	1.4	--	0.4	1.8
<i>Ampelopsis arborea</i>	<u>1.4</u>	--	<u>0.4</u>	<u>1.8</u>
	100.0		100.0	200.0

Table D9

Importance Values for Species Occurring at Site 9, Arranged by Zone and Vegetation Layer

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Zone 6</u>				
<u>Trees</u>				
<i>Carya tomentosa</i>	38.4	45.5	36.3	120.2
<i>Liquidambar styraciflua</i>	30.7	40.0	34.9	105.6
<i>Quercus nigra</i>	15.4	7.3	15.0	37.7
<i>Quercus alba</i>	7.7	3.6	5.0	16.3
<i>Quercus velutina</i>	3.9	1.8	6.8	12.5
<i>Fraxinus americana</i>	3.9	1.8	2.2	7.7
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Carya tomentosa</i>	22.3	38.2	42.2	102.7
<i>Aralia spinosa</i>	11.1	22.5	17.9	512.5
<i>Cercis canadensis</i>	15.7	10.3	9.7	35.7
<i>Morus rubra</i>	11.1	7.8	9.0	27.9
<i>Cornus florida</i>	9.0	4.4	4.8	18.2
<i>Liquidambar styraciflua</i>	4.4	3.5	4.6	12.5
<i>Ulmus alata</i>	4.4	3.5	3.2	11.1
<i>Sassafras albidum</i>	4.4	2.6	2.6	9.6
<i>Quercus lyrata</i>	2.2	0.9	1.1	4.2
<i>Ulmus rubra</i>	2.2	0.9	0.7	3.8
<i>Rhus glabra</i>	2.2	0.9	0.7	3.8
<i>Quercus velutina</i>	2.2	0.9	0.7	3.8
<i>Prunus serotina</i>	2.2	0.9	0.7	3.8
<i>Nyssa sylvatica</i>	2.2	0.9	0.7	3.8
<i>Callicarpa americana</i>	2.2	0.9	0.7	3.8
<i>Acer rubrum</i>	2.2	0.9	0.7	3.8
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Parthenocissus quinquefolia</i>	37.5	64.0	73.3	174.8
<i>Toxicodendron radicans</i>	33.3	29.0	19.5	81.8
<i>Vitis aestivalis</i>	12.5	3.0	4.4	19.9
<i>Smilax glauca</i>	8.3	2.0	1.4	11.7
<i>Smilax rotundifolia</i>	4.2	1.0	0.7	5.9
<i>Bignonia capreolata</i>	4.2	1.0	0.7	5.9
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Toxicodendron radicans</i>	4.8	..	16.1	20.9
<i>Carya tomentosa</i>	5.2	..	12.7	17.9
<i>Dioclea multiflora</i>	6.0	..	10.1	16.1
<i>Chenanthium sessiliflorum</i>	5.2	..	7.9	13.1
<i>Parthenocissus quinquefolia</i>	6.0	..	5.3	11.3
<i>Cercis canadensis</i>	3.7	..	6.8	10.5
<i>Dichanthelium coccineum</i>	5.6	..	3.3	8.9

(Sheet 1 of 4)

Table D9 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Aralia spinosa</i>	1.9	--	6.1	8.0
<i>Sabatia calycina</i>	3.7	--	2.0	5.7
<i>Galium circaezans</i>	3.3	--	1.9	5.2
<i>Vitis rotundifolia</i>	3.1	--	1.6	4.7
<i>Carex flaccidula</i>	3.0	--	1.0	4.0
<i>Ampelopsis brevipedunculata</i>	1.9	--	2.0	3.9
<i>Morus rubra</i>	1.1	--	2.2	3.3
<i>Desmodium glabellum</i>	1.9	--	1.3	3.2
<i>Ageratina altissima</i>	2.3	--	0.7	3.0
<i>Chasmanthium laxum</i>	0.8	--	2.1	2.9
<i>Vitis aestivalis</i>	1.5	--	1.1	2.6
<i>Lactuca floridana</i>	1.9	--	1.3	3.2
<i>Ulmus rubra</i>	1.9	--	0.6	2.5
<i>Rubrus argutus</i>	1.1	--	1.0	2.1
<i>Quercus phellos</i>	1.5	--	0.5	2.0
<i>Desmodium passiflorum</i>	1.5	--	0.5	2.0
<i>Carex cephalophora</i>	1.5	--	2.1	2.9
<i>Sambucus canadensis</i>	0.8	--	0.9	1.7
<i>Elytraria carolinensis</i>	0.8	--	0.9	1.7
<i>Campsis radicans</i>	0.8	--	0.9	1.7
<i>Rubus occidentalis</i>	1.1	--	0.4	1.5
<i>Ilex decidua</i>	1.1	--	0.4	1.5
<i>Crataegus</i> sp.	1.1	--	0.4	1.5
<i>Acer rubrum</i>	1.1	--	0.4	1.5
<i>Smilax bona-nox</i>	0.4	--	0.8	1.2
<i>Quercus stellata</i>	0.4	--	0.8	1.2
<i>Vernonia gigantea</i>	0.8	--	0.2	1.0
<i>Smilax glauca</i>	0.8	--	0.2	1.0
<i>Rubus</i> sp.	0.8	--	0.2	1.0
<i>Quercus alba</i>	0.8	--	0.2	1.0
<i>Prunus serotina</i>	0.8	--	0.2	1.0
Unknown	0.8	--	0.2	1.0
<i>Oxalis debilis</i>	0.8	--	0.2	1.0
Unknown	0.8	--	0.2	1.0
<i>Galium</i> sp.	0.8	--	0.2	1.0
Unknown	0.8	--	0.2	1.0
<i>Cornus florida</i>	0.8	--	0.2	1.0
<i>Bignonia capreolata</i>	0.8	--	0.2	1.0
<i>Viola triloba</i>	0.4	--	0.1	0.5
<i>Viola papilionacea</i>	0.4	--	0.1	0.5
<i>Vitis palmata</i>	0.4	--	0.1	0.5
<i>Ulmus americana</i>	0.4	--	0.1	0.5
<i>Trachelospermum difforme</i>	0.4	--	0.1	0.5
<i>Trepocarpus aethusae</i>	0.4	--	0.1	0.5
<i>Smilax rotundifolia</i>	0.4	--	0.1	0.5
Unknown	0.4	--	0.1	0.5
<i>Sassafras albidum</i>	0.4	--	0.1	0.5

(Sheet 2 of 4)

Table D9 (Continued)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Quercus palustris</i>	3.6	2.1	11.7	17.4
<i>Diospyros virginiana</i>	<u>3.6</u>	<u>2.1</u>	<u>0.3</u>	<u>6.0</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Ulmus americana</i>	24.0	35.8	41.5	101.3
<i>Ilex decidua</i>	28.0	35.8	32.2	96.0
<i>Crataegus viridis</i>	24.0	16.4	14.3	54.7
<i>Fraxinus pennsylvanica</i>	16.0	6.0	5.6	27.6
<i>Diospyros virginiana</i>	4.0	4.5	5.0	13.5
<i>Quercus phellos</i>	<u>4.0</u>	<u>1.5</u>	<u>1.4</u>	<u>6.9</u>
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Campsis radicans</i>	41.7	36.4	43.7	121.8
<i>Berchemia scandens</i>	25.0	36.4	27.3	88.7
<i>Vitis palmata</i>	16.7	13.6	14.5	44.8
<i>Vitis riparia</i>	8.3	9.1	13.7	31.1
<i>Cocculus carolinus</i>	<u>8.3</u>	<u>4.5</u>	<u>0.8</u>	<u>13.6</u>
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Campsis radicans</i>	16.4	--	37.5	53.9
<i>Trachelospermum difforme</i>	15.1	--	16.3	31.4
<i>Viola papilionacea</i>	12.3	--	15.1	27.4
<i>Planera aquatica</i>	11.0	--	4.9	15.9
<i>Leersia virginica</i>	8.2	--	6.8	15.0
<i>Cocculus carolinus</i>	4.1	--	5.0	9.1
<i>Carex squarrosa</i>	5.5	--	2.4	7.9
<i>Quercus phellos</i>	4.1	--	1.8	5.9
<i>Ilex decidua</i>	2.7	--	1.2	3.9
<i>Diospyros virginiana</i>	2.7	--	1.2	3.9
<i>Carya aquatica</i>	2.7	--	1.2	3.9
<i>Berchemia scandens</i>	2.7	--	1.2	3.9
<i>Vitis palmata</i>	1.4	--	0.6	2.0
<i>Taxodium distichum</i>	1.4	--	0.6	2.0
<i>Smilax glauca</i>	1.4	--	0.6	2.0
<i>Quercus lyrata</i>	1.4	--	0.6	2.0
<i>Dioscorea quaternata</i>	1.4	--	0.6	2.0
<i>Crataegus viridis</i>	1.4	--	0.6	2.0
<i>Clematis crispa</i>	1.4	--	0.6	2.0
<i>Brunnichia cirrhosa</i>	<u>2.7</u>	--	<u>1.2</u>	<u>3.9</u>
	100.0		100.0	200.0

(Sheet 3 of 4)

Table D9 (Concluded)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Rubus</i> sp.	0.4	--	0.1	0.5
<i>Quercus nigra</i>	0.4	--	0.1	0.5
<i>Polygonum scandens</i>	0.4	--	0.1	0.5
<i>Paspalum</i> sp.	0.4	--	0.1	0.5
<i>Oxalis debilis</i>	0.4	--	0.1	0.5
<i>Leersia virginica</i>	0.4	--	0.1	0.5
<i>Leersia</i> sp.	0.4	--	0.1	0.5
<i>Juniperus virginiana</i>	0.4	--	0.1	0.5
<i>Galium uniflorum</i>	0.4	--	0.1	0.5
<i>Galium trifidum</i>	0.4	--	0.1	0.5
Unknown	0.4	--	0.1	0.5
<i>Galium circaezans</i>	0.4	--	0.1	0.5
<i>Eupatorium</i> sp.	0.4	--	0.1	0.5
<i>Elytraria carolinensis</i>	0.4	--	0.1	0.5
<i>Dioscorea quaternata</i>	0.4	--	0.1	0.5
<i>Desmodium</i> sp.	0.4	--	0.1	0.5
<i>Desmodium paniculatum</i>	01.4	--	0.1	0.5
<i>Celtis laevigata</i>	0.4	--	0.1	0.5
Unknown	0.4	--	0.1	0.5
<i>Callicarpa americana</i>	0.4	--	0.1	0.5
<i>Carex albolutescens</i>	0.4	--	0.1	0.5
<i>Agrimonia pubescens</i>	0.4	--	0.1	0.5
	100.0		100.0	200.0

(Sheet 4 of 4)

Table D10
Importance Values for Species Occurring at Site 10, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Taxodium distichum</i>	33.4	40.2	59.7	133.3
<i>Ilex decidua</i>	13.3	28.3	3.0	44.6
<i>Nyssa aquatica</i>	13.3	6.0	14.6	33.9
<i>Nyssa biflora</i>	13.3	9.0	10.5	32.8
<i>Acer drummondii</i>	10.1	4.5	1.6	16.2
<i>Quercus lyrata</i>	6.7	3.0	4.9	14.6
<i>Acer rubrum</i>	3.3	6.0	4.7	14.0
<i>Liquidambar styraciflua</i>	3.3	1.5	0.9	5.7
<i>Carpinus caroliniana</i>	<u>3.3</u>	<u>1.5</u>	<u>0.1</u>	<u>4.9</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Styrax americana</i>	25.6	32.8	31.6	90.0
<i>Ilex decidua</i>	23.0	26.7	31.8	81.5
<i>Ilex amelanchier</i>	10.3	20.0	16.9	47.2
<i>Itea virginica</i>	12.8	10.3	7.6	30.7
<i>Acer drummondii</i>	12.8	4.2	4.3	21.3
<i>Quercus lyrata</i>	7.7	3.0	4.3	15.0
<i>Cephalanthus occidentalis</i>	2.6	1.8	2.1	6.5
<i>Taxodium distichum</i>	2.6	0.6	0.7	3.9
<i>Carpinus caroliniana</i>	<u>2.6</u>	<u>0.6</u>	<u>0.7</u>	<u>3.9</u>
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	62.5	50.0	50.0	162.5
<i>Ampelopsis arborea</i>	25.0	40.0	38.2	103.2
<i>Campsis radicans</i>	<u>12.5</u>	<u>10.0</u>	<u>11.8</u>	<u>34.3</u>
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Styrax americana</i>	28.5	--	42.1	70.6
<i>Ampelopsis arborea</i>	10.6	--	18.8	29.4
<i>Quercus lyrata</i>	7.1	--	4.6	11.7
<i>Planera aquatica</i>	7.1	--	4.6	11.7
<i>Cephalanthus occidentalis</i>	7.1	--	2.3	5.9
<i>Viburnum dentatum</i>	3.6	--	2.3	5.9
<i>Taxodium distichum</i>	3.6	--	2.3	5.9
<i>Nyssa biflora</i>	3.6	--	2.3	5.9
<i>Nyssa aquatica</i>	3.6	--	2.3	5.9

(Sheet 1 of 8)

Table D10 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Ilex decidua</i>	3.6	--	2.3	5.9
<i>Forestiera acuminata</i>	3.6	--	2.3	5.9
<i>Ageratina altissima</i>	3.6	--	2.3	5.9
<i>Campsis radicans</i>	3.6	--	2.3	5.9
<i>Carpinus caroliniana</i>	3.6	--	2.3	5.9
<i>Brunnichia cirrhosa</i>	3.6	--	2.3	5.9
<i>Acer rubrum</i>	3.6		2.3	5.9
	100.0		100.0	200.0
<u>Zone 3</u>				
<u>Trees</u>				
<i>Nyssa biflora</i>	41.6	61.0	48.8	151.4
<i>Acer drummondii</i>	33.3	20.8	35.8	89.9
<i>Liquidambar styraciflua</i>	4.2	3.9	9.4	17.5
<i>Diospyros virginiana</i>	4.2	6.5	3.6	14.3
<i>Carpinus caroliniana</i>	8.3	3.9	1.5	13.7
<i>Crataegus aestivalis</i>	4.2	2.6	0.3	7.1
<i>Quercus nigra</i>	4.2	1.3	0.6	6.1
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Styrax americana</i>	18.5	38.7	38.8	96.0
<i>Nyssa biflora</i>	16.3	14.1	20.2	50.6
<i>Acer drummondii</i>	16.3	17.6	16.5	50.4
<i>Arundinaria gigantea</i>	9.2	4.4	3.0	16.6
<i>Itaia virginica</i>	2.3	7.1	3.8	13.2
<i>Carpinus caroliniana</i>	7.0	2.6	3.0	12.6
<i>Ilex decidua</i>	4.7	3.5	3.8	12.0
<i>Liquidambar styraciflua</i>	4.7	2.6	2.4	9.7
<i>Taxodium distichum</i>	4.7	1.7	1.6	8.0
<i>Fraxinus pennsylvanica</i>	4.7	1.7	0.9	7.3
<i>Diospyros virginiana</i>	4.7	1.7	0.9	7.3
<i>Cephalanthus occidentalis</i>	2.3	1.7	2.3	6.3
<i>Quercus laurifolia</i>	2.3	1.7	1.7	5.7
<i>Ulmus americana</i>	2.3	0.9	1.1	4.3
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	27.5	33.3	43.2	104.0
<i>Toxicodendron radicans</i>	17.2	34.9	30.5	82.6
<i>Berchemia scandens</i>	13.8	10.1	11.1	35.0
<i>Ampelopsis arborea</i>	13.8	8.7	6.3	28.8
<i>Brunnichia cirrhosa</i>	10.4	5.8	3.1	19.3
<i>Bignonia capreolata</i>	6.9	2.9	3.2	13.0

(Sheet 2 of 6)

Table D10 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Smilax rotundifolia</i>	6.9	2.9	0.5	10.3
<i>Campsis radicans</i>	3.5	1.4	2.1	7.0
<u>Herbs and Woody Seedlings</u>				
<i>Nyssa biflora</i>	15.3	--	16.1	31.4
<i>Berchemia scandens</i>	12.8	--	14.5	27.3
<i>Saururus cernuus</i>	10.2	--	13.2	23.4
<i>Styrax americana</i>	12.8	--	7.1	19.9
<i>Ampelopsis arborea</i>	7.7	--	11.7	19.4
<i>Toxicodendron radicans</i>	5.1	--	10.3	15.4
<i>Itea virginica</i>	5.1	--	10.3	15.4
<i>Lysimachia radicans</i>	5.1	--	2.8	7.9
<i>Bignonia capreolata</i>	5.1	--	2.8	7.9
<i>Ilex decidua</i>	2.6	--	1.4	4.0
<i>Campsis radicans</i>	2.6	--	1.4	4.0
<i>Carya aquatica</i>	2.6	--	1.4	4.0
<i>Brunnichia cirrhosa</i>	2.6	--	1.4	4.0
<i>Boehmeria cylindrica</i>	2.6	--	1.4	4.0
<i>Aristolochia serpentaria</i>	2.6	--	1.4	4.0
<i>Arundinaria gigantea</i>	2.6	--	1.4	4.0
<i>Acer rubrum</i>	2.6	--	1.4	4.0
	100.0		100.0	200.0

Zone 4

<u>Trees</u>				
<i>Carpinus caroliniana</i>	25.1	36.5	12.6	74.2
<i>Quercus laurifolia</i>	15.6	11.6	28.0	55.2
<i>Quercus nigra</i>	12.5	11.6	28.8	52.9
<i>Acer rubrum</i>	15.6	17.3	15.5	48.4
<i>Nyssa sylvatica</i>	12.5	7.7	7.1	27.3
<i>Liquidambar styraciflua</i>	9.4	9.6	7.0	26.0
<i>Ulmus americana</i>	3.1	1.9	0.4	5.4
<i>Ilex decidua</i>	3.1	1.9	0.4	5.4
<i>Fraxinus pennsylvanica</i>	3.1	1.9	0.2	5.2
	100.0	100.0	100.0	300.0

<u>Saplings and Shrubs</u>				
<i>Carpinus caroliniana</i>	14.0	23.9	28.7	66.6
<i>Liquidambar styraciflua</i>	1.0	22.4	21.6	58.0
<i>Acer rubrum</i>	12.4	22.1	20.7	55.2
<i>Quercus laurifolia</i>	9.4	8.6	7.8	25.8
<i>Quercus nigra</i>	6.3	5.6	6.4	18.3
<i>Cornus foemina</i>	9.4	4.1	3.9	17.4
<i>Nyssa sylvatica</i>	9.4	3.7	3.0	16.1
<i>Viburnum dentatum</i>	1.6	2.6	2.0	6.2

(Sheet 3 of 6)

Table D10 (Continued)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Diospyros virginiana</i>	3.1	1.5	1.0	5.6
<i>Fraxinus pennsylvanica</i>	3.1	0.8	1.5	5.4
<i>Ulmus americana</i>	3.1	0.8	0.7	4.6
<i>Ilex amelanchar</i>	3.1	0.8	0.7	4.6
<i>Ilex opaca</i>	3.1	0.8	0.6	4.5
<i>Magnolia grandiflora</i>	1.6	0.4	0.3	2.3
<i>Crataegus marshallii</i>	1.6	0.4	0.3	2.3
<i>Cephalanthus occidentalis</i>	<u>1.6</u>	<u>0.4</u>	<u>0.2</u>	<u>2.2</u>
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Berchemia scandens</i>	34.4	24.7	41.0	100.1
<i>Toxicodendron radicans</i>	10.3	29.0	13.5	52.8
<i>Vitis rotundifolia</i>	17.3	13.0	16.3	46.6
<i>Ampelopsis arborea</i>	10.4	13.0	21.2	44.6
<i>Campsis radicans</i>	10.4	10.1	4.7	25.2
<i>Smilax rotundifolia</i>	10.4	7.2	2.7	20.3
<i>Brunnichia cirrhosa</i>	3.4	1.5	0.3	5.2
<i>Bignonia carpreolata</i>	<u>3.4</u>	<u>1.5</u>	<u>0.3</u>	<u>5.2</u>
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Quercus laurifolia</i>	11.9	--	17.5	29.4
<i>Itea virginica</i>	6.7	--	17.5	24.2
<i>Mitchella repens</i>	5.0	--	15.1	20.1
<i>Acer rubrum</i>	10.2	--	9.2	19.4
<i>Lysimachia radicans</i>	7.7	--	6.1	13.8
<i>Toxicodendron radicans</i>	5.9	--	4.9	10.8
<i>Smilax rotundifolia</i>	6.7	--	3.2	9.9
<i>Carex</i> sp.	6.7	--	3.2	9.9
<i>Chasmanthium sessiliflorum</i>	1.7	--	6.6	8.3
<i>Saururus cernuus</i>	3.4	--	3.7	7.1
<i>Ampelopsis arborea</i>	3.4	--	3.7	7.1
<i>Campsis radicans</i>	4.2	--	2.0	6.2
<i>Bignonia capreolata</i>	3.4	--	1.6	5.0
<i>Berchemia scandens</i>	3.4	--	1.6	5.0
<i>Quercus phellos</i>	2.5	--	1.2	3.7
<i>Brunnichia cirrhosa</i>	2.5	--	1.2	3.7
<i>Liquidambar styraciflua</i>	0.8	--	2.5	3.3
<i>Ascyrum hypericoides</i>	0.8	--	2.5	3.3
<i>Rubus trivialis</i>	1.7	--	0.8	2.5
<i>Nyssa sylvatica</i>	1.7	--	0.8	2.5
<i>Justicia ovata</i>	1.7	--	0.8	2.5
<i>Vitis rotundifolia</i>	0.8	--	0.4	1.2
<i>Quercus nigra</i>	0.8	--	0.4	1.2
<i>Dichanthelium commutatum</i>	0.8	--	0.4	1.2
<i>Ilex decidua</i>	0.8	--	0.4	1.2

(Sheet 4 of 6)

Table D10 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Ageratina altissima</i>	0.8	--	0.4	1.2
<i>Diospyros virginiana</i>	0.8	--	0.4	1.2
<i>Cornus foemina</i>	0.8	--	0.4	1.2
<i>Clematis crispa</i>	0.8	--	0.4	1.2
<i>Carpinus caroliniana</i>	0.8	--	0.4	1.2
<i>Arundinaria gigantea</i>	0.8	--	0.4	1.2
	100.0		100.0	200.0
<u>Zone 6</u>				
<u>Trees</u>				
<i>Liquidambar styraciflua</i>	29.5	35.5	72.9	137.9
<i>Carpinus caroliniana</i>	20.7	21.6	3.0	45.3
<i>Ilex opaca</i>	17.6	16.9	6.4	40.9
<i>Halesia diptera</i>	14.7	16.9	2.4	34.0
<i>Quercus nigra</i>	5.9	3.1	10.3	19.3
<i>Acer rubrum</i>	2.9	1.5	3.5	7.9
<i>Nyssa sylvatica</i>	2.9	1.5	1.1	5.5
<i>Ilex decidua</i>	2.9	1.5	0.2	4.6
<i>Diospyros virginiana</i>	2.9	1.5	0.2	4.6
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Carpinus caroliniana</i>	14.7	26.9	28.6	70.2
<i>Halesia diptera</i>	14.7	25.9	27.7	68.3
<i>Ilex decidua</i>	13.2	15.9	15.1	44.2
<i>Ilex opaca</i>	14.7	8.5	7.5	30.7
<i>Ilex vomitoria</i>	5.9	6.5	6.3	18.7
<i>Quercus nigra</i>	10.3	2.8	3.3	16.4
<i>Poncirus trifoliata</i>	7.3	4.3	3.4	15.0
<i>Viburnum dentatum</i>	4.4	5.4	4.7	14.5
<i>Crataegus marshallii</i>	5.9	1.7	1.6	9.2
<i>Ulmus americana</i>	2.9	0.6	0.6	4.1
<i>Vaccinium elliotii</i>	1.5	0.6	0.4	2.5
<i>Acer rubrum</i>	1.5	0.3	0.4	2.2
<i>Prunus serotina</i>	1.5	0.3	0.2	2.0
<i>Magnolia grandiflora</i>	1.5	0.3	0.2	2.0
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	28.1	49.5	50.0	127.6
<i>Vitis rotundifolia</i>	21.9	28.9	33.7	84.5
<i>Parthenocissus quinquefolia</i>	12.5	3.3	3.3	19.1
<i>Berchemia scandens</i>	9.4	5.0	4.4	18.8
<i>Campsis radicans</i>	6.2	5.0	6.3	17.5
<i>Bignonia capreolata</i>	9.4	3.3	1.1	13.8
<i>Smilax rotundifolia</i>	9.4	3.3	0.7	13.4

(Sheet 5 of 8)

Table D10 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Trachelospermum difforme</i>	<u>3.1</u> 100.0	<u>1.7</u> 100.0	<u>0.5</u> 100.0	<u>5.3</u> 300.0
<u>Herbs and Woody Seedlings</u>				
<i>Toxicodendron radicans</i>	19.2	--	25.0	44.2
<i>Halesia diptera</i>	16.2	--	19.7	35.9
<i>Viburnum dentatum</i>	5.9	--	6.8	12.7
<i>Carpinus caroliniana</i>	5.9	--	6.8	12.7
<i>Berchemia scandens</i>	2.9	--	9.1	12.0
<i>Ilex decidua</i>	4.4	--	6.0	10.4
<i>Carex blanda</i>	5.9	--	3.0	8.9
<i>Ilex opaca</i>	2.9	--	5.3	8.2
<i>Quercus nigra</i>	4.4	--	2.2	6.6
<i>Campsis radicans</i>	4.4	--	2.2	6.6
<i>Bignonia capreolata</i>	4.4	--	2.2	6.6
<i>Vitis rotundifolia</i>	2.9	--	1.5	4.4
<i>Poncirus trifoliata</i>	2.9	--	1.5	4.4
<i>Crataegus marshallii</i>	2.9	--	1.5	4.4
<i>Carya glabra</i>	2.9	--	1.5	4.4
<i>Botrychium biternatum</i>	2.9	--	1.5	4.4
<i>Viola papilionacea</i>	1.5	--	0.7	2.2
<i>Smilax bona-nox</i>	1.5	--	0.7	2.2
<i>Morus rubra</i>	1.5	--	0.7	2.2
<i>Lespedeza</i> sp.	1.5	--	0.7	2.2
<i>Carex</i> sp.	1.5	--	0.7	2.2
<i>Ampelopsis arborea</i>	<u>1.5</u> 100.0	--	<u>0.7</u> 100.0	<u>2.2</u> 200.0

(Sheet 6 of 6)

Table D11
Importance Values for Species Occurring at Site 11, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Nyssa ogeche</i>	41.2	70.4	54.5	166.1
<i>Nyssa aquatica</i>	17.6	11.4	21.7	50.7
<i>Taxodium distichum</i>	17.6	6.8	14.9	39.3
<i>Fraxinus pennsylvanica</i>	11.8	4.6	8.3	24.7
<i>Planera aquatica</i>	11.8	6.8	0.6	19.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Planera aquatica</i>	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
None present				
<u>Herbs and Woody Seedlings</u>				
<i>Quercus lyrata</i>	15.1	--	17.2	32.3
<i>Gratiola virginiana</i>	16.4	--	12.8	29.2
<i>Cynoctonum mitreola</i>	9.6	--	18.5	28.1
<i>Leersia lenticularis</i>	8.2	--	11.9	20.1
<i>Carya aquatica</i>	9.6	--	7.5	17.1
<i>Planera aquatica</i>	8.2	--	6.4	14.6
<i>Taxodium distichum</i>	6.8	--	5.3	12.1
<i>Vitis palmata</i>	4.1	--	3.2	7.3
<i>Asclepias perennis</i>	4.1	--	3.2	7.3
<i>Pilea pumila</i>	2.7	--	2.1	4.8
<i>Phanopyrum gymnocarpon</i>	2.7	--	2.1	4.8
<i>Nyssa aquatica</i>	2.7	--	2.1	4.8
<i>Spilanthes americana</i>	1.4	--	1.1	2.5
<i>Smilax hispida</i>	1.4	--	1.1	2.5
<i>Nyssa ogeche</i>	1.4	--	1.1	2.5
<i>Gleditsia aquatica</i>	1.4	--	1.1	2.5
<i>Forestiera acuminata</i>	1.4	--	1.1	2.5
<i>Commelina diffusa</i>	1.4	--	1.1	2.5
<i>Cephalanthus occidentalis</i>	1.4	--	1.1	2.5
<u>Zone 3</u>				
<u>Trees</u>				
<i>Carya aquatica</i>	18.6	16.7	34.1	69.4
<i>Forestiera acuminata</i>	14.8	31.2	4.6	50.6
<i>Nyssa aquatica</i>	11.1	10.3	22.0	43.4
<i>Fraxinus caroliniana</i>	14.8	16.7	4.0	35.5

(Sheet 1 of 5)

Table D11 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Nyssa ogeche</i>	7.4	4.2	14.6	26.2
<i>Quercus lyrata</i>	7.4	4.2	10.5	22.1
<i>Planera aquatica</i>	7.4	6.2	1.0	14.6
<i>Gleditsia aquatica</i>	7.4	4.2	2.9	14.5
<i>Fraxinus pennsylvanica</i>	3.7	2.1	5.9	11.7
<i>Crataegus viridis</i>	3.7	2.1	0.2	6.0
<i>Cephalanthus occidentalis</i>	3.7	2.1	0.2	6.0
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Forestiera acuminata</i>	26.8	56.8	55.5	139.1
<i>Fraxinus caroliniana</i>	11.4	13.3	17.0	41.7
<i>Planera aquatica</i>	15.4	13.3	12.9	41.6
<i>Cephalanthus occidentalis</i>	15.4	5.6	5.5	26.5
<i>Carya aquatica</i>	7.7	3.3	3.7	14.7
<i>Fraxinus pennsylvanica</i>	7.7	3.3	2.2	13.2
<i>Crataegus viridis</i>	3.9	1.1	1.4	6.4
<i>Quercus lyrata</i>	3.9	1.1	1.2	6.2
<i>Nyssa ogeche</i>	3.9	1.1	0.3	5.3
<i>Gleditsia aquatica</i>	3.9	1.1	0.3	5.3
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Brunnichia cirrhosa</i>	27.0	27.5	21.8	76.3
<i>Vitis riparia</i>	19.2	27.5	29.4	76.1
<i>Ampelopsis arborea</i>	23.1	13.7	22.0	58.8
<i>Vitis palmata</i>	7.7	13.7	10.2	31.6
<i>Campsis radicans</i>	11.5	7.8	12.2	31.5
<i>Smilax bona-nox</i>	7.7	7.8	3.4	18.9
<i>Cocculus carolinus</i>	3.8	2.0	1.0	6.8
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Carya aquatica</i>	18.0	--	25.7	43.7
<i>Quercus lyrata</i>	11.0	--	16.1	27.1
<i>Leersia lenticularis</i>	9.0	--	11.7	20.7
<i>Brunnichia cirrhosa</i>	12.0	--	7.2	19.2
<i>Aster sp.</i>	7.0	--	4.2	11.2
<i>Ampelopsis arborea</i>	5.0	--	6.1	11.1
<i>Phanopyrum gymnocarpon</i>	4.0	--	5.5	9.5
<i>Gleditsia aquatica</i>	5.0	--	3.0	8.0
<i>Smilax bona-nox</i>	3.0	--	4.9	7.9
<i>Forestiera acuminata</i>	4.0	--	2.4	6.4
<i>Asclepias perennis</i>	4.0	--	2.4	6.4
<i>Toxicodendron radicans</i>	3.0	--	1.8	4.8
<i>Planera aquatica</i>	3.0	--	1.8	4.8
<i>Tragia sp.</i>	2.0	--	1.2	3.2

(Sheet 2 of 5)

Table D11 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Lygodium japonicum</i>	2.0	--	1.2	3.2
<i>Carex</i> sp.	2.0	--	1.2	3.2
<i>Saururus cernuus</i>	1.0	--	0.6	1.6
<i>Quercus nigra</i>	1.0	--	0.6	1.6
<i>Justicia ovata</i>	1.0	--	0.6	1.6
<i>Cynoctonum mitreola</i>	1.0	--	0.6	1.6
<i>Commelina virginica</i>	1.0	--	0.6	1.6
<i>Celtis laevigata</i>	1.0	--	0.6	1.6
	100.0		100.0	200.0
<u>Zone 4</u>				
<u>Trees</u>				
<i>Liquidambar styraciflua</i>	24.3	52.8	38.5	115.6
<i>Quercus nigra</i>	18.2	9.9	19.0	47.1
<i>Carya aquatica</i>	9.1	7.1	17.9	34.1
<i>Carpinus caroliniana</i>	15.1	12.8	4.3	32.2
<i>Ulmus americana</i>	9.1	4.2	9.3	22.6
<i>Diospyros virginiana</i>	6.1	2.9	5.1	14.1
<i>Crataegus viridis</i>	6.1	2.9	0.3	9.3
<i>Fraxinus pennsylvanica</i>	3.0	1.5	4.3	8.8
<i>Ilex decidua</i>	3.0	2.9	0.4	6.3
<i>Platanus occidentalis</i>	3.0	1.5	0.6	5.1
<i>Quercus lyrata</i>	3.0	1.5	0.3	4.8
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Ilex decidua</i>	24.0	30.5	27.1	81.6
<i>Crataegus viridis</i>	20.0	28.8	29.2	78.0
<i>Carpinus caroliniana</i>	20.0	16.9	19.4	56.3
<i>Acer rubrum</i>	8.0	8.5	8.3	24.8
<i>Quercus lyrata</i>	12.0	5.1	3.7	20.8
<i>Liquidambar styraciflua</i>	8.0	3.4	4.2	15.6
<i>Cornus foemina</i>	4.0	3.4	4.2	11.6
<i>Celtis laevigata</i>	4.0	3.4	3.9	11.3
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	21.7	51.8	49.3	122.8
<i>Vitis rotundifolia</i>	30.4	19.3	26.8	76.5
<i>Campsis radicans</i>	30.4	19.3	13.2	62.9
<i>Vitis riparia</i>	8.7	7.2	10.1	26.0
<i>Berchemia scandens</i>	4.4	1.2	0.4	6.0
<i>Brunnichia cirrhosa</i>	4.4	1.2	0.2	5.8
	100.0	100.0	100.0	300.0

(Sheet 3 of 5)

Table D11 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Herbs and Woody Seedlings</u>				
<i>Lygodium japonicum</i>	15.5	--	58.5	74.0
<i>Toxicodendron radicans</i>	12.5	--	5.9	18.4
<i>Campsis radicans</i>	5.2	--	3.5	8.7
<i>Brunnichia cirrhosa</i>	6.2	--	2.0	8.2
<i>Smilax bona-nox</i>	5.2	--	1.7	6.9
<i>Justicia ovata</i>	5.2	--	1.7	6.9
<i>Ilex decidua</i>	5.2	--	1.7	6.9
<i>Botrychium biternatum</i>	5.2	--	1.7	6.9
<i>Vitis rotundifolia</i>	3.1	--	2.8	5.9
<i>Sebastiania fruticosa</i>	3.1	--	2.8	5.9
<i>Oplismenus hirtellus</i>	3.1	--	2.8	5.9
<i>Celtis laevigata</i>	3.1	--	2.8	5.9
<i>Quercus nigra</i>	3.1	--	1.0	4.1
<i>Liquidambar styraciflua</i>	3.1	--	1.0	4.1
<i>Sambucus canadensis</i>	1.0	--	2.1	3.1
<i>Onoclea sensibilis</i>	1.0	--	2.1	3.1
<i>Melia azedarach</i>	2.1	--	0.7	2.8
<i>Aster</i> sp.	2.1	--	0.7	2.8
<i>Woodwardia</i> sp.	1.0	--	0.3	1.3
<i>Ulmus alata</i>	1.0	--	0.3	1.3
<i>Smilax rotundifolia</i>	1.0	--	0.3	1.3
<i>Smilax glauca</i>	1.0	--	0.3	1.3
<i>Quercus lyrata</i>	1.0	--	0.3	1.3
<i>Phytolacca americana</i>	1.0	--	0.3	1.3
<i>Panicum</i> sp.	1.0	--	0.3	1.3
<i>Panicum rigidulum</i>	1.0	--	0.3	1.3
<i>Geum canadense</i>	1.0	--	0.3	1.3
<i>Ageratina altissima</i>	1.0	--	0.3	1.3
<i>Diospyros virginiana</i>	1.0	--	0.3	1.3
<i>Commelina virginica</i>	1.0	--	0.3	1.3
<i>Carex</i> sp.	1.0	--	0.3	1.3
<i>Boehmeria cylindrica</i>	1.0	--	0.3	1.3
<i>Acer negundo</i>	1.0	--	0.3	1.3
	100.0		100.0	200.0

Zone 5Trees

<i>Liquidambar styraciflua</i>	28.2	36.7	59.2	124.1
<i>Carpinus caroliniana</i>	18.7	15.4	4.6	38.7
<i>Ulmus americana</i>	12.5	11.5	6.9	30.9
<i>Celtis laevigata</i>	9.4	5.8	15.6	30.8
<i>Ilex decidua</i>	9.4	11.5	2.1	23.0
<i>Platanus occidentalis</i>	3.1	1.9	6.0	11.0
<i>Ulmus rubra</i>	3.1	5.8	2.0	10.9
<i>Crataegus viridis</i>	6.3	3.8	0.4	10.5

(Sheet 4 of 5)

Table D11 (Concluded)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Cornus foemina</i>	3.1	3.8	0.5	7.4
<i>Acer rubrum</i>	3.1	1.9	1.9	6.9
<i>Quercus nigra</i>	3.1	1.9	0.8	5.8
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Ilex decidua</i>	52.6	80.0	79.0	211.6
<i>Crataegus viridis</i>	10.5	5.0	5.1	20.6
<i>Quercus nigra</i>	10.5	5.0	4.7	20.2
<i>Carpinus caroliniana</i>	10.5	3.3	3.9	17.7
<i>Ulmus americana</i>	5.3	3.3	3.5	12.1
<i>Ulmus rubra</i>	5.3	1.7	1.9	8.9
<i>Cornus foemina</i>	5.3	1.7	1.9	8.9
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	21.0	28.8	36.1	85.9
<i>Toxicodendron radicans</i>	13.2	34.2	28.9	76.3
<i>Campsis radicans</i>	21.0	16.7	12.3	50.0
<i>Bignonia capreolata</i>	15.8	9.0	11.8	36.6
<i>Vitis palmata</i>	10.5	3.8	4.9	19.2
<i>Berchemia scandens</i>	7.9	2.3	1.8	12.0
<i>Brunnichia cirrhosa</i>	5.3	3.2	2.8	11.3
<i>Smilax bona-nox</i>	5.3	2.0	1.4	8.7
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Lygodium japonicum</i>	26.9	--	83.4	110.3
<i>Campsis radicans</i>	12.1	--	4.1	16.2
<i>Toxicodendron radicans</i>	9.4	--	2.6	12.0
<i>Botrychium biternatum</i>	9.4	--	1.5	10.9
<i>Smilax bona-nox</i>	6.7	--	2.1	8.8
<i>Carex</i> sp.	5.3	--	1.9	7.2
<i>Celtis laevigata</i>	4.1	--	0.6	4.7
<i>Carya aquatica</i>	4.1	--	0.6	4.7
<i>Aster</i> sp.	4.1	--	0.6	4.7
<i>Thelypteris kunthii</i>	2.7	--	0.4	3.1
<i>Bignonia capreolata</i>	2.7	--	0.4	3.1
<i>Berchemia scandens</i>	2.7	--	0.4	3.1
<i>Vitis rotundifolia</i>	1.4	--	0.2	1.6
<i>Rubus trivialis</i>	1.4	--	0.2	1.6
<i>Polygonum virginianum</i>	1.4	--	0.2	1.6
<i>Panicum</i> sp.	1.4	--	0.2	1.6
<i>Ilex decidua</i>	1.4	--	0.2	1.6
<i>Eupatorium</i> sp.	1.4	--	0.2	1.6
<i>Decumaria barbara</i>	1.4	--	0.2	1.6
	100.0	--	100.0	200.0

(Sheet 3 of 5)

Table D12
Importance Values for Species Occurring at Site 12, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 4</u>				
<u>Trees</u>				
<i>Liquidambar styraciflua</i>	50.0	69.0	68.5	187.5
<i>Ulmus americana</i>	15.0	6.8	11.5	33.3
<i>Quercus lyrata</i>	5.0	4.4	6.3	15.7
<i>Celtis laevigata</i>	5.0	4.4	4.5	13.9
<i>Taxodium distichum</i>	5.0	2.2	4.7	11.9
<i>Melia azedarach</i>	5.0	4.4	2.5	11.9
<i>Forestiera acuminata</i>	5.0	4.4	0.4	9.8
<i>Planera aquatica</i>	5.0	2.2	1.4	8.6
<i>Acer rubrum</i>	5.0	2.2	0.2	7.4
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Ilex decidua</i>	24.3	52.4	45.6	122.3
<i>Liquidambar styraciflua</i>	21.3	12.4	19.2	52.9
<i>Celtis laevigata</i>	15.2	8.6	5.8	29.6
<i>Forestiera acuminata</i>	3.0	6.3	9.6	18.9
<i>Fraxinus pennsylvanica</i>	6.1	3.7	4.4	14.2
<i>Sebastiania fruticosa</i>	6.1	5.0	2.4	13.5
<i>Sambucus canadensis</i>	3.0	2.5	1.0	6.5
<i>Taxodium distichum</i>	3.0	1.3	1.9	6.2
<i>Quercus lyrata</i>	3.0	1.3	1.9	6.2
<i>Platanus occidentalis</i>	3.0	1.3	1.9	6.2
<i>Halesia diptera</i>	3.0	1.3	1.6	5.9
<i>Ulmus alata</i>	3.0	1.3	1.6	5.9
<i>Acer rubrum</i>	3.0	1.3	1.6	5.9
<i>Lindera benzoin</i>	3.0	1.3	1.2	5.5
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	21.4	39.5	44.1	105.0
<i>Vitis rotundifolia</i>	23.8	28.5	29.2	81.5
<i>Brunnichia cirrhosa</i>	19.0	10.5	11.0	40.5
<i>Campsis radicans</i>	14.3	8.1	7.4	29.8
<i>Smilax bona-nox</i>	11.9	7.6	2.4	21.9
<i>Vitis riparia</i>	4.8	4.1	5.2	14.0
<i>Smilax rotundifolia</i>	2.4	1.1	0.4	3.9
<i>Berchemia scandens</i>	2.4	0.6	0.4	3.4
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Leersia lenticularis</i>	12.3	--	13.7	26.0

(Sheet 1 of 5)

Table D12 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Toxicodendron radicans</i>	8.2	--	17.6	25.8
<i>Smilax bona-nox</i>	8.2	--	16.8	25.0
<i>Carya aquatica</i>	9.2	--	8.6	17.8
<i>Aster</i> sp.	10.3	--	6.1	16.4
<i>Celtis laevigata</i>	8.2	--	4.9	13.1
<i>Lygodium japonicum</i>	6.1	--	6.8	12.9
<i>Campsis radicans</i>	6.1	--	6.8	12.9
<i>Quercus nigra</i>	6.1	--	3.7	9.9
<i>Carex</i> sp.	5.1	--	3.0	8.1
<i>Quercus lyrata</i>	4.1	--	2.4	6.5
<i>Fraxinus pennsylvanica</i>	3.1	--	1.8	4.9
<i>Triadenum walteri</i>	2.0	--	1.2	3.2
<i>Smilax hispida</i>	2.0	--	1.2	3.2
<i>Ilex decidua</i>	2.0	--	1.2	3.2
<i>Carex intumescens</i>	2.0	--	1.2	3.2
<i>Berchemia scandens</i>	2.0	--	1.2	3.2
<i>Ulmus americana</i>	1.0	--	0.6	1.6
<i>Pilea pumila</i>	1.0	--	0.6	1.6
<i>Diospyros virginiana</i>	1.0	--	0.6	1.6
	100.0		100.0	200.0

Zone 5Trees

<i>Liquidambar styraciflua</i>	26.8	25.4	32.5	84.7
<i>Melia azedarach</i>	23.4	37.1	10.9	71.4
<i>Quercus nigra</i>	6.7	5.9	31.3	43.9
<i>Ulmus americana</i>	10.0	5.9	17.4	33.3
<i>Carpinus caroliniana</i>	6.7	5.9	3.4	16.0
<i>Halesia diptera</i>	3.3	3.9	0.7	7.9
<i>Celtis laevigata</i>	3.3	3.9	0.5	7.7
<i>Fraxinus pennsylvanica</i>	3.3	2.0	0.9	6.2
<i>Acer negundo</i>	3.3	2.0	0.8	5.9
<i>Morus rubra</i>	3.3	2.0	0.6	5.9
<i>Diospyros virginiana</i>	3.3	2.0	0.5	5.8
<i>Ilex decidua</i>	3.3	2.0	0.3	5.6
<i>Crataegus viridis</i>	3.3	2.0	0.2	5.5
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Ilex decidua</i>	13.6	32.2	32.8	78.6
<i>Celtis laevigata</i>	9.5	10.6	10.0	30.1
<i>Crataegus viridis</i>	9.5	8.1	7.8	25.4
<i>Sambucus canadensis</i>	9.5	9.3	5.2	24.0
<i>Liquidambar styraciflua</i>	6.8	6.8	8.6	22.2
<i>Fraxinus pennsylvanica</i>	8.1	4.9	4.6	17.6
<i>Quercus nigra</i>	5.5	3.1	4.2	12.8

(Sheet 2 of 6)

Table D12 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Ulmus rubra</i>	4.1	4.3	3.7	12.1
<i>Halesia diptera</i>	2.8	3.7	5.4	11.9
<i>Ulmus alata</i>	5.5	3.1	3.0	11.6
<i>Callicarpa americana</i>	5.5	3.1	2.7	11.3
<i>Lindera benzoin</i>	2.8	2.4	2.3	7.5
<i>Nyssa sylvatica</i>	1.4	1.2	1.8	4.4
<i>Carpinus caroliniana</i>	1.4	1.2	1.8	4.4
<i>Ulmus americana</i>	1.4	0.6	0.9	2.9
<i>Melia azedarach</i>	1.4	0.6	0.9	2.9
<i>Carya illinoensis</i>	1.4	0.6	0.9	2.9
<i>Acer rubrum</i>	1.4	0.6	0.9	2.9
<i>Bumelia lanuginosa</i>	1.4	0.6	0.7	2.7
<i>Quercus michauxii</i>	1.4	0.6	0.6	2.6
<i>Ilex opaca</i>	1.4	0.6	0.4	2.4
<i>Acer negundo</i>	1.4	0.6	0.4	2.4
<i>Morus rubra</i>	1.4	0.6	0.2	2.2
<i>Diospyros virginiana</i>	1.4	0.6	0.2	2.2
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	25.6	46.7	50.3	122.6
<i>Toxicodendron radicans</i>	23.1	36.8	39.5	99.4
<i>Bignonia capreolata</i>	12.8	6.4	4.1	23.3
<i>Smilax rotundifolia</i>	12.8	4.6	2.6	20.0
<i>Smilax bona-nox</i>	10.3	2.7	1.0	14.0
<i>Berchemia scandens</i>	7.7	1.4	1.6	10.7
<i>Brunnichia cirrhus</i>	7.7	1.4	0.9	10.0
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Lygodium japonicum</i>	9.6	--	31.4	41.0
<i>Polygonum sp.</i>	3.0	--	12.1	15.1
<i>Toxicodendron radicans</i>	8.1	--	5.3	13.4
<i>Oplismenus hirtellus</i>	5.3	--	6.9	12.2
<i>Quercus nigra</i>	5.3	--	5.7	11.0
<i>Sambucus canadensis</i>	5.3	--	4.0	9.3
<i>Rubus argutus</i>	5.3	--	2.3	7.6
<i>Rubus trivialis</i>	3.7	--	3.3	7.0
<i>Bignonia capreolata</i>	3.7	--	3.3	7.0
<i>Aster sp.</i>	4.4	--	2.0	6.4
<i>Ilex decidua</i>	3.0	--	3.0	6.0
<i>Elytraria carolinensis</i>	3.0	--	3.0	6.0
<i>Smilax bona-nox</i>	3.7	--	1.6	5.3
<i>Geum canadense</i>	3.7	--	1.6	5.3
<i>Celtis laevigata</i>	3.7	--	1.6	5.3
<i>Botrychium biternatum</i>	3.7	--	1.6	5.3
<i>Ulmus alata</i>	3.0	--	1.3	4.3

(Sheet 3 of 6)

Table D12 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Carex</i> sp.	3.0	--	1.3	4.3
<i>Liquidambar styraciflua</i>	2.2	--	1.0	3.2
<i>Argeratina altissima</i>	2.2	--	1.0	3.2
<i>Smilax rotundifolia</i>	1.5	--	0.7	2.2
<i>Panicum</i> sp.	1.5	--	0.7	2.2
<i>Morus rubra</i>	1.5	--	0.7	2.2
<i>Acer negundo</i>	1.5	--	0.7	2.2
<i>Solidago altissima</i>	0.7	--	0.3	1.0
<i>Quercus phellos</i>	0.7	--	0.3	1.0
<i>Phytolacca americana</i>	0.7	--	0.3	1.0
<i>Lindera benzoin</i>	0.7	--	0.3	1.0
<i>Lespedeza</i> sp.	0.7	--	0.3	1.0
<i>Duchesnia indica</i>	0.7	--	0.3	1.0
<i>Diospyros virginiana</i>	0.7	--	0.3	1.0
<i>Crataegus viridis</i>	0.7	--	0.3	1.0
<i>Cornus foemina</i>	0.7	--	0.3	1.0
<i>Commelina diffusa</i>	0.7	--	0.3	1.0
<i>Cocculus carolinus</i>	0.7	--	0.3	1.0
<i>Callicarpa americana</i>	0.7	--	0.3	1.0
<i>Brunnichia cirrhosa</i>	0.7	--	0.3	1.0
	100.0		100.0	200.0

Zone 6

Trees

<i>Liquidambar styraciflua</i>	30.4	59.2	44.4	134.0
<i>Betula nigra</i>	9.1	6.8	7.2	23.1
<i>Carya illinoensis</i>	3.0	1.7	16.9	21.6
<i>Ulmus alata</i>	6.1	3.4	11.5	21.0
<i>Juglans nigra</i>	9.1	5.1	6.4	20.6
<i>Halesia carolina</i>	9.1	5.1	1.4	15.6
<i>Melia azedarach</i>	9.1	5.1	1.3	15.5
<i>Sassafras albidum</i>	6.1	3.4	1.2	10.7
<i>Quercus nigra</i>	3.0	1.7	4.3	9.0
<i>Bumelia lanuginosa</i>	3.0	1.7	2.0	6.7
<i>Ulmus americana</i>	3.0	1.7	1.7	6.4
<i>Diospyros virginiana</i>	3.0	1.7	0.9	5.6
<i>Celtis laevigata</i>	3.0	1.7	0.5	5.2
<i>Halesia diptera</i>	3.0	1.7	0.3	5.0
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Ulmus alata</i>	10.7	22.6	16.2	51.5
<i>Liquidambar styraciflua</i>	8.5	10.	15.6	34.5
<i>Celtis laevigata</i>	9.7	12.3	10.3	32.3
<i>Quercus nigra</i>	8.5	8.5	9.6	26.6
<i>Callicarpa americana</i>	8.5	7.6	5.9	22.0

(Sheet 4 of 8)

Table D12 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Halesia carolina</i>	5.4	4.2	7.1	16.7
<i>Sebastiania fruticosa</i>	5.4	6.6	3.5	15.5
<i>Lindera benzoin</i>	6.5	4.2	3.3	14.0
<i>Acer negundo</i>	5.4	3.8	2.8	12.0
<i>Halesia diptera</i>	4.3	2.8	4.8	11.9
<i>Ilex decidua</i>	4.3	3.8	3.0	11.1
<i>Cornus foemina</i>	4.3	3.8	3.0	11.1
<i>Ulmus americana</i>	3.2	1.9	2.2	7.3
<i>Melia azedarach</i>	3.2	1.4	2.4	7.0
<i>Juglans nigra</i>	2.2	0.9	1.6	4.7
<i>Gleditsia triacanthos</i>	2.2	0.9	1.0	4.1
<i>Betula nigra</i>	0.9	0.9	1.6	3.6
<i>Sambucus canadensis</i>	1.1	0.9	1.3	3.3
<i>Platanus occidentalis</i>	1.1	0.5	0.8	2.4
<i>Ilex opaca</i>	1.1	0.5	0.6	2.2
<i>Acer rubrum</i>	1.1	0.5	0.6	2.2
<i>Quercus phellos</i>	1.1	0.5	0.5	2.1
<i>Bumelia lanuginosa</i>	1.1	0.5	0.3	1.9
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Clematis ligusticifolia</i>	16.0	23.7	25.9	65.6
<i>Bignonia capreolata</i>	17.9	24.1	21.4	63.4
<i>Aristolochia tomentosa</i>	14.3	15.6	15.4	45.3
<i>Vitis rotundifolia</i>	17.9	11.1	14.1	43.1
<i>Toxicodendron radicans</i>	8.9	13.0	14.8	36.7
<i>Smilax rotundifolia</i>	12.5	9.0	4.9	26.4
<i>Campsis radicans</i>	7.1	1.9	2.5	11.5
<i>Ampelopsis arborea</i>	1.8	1.2	0.8	3.8
<i>Lonicera japonica</i>	1.8	0.2	0.1	2.1
<i>Parthenocissus quinquefolia</i>	1.8	0.2	0.1	2.1
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Oplismenus hirtellus</i>	7.7	--	27.2	34.9
<i>Bignonia capreolata</i>	9.3	--	9.0	18.3
<i>Carex</i> sp.	7.1	--	10.4	17.5
<i>Ageratina altissima</i>	9.3	--	7.9	17.2
<i>Panicum</i> sp.	8.7	--	3.5	12.2
<i>Quercus nigra</i>	4.6	--	6.9	11.5
<i>Acer negundo</i>	5.1	--	5.2	10.3
<i>Hyptis mutabilis</i>	4.1	--	4.8	8.9
<i>Sebastiania fruticosa</i>	4.1	--	3.8	7.9
<i>Elytraria carolinensis</i>	4.1	--	2.7	6.8
<i>Sambucus canadensis</i>	3.6	--	2.5	6.1
<i>Toxicodendron radicans</i>	4.1	--	1.6	5.7
<i>Celtis laevigata</i>	3.6	--	1.4	5.0

(Sheet 5 of 6)

Table D12 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Geum canadense</i>	3.1	--	1.2	4.3
<i>Ulmus alata</i>	1.5	--	1.7	3.2
<i>Quercus phellos</i>	1.5	--	1.7	3.2
<i>Rubus trivialis</i>	2.0	--	0.8	2.8
<i>Lindera benzoin</i>	2.0	--	0.8	2.8
<i>Viburnum cassinoides</i>	1.5	--	0.6	2.1
<i>Dichondra carolinensis</i>	1.5	--	0.6	2.1
<i>Callicarpa americana</i>	0.5	--	1.3	1.8
<i>Smilax rotundifolia</i>	1.0	--	0.4	1.4
<i>Lygodium japonicum</i>	1.0	--	0.4	1.4
<i>Bumelia lanuginosa</i>	1.0	--	0.4	1.4
<i>Clematis ligusticifolia</i>	1.0	--	0.4	1.4
<i>Vitis rotundifolia</i>	0.5	--	0.2	0.7
<i>Sassafras albidum</i>	0.5	--	0.2	0.7
<i>Toxicodendron radicans</i>	0.5	--	0.2	0.7
<i>Polygonum sp.</i>	0.5	--	0.2	0.7
<i>Paspalum sp.</i>	0.5	--	0.2	0.7
<i>Parthenocissus quinquefolia</i>	0.5	--	0.2	0.7
<i>Onoclea sensibilis</i>	0.5	--	0.2	0.7
<i>Lonicera japonica</i>	0.5	--	0.2	0.7
<i>Lindera benzoin</i>	0.5	--	0.2	0.7
<i>Lactuca serriola</i>	0.5	--	0.2	0.7
<i>Ilex decidua</i>	0.5	--	0.2	0.7
<i>Cercis canadensis</i>	0.5	--	0.2	0.7
<i>Agrostis hyemalis</i>	0.5	--	0.2	0.7
<i>Amaranthus tuberculatus</i>	0.5	--	0.2	0.7
	100.0		100.0	200.0

(Sheet 8 of 8)

Table D13
Importance Values for Species Occurring at Site 13, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Planera aquatica</i>	30.8	44.4	25.5	100.7
<i>Taxodium distichum</i>	30.8	22.2	42.3	95.3
<i>Nyssa aquatica</i>	15.4	13.3	30.1	58.8
<i>Fraxinus caroliniana</i>	19.2	17.8	2.0	39.0
<i>Quercus lyrata</i>	3.8	2.3	0.1	6.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Fraxinus caroliniana</i>	37.5	44.4	54.5	136.4
<i>Planera aquatica</i>	50.0	27.8	30.1	107.9
<i>Styrax americana</i>	12.5	27.8	15.4	55.7
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Brunnichia cirrhosa</i>	50.0	50.0	41.2	141.1
<i>Campsis radicans</i>	12.5	20.0	34.1	66.6
<i>Smilax bona-nox</i>	12.5	23.3	17.7	53.5
<i>Ampelopsis arborea</i>	25.0	6.7	7.1	38.8
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Dichanthelium commutatum</i>	22.0	--	17.5	39.5
<i>Ampelopsis arborea</i>	12.2	--	19.9	32.1
<i>Brunnichia cirrhosa</i>	9.8	--	18.0	27.8
<i>Ulmus americana</i>	14.6	--	11.7	26.3
<i>Nyssa aquatica</i>	9.8	--	7.8	17.6
<i>Carex sp.</i>	7.3	--	5.8	13.1
<i>Carya aquatica</i>	7.3	--	5.8	13.1
<i>Styrax americana</i>	4.9	--	3.9	8.8
<i>Quercus lyrata</i>	4.9	--	3.9	8.8
<i>Planera aquatica</i>	2.4	--	1.9	4.3
<i>Liquidambar styraciflua</i>	2.4	--	1.9	4.3
<i>Aster sp.</i>	2.4	--	1.9	4.3
	100.0		100.0	200.0
<u>Zone 1</u>				
<u>Trees</u>				
<i>Quercus lyrata</i>	21.1	35.8	18.1	75.0
<i>Nyssa aquatica</i>	18.2	15.1	18.6	51.9
<i>Planera aquatica</i>	15.2	11.3	21.2	47.7

(Sheet 1 of 5)

Table D13 (Continued)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Betula nigra</i>	12.1	9.4	17.3	38.8
<i>Carya aquatica</i>	15.2	11.3	7.8	34.3
<i>Taxodium distichum</i>	3.0	5.7	9.4	18.1
<i>Acer rubrum</i>	6.1	5.7	2.6	14.4
<i>Ulmus americana</i>	6.1	3.8	3.4	13.3
<i>Fraxinus pennsylvanica</i>	3.0	1.9	1.6	6.6
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Quercus lyrata</i>	40.0	38.4	50.5	128.9
<i>Fraxinus caroliniana</i>	20.0	30.8	23.9	74.7
<i>Nyssa aquatica</i>	20.0	15.4	18.3	53.7
<i>Planera aquatica</i>	10.0	7.7	4.6	22.3
<i>Styrax americana</i>	10.0	7.7	2.7	20.4
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Brunnichia cirrhosa</i>	33.3	20.0	36.0	89.3
<i>Vitis riparia</i>	22.3	35.0	23.0	80.3
<i>Ampelopsis arborea</i>	33.3	30.0	14.0	77.3
<i>Vitis rotundifolia</i>	11.1	15.0	27.0	53.1
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Dichanthelium commutatum</i>	16.6	--	14.9	31.5
<i>Ampelopsis arborea</i>	9.4	--	19.6	29.0
<i>Ulmus americana</i>	14.3	--	12.7	27.0
<i>Quercus lyrata</i>	14.3	--	12.7	27.0
<i>Carya aquatica</i>	14.3	--	12.7	27.0
<i>Boehmeria cylindrica</i>	7.1	--	6.4	13.5
<i>Campsis radicans</i>	4.8	--	4.2	9.0
<i>Aster</i> sp.	4.8	--	4.2	9.0
<i>Quercus laurifolia</i>	2.4	--	2.1	4.5
<i>Panicum</i> sp.	2.4	--	2.1	4.5
<i>Mikania scandens</i>	2.4	--	2.1	4.5
<i>Forestiera acuminata</i>	2.4	--	2.1	4.5
<i>Eupatorium serotinum</i>	2.4	--	2.1	4.5
<i>Brunnichia cirrhosa</i>	2.4	--	2.1	4.5
	100.0		100.0	200.0
<u>Zone 4</u>				
<u>Trees</u>				
<i>Liquidambar styraciflua</i>	33.4	37.6	27.9	98.9
<i>Quercus nigra</i>	20.0	22.9	53.2	96.1
<i>Carpinus caroliniana</i>	16.7	21.2	4.1	42.0
<i>Fraxinus pennsylvanica</i>	6.7	3.3	3.7	13.7

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Table D13 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Ulmus americana</i>	3.3	3.3	4.8	11.4
<i>Quercus phellos</i>	6.7	3.3	1.1	11.1
<i>Quercus lyrata</i>	3.3	3.3	1.1	7.7
<i>Quercus falcata</i> var. <i>pagodifolia</i>	3.3	1.7	2.7	7.7
<i>Nyssa sylvatica</i>	3.3	1.7	1.2	6.2
<i>Ilex decidua</i>	3.3	1.7	0.2	5.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Carpinus caroliniana</i>	36.0	64.4	66.3	166.7
<i>Ilex decidua</i>	24.0	16.9	16.1	57.0
<i>Ulmus americana</i>	16.0	8.5	8.8	33.3
<i>Quercus michauxii</i>	4.0	1.7	1.8	7.5
<i>Nyssa sylvatica</i>	4.0	1.7	1.8	7.5
<i>Liquidambar styraciflua</i>	4.0	1.7	1.8	7.5
<i>Acer rubrum</i>	4.0	1.7	1.8	7.5
<i>Styrax americana</i>	4.0	1.7	1.1	6.8
<i>Quercus nigra</i>	4.0	1.7	0.5	6.2
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	45.4	67.7	69.6	182.7
<i>Vitis rotundifolia</i>	36.4	22.0	26.0	84.4
<i>Berchemia scandens</i>	9.1	5.9	1.6	16.6
<i>Smilax rotundifolia</i>	9.1	4.4	2.8	16.3
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Sabal minor</i>	5.5	--	25.2	30.7
<i>Ulmus americana</i>	10.9	--	8.6	19.5
<i>Smilax rotundifolia</i>	10.9	--	8.6	19.5
<i>Carpinus caroliniana</i>	9.6	--	7.6	17.2
<i>Quercus nigra</i>	8.2	--	6.5	14.7
<i>Dichanthelium commutatum</i>	8.2	--	6.5	14.7
<i>Botrychium biternatum</i>	8.2	--	6.5	14.7
<i>Acer rubrum</i>	8.2	--	6.5	14.7
<i>Toxicodendron radicans</i>	6.8	--	5.4	12.2
<i>Carex</i> sp.	4.1	--	3.2	7.3
<i>Panicum</i> sp.	2.7	--	2.2	4.9
<i>Bignonia capreolata</i>	2.7	--	2.2	4.9
<i>Vitis rotundifolia</i>	1.4	--	1.1	2.5
<i>Mitchella repens</i>	1.4	--	1.1	2.5
<i>Liquidambar styraciflua</i>	1.4	--	1.1	2.5
<i>Ilex decidua</i>	1.4	--	1.1	2.5
<i>Elytraria carolinensis</i>	1.4	--	1.1	2.5
<i>Carya tomentosa</i>	1.4	--	1.1	2.5

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Table D13 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Berchemia scandens</i>	1.4	--	1.1	2.5
<i>Aster</i> sp.	1.4	--	1.1	2.5
<i>Aster</i> sp.	1.4	--	1.1	2.5
<i>Aristolochia serpentaria</i>	1.4	--	1.1	2.5
	100.0		100.0	200.0

Zone 6Trees

<i>Pinus glabra</i>	18.3	23.8	22.9	65.0
<i>Pinus taeda</i>	15.8	12.7	33.4	61.9
<i>Carya tomentosa</i>	10.5	16.4	9.5	36.4
<i>Ulmus alata</i>	13.2	12.7	1.6	27.5
<i>Quercus falcata</i> var. <i>pagodifolia</i>	5.3	5.4	16.6	27.3
<i>Liquidambar styraciflua</i>	7.9	7.3	7.7	22.9
<i>Nyssa sylvatica</i>	7.9	5.5	1.1	14.5
<i>Quercus alba</i>	5.3	3.6	3.7	12.6
<i>Carpinus caroliniana</i>	5.3	5.4	1.1	11.8
<i>Quercus nigra</i>	5.3	3.6	1.7	10.1
<i>Quercus stellata</i>	2.6	1.8	0.9	5.3
<i>Morus rubra</i>	2.6	1.8	0.3	4.7
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Carpinus caroliniana</i>	12.7	28.3	31.6	72.6
<i>Ulmus alata</i>	12.7	15.7	18.0	46.4
<i>Vaccinium arboreum</i>	7.7	14.9	11.6	34.2
<i>Crataegus marshallii</i>	9.0	7.7	6.0	22.7
<i>Ilex decidua</i>	7.7	5.5	6.4	19.6
<i>Asimina parviflora</i>	9.0	5.0	4.6	18.6
<i>Carya tomentosa</i>	6.4	3.1	3.7	13.2
<i>Vaccinium elliotii</i>	3.8	4.5	3.4	11.7
<i>Arundinaria gigantea</i>	3.8	3.6	1.8	9.2
<i>Nyssa sylvatica</i>	3.8	2.3	2.9	9.0
<i>Cornus drummondii</i>	2.6	1.5	1.3	5.7
<i>Liquidambar styraciflua</i>	2.6	1.3	1.4	5.3
<i>Quercus michauxii</i>	2.6	1.3	1.3	5.2
<i>Pinus taeda</i>	2.6	0.9	1.3	4.8
<i>Quercus falcata</i> var. <i>pagodifolia</i>	2.6	0.9	0.7	4.2
<i>Ulmus americana</i>	1.3	0.4	0.7	2.4
<i>Quercus phellos</i>	1.3	0.4	0.7	2.4
<i>Quercus nigra</i>	1.3	0.4	0.7	2.4
<i>Amelanchier arborea</i>	1.3	0.4	0.7	2.4
<i>Ilex opaca</i>	1.3	0.4	0.4	2.1
<i>Carya glabra</i>	1.3	0.4	0.3	2.0

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Table D13 (Concluded)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Asimina triloba</i>	1.3	0.4	0.3	2.0
<i>Malus coronaria</i>	1.3	0.4	0.2	1.9
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	27.7	40.9	44.9	113.5
<i>Toxicodendron radicans</i>	27.7	30.8	25.1	83.6
<i>Gelsemium sempervirens</i>	16.6	12.8	14.0	43.4
<i>Smilax rotundifolia</i>	5.6	5.1	6.3	17.0
<i>Vitis riparia</i>	5.6	2.6	3.0	11.2
<i>Smilax glauca</i>	5.6	2.6	3.0	11.2
<i>Berchemia scandens</i>	5.6	2.6	3.0	11.2
<i>Bignonia capreolata</i>	5.6	2.6	0.7	8.9
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Arundinaria gigantea</i>	12.9	--	27.8	40.7
<i>Carex</i> sp.	10.9	--	8.9	19.8
<i>Chasmanthium sessiliflorum</i>	7.6	--	7.2	14.8
<i>Vaccinium arboreum</i>	5.4	--	9.0	14.4
<i>Bignonia capreolata</i>	8.7	--	4.7	13.4
<i>Panicum</i> sp.	7.6	--	4.2	11.8
<i>Crataegus marshallii</i>	4.3	--	5.5	9.8
<i>Smilax glauca</i>	5.4	--	3.0	8.4
<i>Toxicodendron radicans</i>	5.4	--	3.0	8.4
<i>Mitchella repens</i>	3.3	--	4.9	8.2
<i>Quercus nigra</i>	4.3	--	2.4	6.7
<i>Ulmus alata</i>	3.3	--	1.8	5.1
<i>Smilax bona-nox</i>	3.3	--	1.8	5.1
<i>Smilax rotundifolia</i>	1.1	--	3.7	4.8
<i>Ilex opaca</i>	1.1	--	3.7	4.8
<i>Carpinus caroliniana</i>	2.2	--	1.2	3.4
<i>Acer rubrum</i>	2.2	--	1.2	3.4
<i>Vitis riparia</i>	1.1	--	0.6	1.7
<i>Vaccinium elliotii</i>	1.1	--	0.6	1.7
<i>Ulmus americana</i>	1.1	--	0.6	1.7
<i>Solanum carolinense</i>	1.1	--	0.6	1.7
<i>Sebastiania fruticosa</i>	1.1	--	0.6	1.7
<i>Sabal minor</i>	1.1	--	0.6	1.7
<i>Quercus Phellos</i>	1.1	--	0.6	1.7
<i>Quercus michauxii</i>	1.1	--	0.6	1.7
<i>Malus coronaria</i>	1.1	--	0.6	1.7
<i>Cornus foemina</i>	1.1	--	0.6	1.7
	100.0	--	100.0	200.0

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Table D14

Importance Values for Species Occurring at Site 14, Arranged by Zone and Vegetation Layer

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Zone 2</u>				
<u>Trees</u>				
<i>Planera aquatica</i>	31.6	51.0	34.0	116.6
<i>Nyssa aquatica</i>	15.8	9.8	34.1	59.7
<i>Fraxinus caroliniana</i>	26.3	25.5	7.8	59.6
<i>Taxodium distichum</i>	10.5	7.8	20.6	38.9
<i>Forestiera acuminata</i>	10.5	3.9	0.4	14.8
<i>Carya aquatica</i>	5.3	2.0	3.1	10.4
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Forestiera acuminata</i>	42.8	63.1	69.1	175.0
<i>Fraxinus caroliniana</i>	28.6	26.3	20.5	75.4
<i>Planera aquatica</i>	14.3	5.3	5.2	24.8
<i>Nyssa aquatica</i>	14.3	5.3	5.2	24.8
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Brunnichia cirrhosa</i>	47.0	73.9	85.4	206.3
<i>Ampelopsis arborea</i>	29.4	18.7	8.9	57.0
<i>Trachelospermum difforme</i>	11.8	4.7	1.7	18.2
<i>Vitis rotundifolia</i>	5.9	1.8	3.6	11.3
<i>Vitis riparia</i>	5.9	0.9	0.4	7.2
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Leersia lenticularis</i>	13.9	--	23.5	37.4
<i>Brunnichia cirrhosa</i>	17.3	--	12.8	30.1
<i>Ampelopsis arborea</i>	8.1	--	19.2	27.3
<i>Boehmeria cylindrica</i>	12.7	--	9.4	22.1
<i>Pluchea camphorata</i>	7.0	--	5.2	12.2
<i>Taxodium distichum</i>	5.7	--	4.2	9.9
<i>Planera aquatica</i>	4.6	--	3.4	8.0
<i>Trachelospermum difforme</i>	3.4	--	2.5	5.9
<i>Panicum sp.</i>	3.4	--	2.5	5.9
<i>Nyssa aquatica</i>	3.4	--	2.5	5.9
<i>Coccoloba diffusa</i>	3.4	--	2.5	5.9
<i>Ulmus americana</i>	2.4	--	1.7	4.1
<i>Toxicodendron radicans</i>	2.4	--	1.7	4.1
<i>Carex sp.</i>	2.4	--	1.7	4.1
<i>Vitis riparia</i>	1.1	--	0.8	1.9
<i>Ulmus alata</i>	1.1	--	0.8	1.9
<i>Panicum rigidulum</i>	1.1	--	0.8	1.9

(Sheet 1 of 5)

Table D14 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Ilex decidua</i>	1.1	--	0.8	1.9
<i>Forestiera acuminata</i>	1.1	--	0.8	1.9
<i>Eupatorium serotinum</i>	1.1	--	0.8	1.9
<i>Ageratina altissima</i>	1.1	--	0.8	1.9
<i>Carya aquatica</i>	1.1	--	0.8	1.9
<i>Bidens discoidea</i>	1.1	--	0.8	1.9
	100.0		100.0	200.0
<u>Zone 5</u>				
<u>Trees</u>				
<i>Carpinus caroliniana</i>	22.0	36.9	10.0	68.9
<i>Quercus phellos</i>	15.6	11.1	28.7	55.4
<i>Liquidambar styraciflua</i>	15.6	18.5	10.8	44.9
<i>Quercus nigra</i>	6.2	5.6	12.3	24.1
<i>Fraxinus pennsylvanica</i>	9.5	7.4	1.6	18.5
<i>Quercus michauxii</i>	6.2	3.7	8.5	18.4
<i>Pinus glabra</i>	3.1	3.7	11.2	18.0
<i>Nyssa sylvatica</i>	6.2	3.7	7.7	17.6
<i>Ulmus americana</i>	6.3	3.7	7.0	17.0
<i>Quercus lyrata</i>	3.1	1.9	1.0	6.0
<i>Ulmus alata</i>	3.1	1.9	0.6	5.6
<i>Pinus elliotii</i>	3.1	1.9	0.6	5.6
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Carpinus caroliniana</i>	20.5	25.8	28.3	74.6
<i>Ilex decidua</i>	12.7	19.2	19.2	51.1
<i>Ulmus alata</i>	12.7	19.2	17.0	48.9
<i>Ulmus rubra</i>	10.3	9.0	9.2	28.5
<i>Fraxinus pennsylvanica</i>	10.3	6.7	7.5	24.5
<i>Quercus michauxii</i>	10.3	6.7	6.5	23.5
<i>Liquidambar styraciflua</i>	10.3	5.6	6.1	22.0
<i>Arundinaria gigantea</i>	5.1	4.5	2.5	12.1
<i>Quercus phellos</i>	2.6	1.1	1.4	5.1
<i>Quercus nigra</i>	2.6	1.1	1.4	5.1
<i>Cornus drummondii</i>	2.6	1.1	0.9	4.6
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	42.9	54.3	58.6	155.8
<i>Toxicodendron radicans</i>	19.0	23.9	19.5	62.4
<i>Vitis riparia</i>	19.0	10.9	10.0	39.9
<i>Campsis radicans</i>	14.3	8.7	9.3	32.3
<i>Smilax rotundifolia</i>	4.8	2.2	2.6	9.6
	100.0	100.0	100.0	300.0

(Sheet 2 of 5)

Table D14 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Herbs and Woody Seedlings</u>				
<i>Carex</i> sp.	17.6	--	24.1	41.7
<i>Smilax rotundifolia</i>	8.8	--	12.0	20.8
<i>Bignonia capreolata</i>	11.4	--	8.8	20.2
<i>Quercus nigra</i>	6.3	--	5.0	11.3
<i>Dichanthelium commutatum</i>	6.3	--	5.0	11.3
<i>Arundinaria gigantea</i>	2.5	--	7.1	9.6
<i>Sabal minor</i>	5.0	--	4.0	9.0
<i>Quercus phellos</i>	5.0	--	4.0	9.0
<i>Panicum</i> sp.	5.0	--	4.0	9.0
<i>Rubus trivialis</i>	3.8	--	3.0	6.8
<i>Toxicodendron radicans</i>	3.8	--	3.0	6.8
<i>Dicliptera brachiata</i>	3.8	--	3.0	6.8
<i>Viola missouriensis</i>	2.5	--	2.0	4.5
<i>Aster</i> sp.	2.5	--	2.0	4.5
<i>Aristolochia serpentaria</i>	2.5	--	2.0	4.5
<i>Vitis rotundifolia</i>	1.2	--	1.0	2.2
<i>Vaccinium elliotii</i>	1.2	--	1.0	2.2
<i>Smilax glauca</i>	1.2	--	1.0	2.2
<i>Smilax bona-nox</i>	1.2	--	1.0	2.2
<i>Planera aquatica</i>	1.2	--	1.0	2.2
<i>Morus rubra</i>	1.2	--	1.0	2.2
<i>Carya aquatica</i>	1.2	--	1.0	2.2
<i>Brunnichia cirrhosa</i>	1.2	--	1.0	2.2
<i>Botrychium biternatum</i>	1.2	--	1.0	2.2
<i>Berchemia scandens</i>	1.2	--	1.0	2.2
<i>Ampelopsis arborea</i>	1.2	--	1.0	2.2
	100.0		100.0	260.0

Zone 6

<u>Trees</u>				
<i>Juniperus virginiana</i>	24.4	23.5	34.4	82.3
<i>Carya tomentosa</i>	15.2	23.5	14.7	53.4
<i>Quercus stellata</i>	12.1	14.9	14.9	41.9
<i>Ulmus alata</i>	9.1	6.4	4.3	19.8
<i>Quercus nigra</i>	9.1	6.4	1.5	17.0
<i>Pinus glabra</i>	3.0	4.3	8.8	16.1
<i>Pinus taeda</i>	3.0	2.1	10.4	15.5
<i>Quercus falcata</i> var. <i>pagodifolia</i>	6.1	4.2	1.4	11.7
<i>Liquidambar styraciflua</i>	3.0	4.2	4.0	11.2
<i>Nyssa sylvatica</i>	3.0	2.1	3.6	6.0
<i>Quercus phellos</i>	3.0	2.1	0.9	6.0

(Sheet 3 of 5)

Table D14 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Malus angustifolia</i>	3.0	2.1	0.4	5.5
<i>Fraxinus americana</i>	3.0	2.1	0.4	5.5
<i>Quercus michauxii</i>	3.0	2.1	0.3	5.4
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Vaccinium arboreum</i>	11.4	42.4	43.1	96.9
<i>Ilex decidua</i>	12.8	8.8	10.2	31.8
<i>Arundinaria gigantea</i>	5.7	15.6	9.3	30.6
<i>Juniperus virginiana</i>	8.6	5.6	7.3	21.5
<i>Ulmus alata</i>	8.6	5.6	6.2	20.4
<i>Quercus falcata</i> var. <i>pagodifolia</i>	8.6	4.8	6.4	19.8
<i>Cornus drummondii</i>	8.6	4.4	4.1	17.1
<i>Fraxinus americana</i>	5.7	2.4	2.4	10.5
<i>Cercis canadensis</i>	5.7	2.4	1.8	9.9
<i>Carya tomentosa</i>	2.9	1.6	2.4	6.9
<i>Asimina parviflora</i>	4.3	1.2	0.9	6.4
<i>Quercus stellata</i>	2.9	0.8	1.2	4.9
<i>Quercus nigra</i>	2.9	0.8	1.1	4.8
<i>Quercus michauxii</i>	2.9	0.8	0.8	4.5
<i>Vaccinium elliotii</i>	1.4	0.8	0.3	2.5
<i>Quercus phellos</i>	1.4	0.4	0.6	2.4
<i>Prunus umbellata</i>	1.4	0.4	0.6	2.4
<i>Malus angustifolia</i>	1.4	0.4	0.6	2.4
<i>Carpinus caroliniana</i>	1.4	0.4	0.4	2.2
<i>Asimina triloba</i>	1.4	0.4	0.3	2.1
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	25.0	28.0	47.6	100.6
<i>Toxicodendron radicans</i>	20.0	25.0	22.4	67.4
<i>Cocculus carolinus</i>	25.0	18.8	8.5	52.3
<i>Bignonia capreolata</i>	10.0	9.4	7.2	26.6
<i>Gelsemium sempervirens</i>	5.0	6.3	10.5	21.8
<i>Smilax bona-nox</i>	5.0	6.3	1.9	13.2
<i>Parthenocissus quinquefolia</i>	5.0	3.1	1.3	9.4
<i>Berchemia scandens</i>	5.0	1.1	0.6	8.7
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Chasmanthium sessiliflorum</i>	13.8	..	28.5	42.3
<i>Bignonia capreolata</i>	17.2	..	13.86	30.8
<i>Quercus falcata</i> var. <i>pagodifolia</i>	6.0	..	9.4	15.4
<i>Arundinaria gigantea</i>	5.2	..	8.9	14.1
<i>Aster</i> sp.	7.8	..	5.4	13.2

(Sheet 4 of 5)

Table D14 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Carex</i> sp.	6.9	--	4.3	11.2
<i>Quercus nigra</i>	6.0	--	3.8	9.8
<i>Quercus phellos</i>	5.2	--	3.3	8.5
<i>Panicum</i> sp.	5.2	--	3.3	8.5
<i>Ulmus alata</i>	3.4	--	2.2	5.6
<i>Sabal minor</i>	3.4	--	2.2	5.6
<i>Vaccinium arboreum</i>	1.7	--	3.9	5.6
<i>Rubus trivialis</i>	1.7	--	1.1	2.8
<i>Robinia nana</i>	1.7	--	1.1	2.8
<i>Oxalis stricta</i>	1.7	--	1.1	2.8
<i>Mitchella repens</i>	1.7	--	1.1	2.8
<i>Conoclinium coelestinum</i>	1.7	--	1.1	2.8
<i>Dicliptera brachiata</i>	1.7	--	1.1	2.8
<i>Cocculus carolinus</i>	1.7	--	1.1	2.8
<i>Smilax glauca</i>	0.9	--	0.5	1.4
<i>Rubus argutus</i>	0.9	--	0.5	1.4
<i>Pinus glabra</i>	0.9	--	0.5	1.4
<i>Juniperus virginiana</i>	0.9	--	0.5	1.4
<i>Gelsemium sempervirens</i>	0.9	--	0.5	1.4
<i>Castanea pumila</i>	0.9	--	0.5	1.4
<i>Berchemia scandens</i>	0.9	--	0.5	1.4
	100.0		100.0	200.0

(Sheet 5 of 5)

Table D15

Importance Values for Species Occurring at Site 15, Arranged by Zone and Vegetation Layer

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Zone 2</u>				
<u>Trees</u>				
<i>Taxodium distichum</i>	24.4	42.7	41.1	108.2
<i>Quercus lyrata</i>	14.6	6.9	35.8	57.3
<i>Fraxinus caroliniana</i>	22.0	25.6	7.0	54.6
<i>Planera aquatica</i>	19.5	12.8	10.1	42.4
<i>Nyssa aquatica</i>	14.6	10.3	4.4	29.3
<i>Nyssa biflora</i>	4.9	1.7	1.6	8.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Fraxinus caroliniana</i>	45.4	60.9	60.4	166.7
<i>Styrax americana</i>	31.8	33.3	35.0	100.1
<i>Itea virginica</i>	9.1	4.2	2.6	15.9
<i>Planera aquatica</i>	9.1	1.1	1.5	11.7
<i>Taxodium distichum</i>	4.6	0.5	0.5	5.6
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	25.0	58.8	51.6	135.4
<i>Smilax walteri</i>	25.0	17.9	24.6	67.5
<i>Campsis radicans</i>	12.5	17.9	21.1	51.5
<i>Smilax hispida</i>	25.0	3.6	1.8	30.4
<i>Smilax laurifolia</i>	12.5	1.8	0.9	15.2
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Boehmeria cylindrica</i>	11.3	..	17.8	29.1
<i>Vitis palmata</i>	13.2	..	15.6	28.8
<i>Smilax hispida</i>	16.9	..	8.3	25.2
<i>Justicia ovata</i>	5.7	..	13.3	19.0
<i>Aster simplex</i>	7.5	..	10.8	18.3
<i>Toxicodendron radicans</i>	3.8	..	9.6	13.4
<i>Hypoxis leptocarpa</i>	3.8	..	9.6	13.4
<i>Fraxinus caroliniana</i>	7.5	..	5.4	12.9
<i>Leersia virginica</i>	9.4	..	3.0	12.4
<i>Planera aquatica</i>	5.7	..	1.8	7.5
<i>Campsis radicans</i>	3.8	..	1.2	5.0
<i>Acer rubrum</i>	3.8	..	1.2	5.0
<i>Vitis rotundifolia</i>	1.9	..	0.6	2.5
<i>Styrax americana</i>	1.9	..	0.6	2.5

(Sheet 1 of 5)

Table D15 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Ilex decidua</i>	1.9	--	0.6	2.5
<i>Crataegus viridis</i>	1.9	--	0.6	2.5
	100.0		100.0	100.0
<u>Zone 3</u>				
<u>Trees</u>				
<i>Quercus laurifolia</i>	21.2	26.0	35.5	82.7
<i>Liquidambar styraciflua</i>	24.3	18.0	23.2	65.5
<i>Ilex decidua</i>	18.2	30.0	2.6	50.8
<i>Quercus phellos</i>	9.1	6.0	27.8	42.0
<i>Quercus lyrata</i>	6.1	6.0	1.2	13.3
<i>Carpinus caroliniana</i>	6.1	4.0	0.8	10.9
<i>Quercus nigra</i>	3.0	2.0	5.5	10.5
<i>Taxodium distichum</i>	3.0	2.0	2.4	7.4
<i>Ulmus americana</i>	3.0	2.0	0.6	5.6
<i>Acer rubrum</i>	3.0	2.0	0.2	5.2
<i>Carya aquatica</i>	3.0	2.0	0.2	5.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Ilex decidua</i>	21.7	52.5	58.7	132.9
<i>Quercus laurifolia</i>	15.2	7.9	11.7	34.8
<i>Styrax americana</i>	10.9	10.1	6.0	27.0
<i>Vaccinium elliotii</i>	10.9	7.4	4.9	23.2
<i>Sebastiania fruticosa</i>	6.5	6.5	3.7	16.7
<i>Acer rubrum</i>	8.7	3.7	3.0	15.4
<i>Crataegus viridis</i>	4.3	3.3	3.6	11.2
<i>Liquidambar styraciflua</i>	4.3	2.8	3.9	11.0
<i>Nyssa aquatica</i>	4.3	1.9	2.1	8.3
<i>Viburnum dentatum</i>	2.2	1.4	0.9	4.5
<i>Ulmus americana</i>	2.2	0.5	0.5	3.2
<i>Quercus lyrata</i>	2.2	0.5	0.3	3.0
<i>Crataegus marshallii</i>	2.2	0.5	0.3	3.0
<i>Fraxinus caroliniana</i>	2.2	0.5	0.2	2.9
<i>Carpinus caroliniana</i>	2.2	0.5	0.2	2.9
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Toxicodendron radicans</i>	30.1	83.0	93.5	206.6
<i>Saillax walteri</i>	23.3	8.1	3.5	34.9
<i>Bignonia capreolata</i>	16.7	4.1	1.1	21.9
<i>Campsis radicans</i>	13.4	3.0	1.0	17.4
<i>Saillax hispida</i>	6.6	0.4	0.1	7.1
<i>Trachelospermum diffusum</i>	3.3	1.0	0.3	4.6
<i>Vitis palmata</i>	3.3	0.2	0.3	3.8

(Sheet 2 of 5)

Table D15 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Vitis rotundifolia</i>	3.3 100.0	0.2 100.0	0.2 100.0	3.7 300.0
<u>Herbs and Woody Seedlings</u>				
<i>Toxicodendron radicans</i>	12.8	--	33.2	46.0
<i>Vitis palmata</i>	12.8	--	17.7	30.5
<i>Smilax hispida</i>	13.4	--	13.2	26.6
<i>Hypoxis leptocarpa</i>	8.5	--	8.9	17.4
<i>Campsis radicans</i>	6.3	--	4.5	10.8
<i>Sebastiania fruticosa</i>	4.9	--	4.7	9.6
<i>Dichanthelium commutatum</i>	3.5	--	4.3	7.8
<i>Carex</i> sp.	4.9	--	1.4	6.3
<i>Aster simplex</i>	4.2	--	1.2	5.4
<i>Bignonia capreolata</i>	4.2	--	0.7	4.9
<i>Justicia ovata</i>	2.1	--	1.5	3.6
<i>Fraxinus caroliniana</i>	2.1	--	1.5	3.6
<i>Acer rubrum</i>	2.8	--	0.5	3.3
<i>Mikania scandens</i>	2.1	--	0.9	3.0
<i>Crataegus viridis</i>	2.1	--	0.9	3.0
<i>Trachelospermum difforme</i>	1.4	--	1.4	2.8
Unknown	1.4	--	0.8	2.2
<i>Boehmeria cylindrica</i>	1.4	--	0.8	2.2
<i>Vitis rotundifolia</i>	1.4	--	0.2	1.6
<i>Planera aquatica</i>	1.4	--	0.2	1.6
<i>Ilex decidua</i>	1.4	--	0.2	1.6
<i>Styrax americana</i>	0.7	--	0.1	0.8
<i>Vaccinium elliotii</i>	0.7	--	0.1	0.8
<i>Taxodium distichum</i>	0.7	--	0.1	0.8
<i>Sebatia calycina</i>	0.7	--	0.1	0.8
<i>Quercus nigra</i>	0.7	--	0.1	0.8
<i>Liquidambar styraciflua</i>	0.7	--	0.1	0.8
<i>Ampelopsis arborea</i>	0.7 100.0	--	0.1 100.0	0.8 200.0

Zone 6Trees

<i>Quercus stellata</i>	25.1	26.9	28.9	80.9
<i>Quercus falcata</i>	15.6	20.6	34.6	70.8
<i>Carya tomentosa</i>	18.8	25.4	14.9	59.1
<i>Quercus nigra</i>	9.4	7.9	8.5	25.8
<i>Cornus florida</i>	9.4	4.8	2.5	16.7
<i>Quercus laurifolia</i>	6.2	4.8	5.5	16.5
<i>Liquidambar styraciflua</i>	6.2	4.8	3.6	14.6

(Sheet 3 of 5)

Table D15 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Pinus echinata</i>	6.2	3.2	1.1	10.5
<i>Vaccinium arboreum</i>	3.1	1.6	0.4	5.1
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Carya tomentosa</i>	13.6	24.2	29.5	67.3
<i>Vaccinium arboreum</i>	9.5	19.1	19.1	47.7
<i>Viburnum rufidulum</i>	4.0	12.5	10.8	27.3
<i>Quercus falcata</i>	9.6	8.2	7.3	25.1
<i>Quercus stellata</i>	9.6	6.9	6.8	23.3
<i>Sassafras albidum</i>	6.8	4.7	4.3	15.8
<i>Cornus florida</i>	6.8	4.3	4.6	15.7
<i>Liquidambar styraciflua</i>	5.4	4.3	3.8	13.5
<i>Quercus nigra</i>	6.8	3.4	2.6	12.8
<i>Crataegus flava</i>	5.4	2.2	1.5	9.1
<i>Prunus umbellata</i>	4.1	2.2	1.9	8.2
<i>Chionanthus virginicus</i>	2.7	2.2	2.5	7.4
<i>Vaccinium elliotii</i>	2.7	1.3	0.9	4.9
<i>Pinus taeda</i>	1.3	0.9	0.6	2.8
<i>Quercus laurifolia</i>	1.3	0.4	0.8	2.5
<i>Morus rubra</i>	1.3	0.4	0.5	2.2
<i>Hamamelis virginiana</i>	1.3	0.4	0.5	2.2
<i>Carpinus caroliniana</i>	1.3	0.4	0.5	2.2
<i>Vaccinium corymbosum</i>	1.3	0.4	0.3	2.0
<i>Quercus marilandica</i>	1.3	0.4	0.3	2.0
<i>Prunus serotina</i>	1.3	0.4	0.3	2.0
<i>Ilex decidua</i>	1.3	0.4	0.3	2.0
<i>Diospyros virginiana</i>	1.3	0.4	0.3	2.0
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	38.4	56.7	58.4	153.5
<i>Vitis aestivalis</i>	30.8	26.7	36.6	94.1
<i>Gelsemium sempervirens</i>	23.1	13.3	4.0	40.4
<i>Lonicera sempervirens</i>	7.7	3.3	1.0	12.0
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Toxicodendron radicans</i>	13.9	..	25.4	39.3
<i>Vitis rotundifolia</i>	9.3	..	20.9	30.2
<i>Gelsemium sempervirens</i>	9.3	..	13.6	22.9
<i>Quercus stellata</i>	8.1	..	8.3	16.4
<i>Quercus nigra</i>	7.1	..	8.0	15.1
<i>Aristolochia serpentaria</i>	7.1	..	1.9	9.0
<i>Vaccinium arboreum</i>	4.7	..	2.9	7.6
<i>Aristida</i> sp.	4.7	..	1.3	6.0

(Sheet 4 of 5)

Table D15 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Vaccinium elliottii</i>	3.5	--	1.0	4.5
<i>Carex</i> sp.	3.5	--	1.0	4.5
<i>Sassafras albidum</i>	1.2	--	2.0	3.2
<i>Liquidambar styraciflua</i>	1.2	--	2.0	3.2
<i>Cornus florida</i>	1.2	--	2.0	3.2
<i>Carya tomentosa</i>	1.2	--	2.0	3.2
<i>Dichanthelium commutatum</i>	2.4	--	0.6	3.0
<i>Lespedeza</i> sp.	2.4	--	0.6	3.0
<i>Stylisma humistrata</i>	2.4	--	0.6	3.0
<i>Acer rubrum</i>	2.4	--	0.6	3.0
<i>Solidago odorata</i>	1.2	--	0.3	1.5
<i>Solidago</i> sp.	1.2	--	0.3	1.5
<i>Smilax glauca</i>	1.2	--	0.3	1.5
<i>Rhus copallinum</i>	1.2	--	0.3	1.5
<i>Prunus umbellata</i>	1.2	--	0.3	1.5
<i>Polypodium scar dens</i>	1.2	--	0.3	1.5
<i>Ilex opaca</i>	1.2	--	0.3	1.5
<i>Hamamelis virginiana</i>	1.2	--	0.3	1.5
<i>Diospyros virginiana</i>	1.2	--	0.3	1.5
<i>Cnidioscolus stimulosus</i>	1.2	--	0.3	1.5
	100.0		100.0	200.0

(Sheet 5 of 5)

Table D16
Importance Values for Species Occurring at Site 16, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Fraxinus caroliniana</i>	25.8	53.6	17.4	96.8
<i>Nyssa aquatica</i>	22.6	9.6	53.3	85.5
<i>Planera aquatica</i>	29.1	28.0	21.0	78.1
<i>Taxodium distichum</i>	9.7	2.4	4.0	16.1
<i>Salix nigra</i>	6.4	4.8	2.9	14.1
<i>Betula nigra</i>	3.2	0.8	1.2	5.2
<i>Quercus laurifolia</i>	3.2	0.8	0.2	4.2
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Fraxinus caroliniana</i>	37.6	55.4	56.0	149.0
<i>Planera aquatica</i>	25.0	22.6	21.3	68.9
<i>Salix nigra</i>	8.3	14.7	17.3	40.3
<i>Cephalanthus occidentalis</i>	8.3	3.1	2.5	13.9
<i>Crataegus aestivalis</i>	8.3	1.2	1.6	11.1
<i>Gleditsia aquatica</i>	8.3	1.2	0.7	10.2
<i>Irea virginica</i>	4.2	1.8	0.6	6.6
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Smilax walteri</i>	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Planera aquatica</i>	57.2	--	57.2	114.4
<i>Taxodium distichum</i>	14.3	--	14.3	28.6
<i>Fraxinus caroliniana</i>	14.3	--	14.3	28.6
<i>Vitis sp.</i>	7.1	--	7.1	14.2
<i>Panicum rigidulum</i>	7.1	--	7.1	14.2
	100.0		100.0	200.0
<u>Zone 3</u>				
<u>Trees</u>				
<i>Fraxinus caroliniana</i>	20.7	49.9	13.4	84.0
<i>Quercus laurifolia</i>	24.2	18.0	41.3	83.5
<i>Quercus lyrata</i>	10.4	4.2	14.3	28.9
<i>Taxodium distichum</i>	10.4	5.6	6.5	22.5
<i>Acer rubrum</i>	6.9	6.9	2.5	16.3
<i>Liquidambar styraciflua</i>	6.9	2.8	6.0	15.7
<i>Planera aquatica</i>	3.4	5.6	4.3	13.3
<i>Nyssa aquatica</i>	3.4	1.4	8.5	13.3

(Sheet 1 of 7)

Table D16 (Continued)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Betula nigra</i>	6.9	2.8	2.3	12.0
<i>Ilex decidua</i>	3.4	1.4	0.6	5.4
<i>Cephalanthus occidentalis</i>	<u>3.4</u>	<u>1.4</u>	<u>0.3</u>	<u>5.1</u>
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Fraxinus caroliniana</i>	25.5	59.7	60.7	145.9
<i>Quercus laurifolia</i>	15.4	6.6	8.6	30.6
<i>Cephalanthus occidentalis</i>	7.7	7.4	6.6	21.7
<i>Crataegus aestivalis</i>	7.7	3.7	4.7	16.1
<i>Styrax americana</i>	5.1	5.1	5.2	15.4
<i>Taxodium distichum</i>	7.7	2.9	2.3	12.9
<i>Sebastiania fruticosa</i>	7.7	2.9	1.4	12.0
<i>Ilex decidua</i>	5.1	3.7	2.9	11.7
<i>Quercus lyrata</i>	5.1	1.5	2.1	8.7
<i>Acer rubrum</i>	2.6	2.2	2.6	7.4
<i>Hypericum galioides</i>	2.6	2.2	1.0	5.8
<i>Gleditsia aquatica</i>	2.6	0.7	1.3	4.6
<i>Planera aquatica</i>	2.6	0.7	0.3	3.6
<i>Liquidambar styraciflua</i>	<u>2.6</u>	<u>0.7</u>	<u>0.3</u>	<u>3.6</u>
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Smilax walteri</i>	50.0	89.0	94.4	233.4
<i>Vitis riparia</i>	16.7	4.4	1.4	22.5
<i>Trachelospermum difforme</i>	16.7	2.2	1.4	20.3
<i>Vitis aestivalis</i>	8.3	2.2	1.4	11.9
<i>Ampelopsis arborea</i>	<u>8.3</u>	<u>2.2</u>	<u>1.4</u>	<u>11.9</u>
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Panicum rigidulum</i>	8.5	--	44.2	52.7
<i>Smilax rotundifolia</i>	12.8	--	10.5	23.3
<i>Ampelopsis arborea</i>	10.6	--	4.8	15.4
<i>Erechtites hieracifolia</i>	6.4	--	7.7	14.1
<i>Trachelospermum difforme</i>	6.4	--	2.9	9.3
<i>Toxicodendron radicans</i>	6.4	--	2.9	9.3
<i>Quercus nigra</i>	6.4	--	2.9	9.3
<i>Planera aquatica</i>	6.4	--	2.9	9.3
<i>Carex joorii</i>	6.4	--	2.9	9.3
<i>Sebastiania fruticosa</i>	2.1	--	5.9	8.0
<i>Taxodium distichum</i>	4.3	--	1.8	6.1
<i>Quercus laurifolia</i>	4.3	--	1.8	6.1
<i>Parthenocissus quinquefolia</i>	4.3	--	1.8	6.1
<i>Vitis sp.</i>	2.1	--	1.0	3.1
<i>Quercus phellos</i>	2.1	--	1.0	3.1
<i>Liquidambar styraciflua</i>	2.1	--	1.0	3.1

(Sheet 2 of 7)

Table D16 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Hypericum galioides</i>	2.1	--	1.0	3.1
<i>Fraxinus caroliniana</i>	2.1	--	1.0	3.1
<i>Cephalanthus occidentalis</i>	2.1	--	1.0	3.1
<i>Acer rubrum</i>	2.1	--	1.0	3.1
	100.0		100.0	200.0
<u>Zone 4</u>				
<u>Trees</u>				
<i>Quercus laurifolia</i>	30.0	38.9	47.8	116.7
<i>Quercus nigra</i>	16.7	13.0	12.2	41.9
<i>Carpinus caroliniana</i>	6.7	22.2	4.6	33.5
<i>Liquidambar styraciflua</i>	10.0	5.5	14.3	29.8
<i>Acer rubrum</i>	10.0	5.5	5.5	21.0
<i>Quercus lyrata</i>	10.0	5.5	4.0	19.5
<i>Pinus taeda</i>	3.3	1.9	9.3	14.5
<i>Nyssa sylvatica</i>	6.7	3.7	1.5	11.9
<i>Betula nigra</i>	3.3	1.9	0.6	5.8
<i>Ilex decidua</i>	3.3	1.9	0.2	5.4
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Quercus laurifolia</i>	6.8	11.9	17.2	35.9
<i>Vaccinium elliotii</i>	7.8	11.9	8.1	27.8
<i>Styrax americana</i>	7.8	9.2	10.1	27.1
<i>Fraxinus caroliniana</i>	7.8	10.2	8.4	26.4
<i>Ilex decidua</i>	9.0	7.0	10.0	26.0
<i>Cornus foemina</i>	6.8	8.9	10.1	25.8
<i>Hypericum galioides</i>	1.1	13.9	7.8	22.8
<i>Carpinus caroliniana</i>	5.6	5.8	7.5	18.9
<i>Acer rubrum</i>	6.8	5.2	6.6	18.6
<i>Nyssa sylvatica</i>	5.6	3.1	3.3	12.0
<i>Ilex opaca</i>	5.6	1.8	1.9	9.3
<i>Liquidambar styraciflua</i>	3.4	1.2	1.3	5.9
<i>Quercus nigra</i>	3.4	0.9	1.6	5.9
<i>Itea virginica</i>	2.3	1.2	0.7	4.2
<i>Leucothoe racemosa</i>	1.1	1.8	1.1	4.0
<i>Sebastiania fruticosa</i>	2.3	0.9	0.5	3.7
<i>Sabal minor</i>	2.3	0.9	0.5	3.7
<i>Ulmus americana</i>	2.3	0.6	0.5	3.4
<i>Amorpha fruticosa</i>	2.3	0.6	0.3	3.2
<i>Vaccinium corymbosum</i>	1.1	0.6	0.4	2.1
<i>Quercus virginiana</i>	1.1	0.3	0.4	1.8
<i>Viburnum dentatum</i>	1.1	0.3	0.3	1.7
<i>Diospyros virginiana</i>	1.1	0.3	0.3	1.7
<i>Cephalanthus occidentalis</i>	1.1	0.3	0.3	1.7
<i>Viburnum obovatum</i>	1.1	0.3	0.2	1.6

(Sheet 3 of 7)

Table D16 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Persea borbonia</i>	1.1	0.3	0.2	1.6
<i>Taxodium distichum</i>	1.1	0.3	0.2	1.6
<i>Betula nigra</i>	1.1	0.3	0.2	1.6
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Smilax walteri</i>	34.7	62.1	31.5	128.3
<i>Campsis radicans</i>	30.4	19.7	50.3	100.4
<i>Vitis riparia</i>	15.0	4.6	5.6	23.2
<i>Ampelopsis arborea</i>	8.7	7.6	6.5	22.8
<i>Vitis palmata</i>	3.3	1.5	4.1	8.9
<i>Trachelospermum difforme</i>	3.3	1.5	1.0	5.8
<i>Parthenocissus quinquefolia</i>	3.3	1.5	0.5	5.3
<i>Vitis rotundifolia</i>	3.3	1.5	0.5	5.3
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Carex louisianica</i>	4.6	--	14.5	19.1
<i>Sebastiania fruticosa</i>	9.8	--	7.7	17.5
<i>Itea virginica</i>	8.3	--	8.6	16.3
<i>Quercus laurifolia</i>	6.1	--	9.7	15.8
<i>Carex joorii</i>	4.6	--	8.7	12.3
<i>Vaccinium elliotii</i>	3.8	--	7.6	11.4
<i>Smilax rotundifolia</i>	4.6	--	5.6	10.2
<i>Hypericum galioides</i>	3.8	--	5.2	9.0
<i>Toxicodendron radicans</i>	6.1	--	2.3	8.4
<i>Carpinus caroliniana</i>	5.3	--	2.1	7.4
<i>Trachelospermum difforme</i>	3.8	--	3.6	7.4
<i>Rubus trivialis</i>	3.8	--	2.7	6.5
<i>Mitchella repens</i>	3.8	--	2.7	6.5
<i>Ampelopsis arborea</i>	3.1	--	3.4	6.5
<i>Campsis radicans</i>	2.3	--	2.3	4.6
<i>Liquidambar styraciflua</i>	3.1	--	0.7	3.8
<i>Hypoxis leptocarpa</i>	2.3	--	1.4	3.7
<i>Acer rubrum</i>	2.3	--	1.4	3.7
<i>Saururus cernuus</i>	2.3	--	2.6	3.4
<i>Vitis rotundifolia</i>	0.8	--	1.3	2.8
Unknown	1.5	--	1.3	2.8
<i>Elaeagnus virginiana</i>	1.5	--	1.1	2.8
<i>Syrax americana</i>	0.8	--	1.1	1.9
<i>Ulmus americana</i>	1.5	--	0.3	1.8
<i>Sabal minor</i>	1.5	--	0.3	1.8
<i>Pinus glabra</i>	1.5	--	0.3	1.8
<i>Parthenocissus quinquefolia</i>	1.5	--	0.3	1.8
<i>Viola floridana</i>	0.8	--	0.2	1.0
<i>Chaenactis sessiliflora</i>	0.8	--	0.2	1.0
<i>Dichanthium coccineum</i>	0.8	--	0.2	1.0

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Table D16 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Nyssa sylvatica</i>	0.8	--	0.2	1.0
<i>Ilex opaca</i>	0.8	--	0.2	1.0
<i>Crataegus aestivalis</i>	0.8	--	0.2	1.0
<i>Cornus fccmina</i>	0.8	--	0.2	1.0
<i>Betula nigra</i>	0.8	--	0.2	1.0
	100.0		100.0	200.0

Zone 6Trees

<i>Pinus taeda</i>	36.5	36.1	81.8	154.4
<i>Quercus nigra</i>	18.2	22.2	9.8	50.2
<i>Carya glabra</i>	13.6	13.9	2.8	30.3
<i>Nyssa sylvatica</i>	13.6	13.9	1.9	29.4
<i>Quercus virginiana</i>	9.1	8.3	2.8	20.2
<i>Liquidambar styraciflua</i>	4.5	2.8	0.6	7.9
<i>Vaccinium arboreum</i>	4.5	2.8	0.3	7.6
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Myrica cerifera</i>	6.7	25.1	24.7	56.5
<i>Liquidambar styraciflua</i>	7.4	11.5	13.3	32.2
<i>Quercus nigra</i>	7.4	9.4	10.5	27.3
<i>Symplocos tinctoria</i>	8.8	9.3	8.3	26.4
<i>Acer rubrum</i>	6.7	6.4	7.4	20.5
<i>Nyssa sylvatica</i>	7.4	4.6	5.9	17.9
<i>Vaccinium elliotii</i>	5.7	6.1	4.9	17.7
<i>Carya glabra</i>	7.4	4.6	4.6	16.6
<i>Vaccinium corymbosum</i>	5.1	5.3	4.1	14.5
<i>Rhododendron canescens</i>	4.4	3.2	2.9	10.5
<i>Ilex opaca</i>	4.4	2.3	2.7	9.4
<i>Clethra alnifolia</i>	4.4	2.8	2.2	9.4
<i>Vaccinium arboreum</i>	2.9	2.5	2.7	8.1
<i>Sassafras albidum</i>	2.9	1.7	1.5	6.1
<i>Quercus velutina</i>	2.2	1.0	1.0	4.2
<i>Ilex glabra</i>	2.2	0.5	0.5	3.2
<i>Pinus taeda</i>	2.2	0.4	0.3	2.9
<i>Sebastiania fruticosa</i>	1.5	0.7	0.6	2.8
<i>Prunus umbellata</i>	1.5	0.5	0.8	2.8
<i>Ascyrum hypericoides</i>	1.5	0.3	0.2	2.0
<i>Rhus copallinum</i>	1.4	0.4	0.2	2.0
<i>Viburnum dentatum</i>	0.7	0.2	0.1	1.0
<i>Quercus virginiana</i>	0.7	0.2	0.1	1.0
<i>Quercus laurifolia</i>	0.7	0.2	0.1	1.0
<i>Persea borbonia</i>	0.7	0.2	0.1	1.0
<i>Vaccinium arboreum</i>	0.7	0.2	0.1	1.0
<i>Leucothoe racemosa</i>	0.7	0.2	0.1	1.0

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Table D16 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Gaylussacia frondosa</i>	<u>0.7</u> 100.0	<u>0.2</u> 100.0	<u>0.1</u> 100.0	<u>1.0</u> 300.0
<u>Woody Vines</u>				
<i>Vitis rotundifolia</i>	33.4	71.9	83.5	188.8
<i>Gelsemium sempervirens</i>	20.1	11.6	7.6	39.3
<i>Smilax glauca</i>	10.1	3.3	0.8	14.2
<i>Smilax laurifolia</i>	6.7	2.5	1.3	10.5
<i>Campsis radicans</i>	3.3	1.7	3.3	8.3
<i>Vitis cinerea</i>	3.3	2.5	1.0	6.8
<i>Ampelopsis arborea</i>	3.3	1.7	0.4	5.4
<i>Vitis riparia</i>	3.3	0.8	0.5	4.6
<i>Trachelospermum difforme</i>	3.3	0.8	0.4	5.4
<i>Smilax walteri</i>	3.3	0.8	0.5	4.6
Unknown	3.3	0.8	0.2	4.3
<i>Smilax bona-rox</i>	3.3	0.8	0.2	4.3
<i>Parthenocissus quinquefolia</i>	<u>3.3</u> 100.0	<u>0.8</u> 100.0	<u>0.2</u> 100.0	<u>4.3</u> 300.0
<u>Herbs and Woody Seedlings</u>				
<i>Vaccinium corymbosum</i>	7.7	--	16.7	24.4
<i>Clethra alnifolia</i>	8.2	--	3.7	17.9
<i>Vitis rotundifolia</i>	6.5	--	8.0	14.5
<i>Myrica cerifera</i>	5.3	--	9.2	14.5
<i>Smilax pumila</i>	6.5	--	7.0	13.5
<i>Quercus nigra</i>	6.5	--	5.0	11.5
<i>Toxicodendron radicans</i>	5.3	--	5.0	10.3
<i>Liquidambar styraciflua</i>	4.2	--	5.7	9.9
<i>Pinus glabra</i>	4.8	--	3.2	8.0
<i>Vaccinium elliotii</i>	3.6	--	4.0	7.6
<i>Carya glabra</i>	3.6	--	2.4	6.0
<i>Vaccinium arboreum</i>	2.4	--	2.6	5.0
<i>Acer rubrum</i>	1.8	--	3.1	4.9
<i>Symplocos tinctoria</i>	2.4	--	1.6	4.0
<i>Sebastiania fruticosa</i>	2.4	--	1.6	4.0
<i>Parthenocissus quinquefolia</i>	2.4	--	1.6	4.0
<i>Nyssa sylvatica</i>	1.8	--	1.5	3.3
<i>Mitchella repens</i>	1.8	--	1.5	3.3
<i>Hypericum galioides</i>	0.6	--	1.7	2.3
<i>Gaylussacia frondosa</i>	0.6	--	1.7	2.3
<i>Smilax rotundifolia</i>	1.8	--	0.3	2.1
<i>Gelsemium sempervirens</i>	1.8	--	0.3	2.1
<i>Campsis radicans</i>	1.8	--	0.3	2.1
<i>Sassafras albidum</i>	1.2	--	0.8	2.0
<i>Rhus copallinum</i>	1.2	--	0.8	2.0
<i>Ilex opaca</i>	1.2	--	0.8	2.0
<i>Callicarpa americana</i>	1.2	--	0.8	2.0

(Sheet 6 of 7)

Table D16 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<i>Smilax glauca</i>	1.2	--	0.2	1.4
<i>Quercus virginiana</i>	1.2	--	0.2	1.4
<i>Robinia pseudoacacia</i>	0.6	--	0.7	1.3
<i>Rhododendron canescens</i>	0.6	--	0.7	1.3
<i>Viburnum obovatum</i>	0.6	--	0.1	0.7
<i>Viola floridana</i>	0.6	--	0.1	0.7
<i>Trachelospermum difforme</i>	0.6	--	0.1	0.7
<i>Scleria triglomerata</i>	0.6	--	0.1	0.7
<i>Quercus lyrata</i>	0.6	--	0.1	0.7
<i>Prunus serotina</i>	0.6	--	0.1	0.7
<i>Ascyrum hypericoides</i>	0.6	--	0.1	0.7
<i>Dichondra repens</i>	0.6	--	0.1	0.7
<i>Cyperus</i> sp.	0.6	--	0.1	0.7
<i>Crataegus</i> sp.	0.6	--	0.1	0.7
<i>Stylisma humistrata</i>	0.6	--	0.1	0.7
<i>Berchemia scandens</i>	0.6	--	0.1	0.7
<i>Ampelopsis arborea</i>	0.6	--	0.1	0.7
	100.0		100.0	200.0

(Sheet 7 of 7)

Table D17
Importance Values for Species Occurring at Site 17, Arranged by Zone and Vegetation Layer

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Zone 2</u>				
<u>Trees</u>				
<i>Fraxinus caroliniana</i>	25.0	58.8	34.3	118.1
<i>Planera aquatica</i>	17.5	20.6	21.2	59.3
<i>Taxodium distichum</i>	20.0	6.9	20.8	47.7
<i>Nyssa biflora</i>	12.5	3.9	16.8	33.2
<i>Crataegus aestivalis</i>	15.0	7.3	5.3	27.6
<i>Cephalanthus occidentalis</i>	5.0	1.7	0.7	7.4
<i>Betula nigra</i>	2.5	0.4	0.5	3.4
<i>Acer rubrum</i>	2.5	0.4	0.4	3.3
	100.0	100.0	100.0	300.0
<u>Saplings and Shrubs</u>				
<i>Fraxinus caroliniana</i>	18.2	71.8	73.0	163.0
<i>Crataegus aestivalis</i>	18.2	10.6	11.0	39.8
<i>Planera aquatica</i>	16.4	8.7	8.3	33.4
<i>Cephalanthus occidentalis</i>	9.1	3.3	3.4	15.8
<i>Taxodium distichum</i>	7.3	1.4	1.2	9.9
<i>Quercus laurifolia</i>	5.5	1.1	1.1	7.7
<i>Leucothoe racemosa</i>	5.5	0.87	0.3	6.6
<i>Acer rubrum</i>	3.6	0.6	0.6	4.8
<i>Itea virginica</i>	3.6	0.7	0.3	4.6
<i>Quercus lyrata</i>	3.6	0.3	0.3	4.2
<i>Ilex verticillata</i>	1.8	0.3	0.1	2.2
<i>Lyonia lucida</i>	1.8	0.1	0.1	2.0
<i>Styrax americana</i>	1.8	0.1	0.1	2.0
<i>Cyrilla racemiflora</i>	1.8	0.1	0.1	2.0
<i>Betula nigra</i>	1.8	0.1	0.1	2.0
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Smilax walteri</i>	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Fraxinus caroliniana</i>	37.1	--	45.5	82.6
<i>Planera aquatica</i>	25.9	--	28.6	54.5
<i>Crataegus aestivalis</i>	14.8	--	18.2	33.0
<i>Eleocharis microcarpa</i>	7.4	--	2.5	9.9
<i>Taxodium distichum</i>	3.7	--	1.3	5.0
<i>Quercus laurifolia</i>	3.7	--	1.3	5.0
<i>Fraxinus pennsylvanica</i>	3.7	--	1.3	5.0

(Sheet 1 of 6)

Table D17 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Boehmeria cylindrica</i>	<u>3.7</u> 100.0		<u>1.3</u> 100.0	<u>5.0</u> 200.0
<u>Zone 3</u>				
<u>Trees</u>				
<i>Nyssa biflora</i>	23.2	37.1	63.6	123.9
<i>Quercus laurifolia</i>	23.2	32.3	18.8	74.3
<i>Acer rubrum</i>	20.9	15.0	12.0	47.9
<i>Liquidambar styraciflua</i>	9.3	3.1	0.8	13.2
<i>Fraxinus caroliniana</i>	4.7	4.7	0.8	10.2
<i>Taxodium distichum</i>	4.7	2.3	3.0	10.0
<i>Ilex myrtifolia</i>	7.0	2.3	0.5	9.8
<i>Cyrilla racemiflora</i>	4.7	1.6	0.2	6.5
<i>Persea borbonia</i>	<u>2.3</u> 100.0	<u>1.6</u> 100.0	<u>0.3</u> 100.0	<u>4.2</u> 300.0
<u>Saplings and Shrubs</u>				
<i>Fraxinus caroliniana</i>	11.8	23.2	25.7	60.7
<i>Acer rubrum</i>	9.5	17.8	19.7	47.0
<i>Quercus laurifolia</i>	9.5	12.4	16.3	38.2
<i>Nyssa biflora</i>	6.4	9.2	8.6	24.2
<i>Crataegus aestivalis</i>	7.4	8.8	7.9	24.1
<i>Cyrilla racemiflora</i>	7.4	5.2	5.0	17.6
<i>Styrax americana</i>	8.5	4.4	4.0	16.9
<i>Ilex myrtifolia</i>	7.4	4.4	3.7	15.5
<i>Liquidambar styraciflua</i>	6.4	1.8	1.7	9.9
<i>Leucothoe racemosa</i>	6.4	2.2	1.3	9.9
<i>Vaccinium elliotii</i>	4.3	1.6	0.8	6.7
<i>Clethra alnifolia</i>	2.1	3.0	1.5	6.6
<i>Itea virginica</i>	3.2	2.2	1.0	6.4
<i>Persea borbonia</i>	3.2	1.6	1.2	6.0
<i>Symplocos tinctoria</i>	1.1	1.0	0.7	2.8
<i>Myrica cerifera</i>	2.1	0.4	0.2	2.7
<i>Quercus lyrata</i>	1.1	0.4	0.4	1.9
<i>Quercus nigra</i>	1.1	0.2	0.2	1.5
<i>Lyonia lucida</i>	<u>1.1</u> 100.0	<u>0.2</u> 100.0	<u>0.1</u> 100.0	<u>1.4</u> 300.0
<u>Woody Vines</u>				
<i>Smilax laurifolia</i>	24.0	51.9	68.6	144.5
<i>Gelsemium rankinii</i>	28.0	17.3	5.0	50.3
<i>Berchemia scandens</i>	20.0	11.1	16.4	47.5
<i>Smilax walteri</i>	12.0	9.9	3.0	24.9
<i>Smilax glauca</i>	4.0	3.7	2.2	9.9

(Sheet 2 of 6)

Table D17 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Smilax hispida</i>	4.0	3.7	1.0	8.7
<i>Toxicodendron radicans</i>	4.0	1.2	3.0	8.2
<i>Vitis rotundifolia</i>	4.0	1.2	0.8	6.0
	100.0	100.0	100.0	300.0

Herbs and Woody Seedlings

<i>Ascyrum hypericoides</i>	10.3	--	26.6	36.9
<i>Mitchella repens</i>	6.9	--	16.7	23.6
<i>Quercus laurifolia</i>	13.7	--	8.6	22.3
<i>Fraxinus caroliniana</i>	10.3	--	8.9	19.2
<i>Acer rubrum</i>	9.5	--	6.5	16.0
<i>Smilax laurifolia</i>	11.1	--	4.3	15.4
<i>Gelsemium rankinii</i>	6.9	--	6.8	13.7
<i>Berchemia scandens</i>	6.9	--	4.3	11.2
<i>Itea virginica</i>	4.3	--	2.4	6.7
<i>Carex joorii</i>	4.3	--	2.4	6.7
<i>Nyssa sylvatica</i>	0.9	--	3.6	4.5
<i>Centella erecta</i>	1.7	--	1.7	3.4
<i>Cyrilla racemiflora</i>	2.6	--	0.7	3.3
<i>Smilax hispida</i>	0.9	--	1.5	2.4
<i>Persea borbonia</i>	0.9	--	1.5	2.4
<i>Liquidambar styraciflua</i>	0.9	--	1.5	2.4
<i>Woodwardia virginica</i>	1.7	--	0.5	2.2
<i>Toxicodendron radicans</i>	1.7	--	0.5	2.2
<i>Smilax walteri</i>	0.9	--	0.2	1.1
<i>Nyssa biflora</i>	0.9	--	0.2	1.1
<i>Gelsemium sempervirens</i>	0.9	--	0.2	1.1
<i>Crataegus viridis</i>	0.9	--	0.2	1.1
<i>Carex</i> sp.	0.9	--	0.2	1.1
	100.0		100.0	200.0

Zone 4Trees

<i>Acer rubrum</i>	18.7	33.7	29.2	81.6
<i>Ilex opaca</i>	16.4	14.7	3.5	34.6
<i>Nyssa sylvatica</i>	11.6	9.5	12.8	33.9
<i>Gordonia lasianthus</i>	9.3	9.5	10.9	29.7
<i>Liquidambar styraciflua</i>	9.3	6.8	12.4	28.5
<i>Quercus nigra</i>	11.6	8.1	7.3	27.0
<i>Persea borbonia</i>	11.6	9.5	2.1	23.2
<i>Pinus taeda</i>	2.3	2.7	13.5	18.5
<i>Quercus michauxii</i>	2.3	1.4	7.1	10.8
<i>Symplocos tinctoria</i>	4.6	2.7	0.7	8.0
<i>Quercus phellos</i>	2.3	1.4	0.5	4.2
	100.0	100.0	100.0	300.0

(Sheet 3 of 6)

Table D17 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<u>Saplings and Shrubs</u>				
<i>Ilex opaca</i>	12.6	35.3	41.4	89.3
<i>Ilex coriacea</i>	8.8	15.0	11.6	35.4
<i>Vaccinium fuscatum</i>	12.6	10.7	10.9	34.2
<i>Persea borbonia</i>	12.6	11.6	9.2	33.4
<i>Gordonia lasianthus</i>	5.1	67.5	6.6	18.2
<i>Acer rubrum</i>	7.6	3.7	4.1	15.4
<i>Symplocos tinctoria</i>	7.6	3.1	3.9	14.6
<i>Clethra alnifolia</i>	6.4	4.3	2.8	13.5
<i>Quercus nigra</i>	5.1	4.0	3.1	12.2
<i>Cyrilla racemiflora</i>	5.1	1.6	1.4	8.1
<i>Magnolia virginiana</i>	3.8	1.2	1.7	6.7
<i>Quercus michauxii</i>	3.8	0.9	1.6	6.3
<i>Prunus serotina</i>	2.5	0.6	0.5	3.6
<i>Lyonia lucida</i>	2.5	0.6	0.4	3.5
<i>Sebastiania fruticosa</i>	1.3	0.3	0.4	2.0
<i>Myrica cerifera</i>	1.3	0.3	0.2	1.8
<i>Leucothoe racemosa</i>	1.3	0.3	0.2	1.8
	100.0	100.0	100.0	300.0
<u>Woody Vines</u>				
<i>Smilax laurifolia</i>	33.2	44.4	65.5	143.1
<i>Smilax walteri</i>	42.6	43.4	21.3	107.3
<i>Vitis rotundifolia</i>	19.5	6.6	11.1	37.2
<i>Smilax glauca</i>	4.7	5.6	2.1	12.4
	100.0	100.0	100.0	300.0
<u>Herbs and Woody Seedlings</u>				
<i>Ilex coriacea</i>	8.7	--	16.4	25.1
<i>Woodwardia areolata</i>	10.9	--	13.1	24.0
<i>Persea borbonia</i>	13.0	--	10.1	23.1
<i>Leucothoe axillaris</i>	4.3	--	18.5	22.8
<i>Mitchella repens</i>	13.0	--	9.3	22.3
<i>Clethra alnifolia</i>	7.6	--	7.9	15.5
<i>Symplocos tinctoria</i>	6.5	--	5.5	12.0
<i>Quercus nigra</i>	6.5	--	2.4	8.9
<i>Asarum arifolium</i>	5.4	--	2.2	7.6
<i>Ilex opaca</i>	4.3	--	2.0	6.3
<i>Osmunda cinnamomea</i>	3.3	--	1.8	5.1
<i>Smilax rotundifolia</i>	1.1	--	3.3	4.4
<i>Smilax glauca</i>	3.3	--	0.6	3.9
<i>Smilax walteri</i>	2.2	--	1.6	3.8
<i>Quercus michauxii</i>	2.2	--	1.6	3.8
<i>Vaccinium sp.</i>	1.1	--	1.4	2.5
<i>Woodwardia virginica</i>	1.1	--	1.3	2.4
<i>Vitis rotundifolia</i>	1.1	--	0.2	1.3

(Sheet 4 of 6)

Table D17 (Continued)

Species	Percent Relative Frequency	Percent Relative Density	Percent Relative Dominance	Importance Value
<i>Vaccinium corymbosum</i>	1.1	--	0.2	1.3
<i>Nyssa sylvatica</i>	1.1	--	0.2	1.3
<i>Cyrilla racemiflora</i>	1.1	--	0.2	1.3
<i>Carex</i> sp.	1.1	--	0.2	1.3
	100.0		100.0	200.0

Zone 6Trees

<i>Quercus nigra</i>	43.6	59.3	37.1	140.0
<i>Pinus taeda</i>	26.2	18.7	44.6	89.5
<i>Liquidambar styraciflua</i>	13.0	9.4	9.7	32.1
<i>Quercus virginiana</i>	4.3	6.3	6.6	17.2
<i>Symplocos tinctoria</i>	4.3	3.1	1.4	8.8
<i>Sassafras albidum</i>	4.3	1.6	0.3	6.2
<i>Ilex opaca</i>	4.3	1.6	0.3	6.2
	100.0	100.0	100.0	300.0

Saplings and Shrubs

<i>Symplocos tinctoria</i>	11.5	51.6	46.0	109.1
<i>Quercus nigra</i>	10.5	12.3	16.2	39.0
<i>Sassafras albidum</i>	9.3	7.1	8.0	24.4
<i>Liquidambar styraciflua</i>	10.4	6.1	7.2	23.7
<i>Ilex opaca</i>	8.2	3.9	4.8	16.9
<i>Myrica cerifera</i>	5.8	4.7	4.1	14.6
<i>Vaccinium elliotii</i>	7.0	3.0	2.4	12.4
<i>Acer rubrum</i>	5.8	3.0	3.4	12.2
<i>Persea borbonia</i>	5.8	1.8	1.4	9.0
<i>Castanea pumila</i>	4.6	1.8	1.5	7.9
<i>Nyssa sylvatica</i>	3.5	0.9	1.8	6.2
<i>Quercus falcata</i>	3.5	0.7	0.4	4.6
<i>Prunus serotina</i>	2.3	0.9	0.8	4.0
<i>Quercus virginiana</i>	2.3	0.4	0.5	3.2
<i>Cornus florida</i>	2.3	0.4	0.4	3.1
<i>Vaccinium arboreum</i>	1.2	0.4	0.4	2.0
<i>Vaccinium fuscum</i>	1.2	0.2	0.2	1.6
<i>Quercus stellata</i>	1.2	0.2	0.2	1.6
<i>Quercus michauxii</i>	1.2	0.2	0.1	1.5
<i>Ilex coriacea</i>	1.2	0.2	0.1	1.5
<i>Diospyros virginiana</i>	1.2	0.2	0.1	1.5
	100.0	100.0	100.0	300.0

Woody Vines

<i>Vitis rotundifolia</i>	46.1	50.0	55.0	151.1
<i>Celastrum scandens</i>	53.9	50.0	45.0	148.9
	100.0	100.0	100.0	300.0

(Sheet 5 of 6)

Table D17 (Concluded)

<u>Species</u>	<u>Percent Relative Frequency</u>	<u>Percent Relative Density</u>	<u>Percent Relative Dominance</u>	<u>Importance Value</u>
<u>Herbs and Woody Seedlings</u>				
<i>Quercus nigra</i>	17.7	--	20.7	38.4
<i>Symplocos tinctoria</i>	8.8	--	12.7	27.4
<i>Sassafras albidum</i>	14.7	--	12.7	27.4
<i>Nyssa sylvatica</i>	7.8	--	12.8	20.6
<i>Persea borbonia</i>	8.8	--	10.8	19.6
<i>Chimaphila maculata</i>	4.9	--	3.8	8.7
<i>Vitis rotundifolia</i>	3.9	--	2.3	6.2
<i>Tragia urens</i>	3.9	--	2.3	6.2
<i>Liquidambar styraciflua</i>	3.9	--	2.3	6.2
<i>Gelsemium sempervirens</i>	2.0	--	1.8	3.8
<i>Smilax glauca</i>	2.9	--	0.7	3.6
<i>Pinus taeda</i>	2.9	--	0.7	3.6
<i>Ilex opaca</i>	2.9	--	0.7	3.6
<i>Cnidioscolus stimulosus</i>	2.9	--	0.7	3.6
<i>Dichanthelium commutatum</i>	2.0	--	0.5	2.5
<i>Vaccinium elliotii</i>	1.0	--	1.5	2.5
<i>Quercus velutina</i>	1.0	--	1.5	2.5
<i>Lonicera sempervirens</i>	1.0	--	1.5	2.5
<i>Smilax hispida</i>	1.0	--	0.2	1.2
<i>Sebastiania fruticosa</i>	1.0	--	0.2	1.2
<i>Rhus copallinum</i>	1.0	--	0.2	1.2
Unknown	1.0	--	0.2	1.2
<i>Mitchella repens</i>	1.0	--	0.2	1.2
<i>Carex</i> sp.	1.0	--	0.2	1.2
<i>Andropogon virginicus</i>	1.0	--	0.2	1.2
	100.0		100.0	200.0

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Appendix E

FTI Plant List and Comparison with Two Other Water- Tolerance Rating Systems

Table E1
FTI Plant List

Species	Species Code	FTI ¹ - SD	NWI ² Status Region 2	Water Logging Tolerance Ratings ³ (WLT)
Trees				
<i>Acer drummondii</i>	ACDR	3.48 ± 0.12	OBL	
<i>Acer negundo</i>	ACNE	4.83 ± 0.47	FACW	Moderately tolerant
<i>Acer rubrum</i>	ACRU	4.21 ± 0.68	FAC	Moderately tolerant
<i>Acer saccharinum</i>	ACSA	3.75 ± 0.36	FACW	Moderately tolerant
<i>Betula nigra</i>	BENI	4.01 ± 1.73	OBL	Moderately tolerant
<i>Bumelia lanuginosa</i>	BULA	6.50 ± 0.00	FACU	
<i>Bumelia lycoides</i>	BULY	4.50 ± 0.00	FACW	
<i>Carpinus caroliniana</i>	CACA	4.84 ± 0.61	FAC	Weakly tolerant
<i>Carya aquatica</i>	CAAQ	3.54 ± 0.34	OBL	Highly tolerant
<i>Carya glabra</i>	CAGL	6.50 ± 0.00	FACU	
<i>Carya illinoensis</i>	CAIL	5.57 ± 1.01	FAC	Weakly tolerant
<i>Carya tomentosa</i>	CATO	6.50 ± 0.00	UPL	
<i>Celtis laevigata</i>	CELA	4.84 ± 0.56	FACW	Weakly tolerant
<i>Cephalanthus occidentalis</i>	CEOC	2.83 ± 0.52	OBL	Most tolerant
<i>Cercis canadensis</i>	CECA	5.50 ± 1.40	FACU	
<i>Cornus drummondii</i>	CODR	4.50 ± 0.00	FAC	
<i>Cornus florida</i>	COFL	6.50 ± 0.00	FACU	Least tolerant

(Sheet 1 of 13)

¹ Mean for all study sites

² Taken from Reed (1968), definitions are at the end of the appendix

³ Taken from Hook (1984), definitions are at the end of the appendix

Table E1 (Continued)

Species	Species Code	FTI - SD	NWI Status Region 2	Water Logging Tolerance Ratings (WLT)
<i>Cornus foemina</i>	COFO	5.50 ± 0.00	FACW-	
<i>Crataegus aestivilis</i>	GRAE	3.00 ± 0.70	OBL	Moderately tolerant
<i>Crataegus viridis</i>	CRVI	4.52 ± 0.58	FACW	Moderately tolerant
<i>Cyrilla racemiflora</i>	CYRA	3.50 ± 0.00	FACW	
<i>Diospyros virginiana</i>	DIVI	4.13 ± 0.82	FAC	Moderately tolerant
<i>Fagus grandifolia</i>	FAGR	6.50 ± 0.00	FACU	Least tolerant
<i>Forestiera acuminata</i>	FOAC	3.48 ± 0.50	OBL	Most tolerant
<i>Fraxinus americana</i>	FRAM	6.50 ± 0.00	FACU	
<i>Fraxinus caroliniana</i>	FRCA	2.87 ± 0.41	OBL	Most tolerant
<i>Fraxinus pennsylvanica</i>	FRPE	4.44 ± 0.67	FACW	Moderately tolerant
<i>Gleditsia aquatica</i>	GLAQ	3.50 ± 0.00	OBL	Highly tolerant
<i>Gordonia lasianthus</i>	GOLA	4.50 ± 0.00	FACW	Moderately tolerant
<i>Halesia carolina</i>	HACA	6.50 ± 0.00	FACU+	
<i>Halesia diptera</i>	HADI	6.19 ± 0.43	FAC	
<i>Ilex decidua</i>	ILDE	4.35 ± 0.83	FACW	Moderately tolerant
<i>Ilex myrtifolia</i>	ILMY	3.50 ± 0.00	FACW	
<i>Ilex opaca</i>	ILOP	5.79 ± 0.72	FACU+	Weakly tolerant
<i>Juglans nigra</i>	JUNI	6.50 ± 0.00	FACU	Weakly tolerant
<i>Juniperus virginiana</i>	JUVI	6.50 ± 0.00	FACU	Least tolerant
<i>Liquidambar styraciflua</i>	LIST	5.03 ± 0.65	FAC+	Moderately tolerant

(Sheet 2 of 13)

Table E1 (Continued)

Species	Species Code	FTI - SD	NWI Status Region 2	Water Logging Tolerance Ratings (WLT)
<i>Malus angustifolia</i>	MAAN	6.50 ± 0.00	UPL	
<i>Melia azedarach</i>	MEAZ	5.54 ± 0.00	UPL	
<i>Morus rubra</i>	MORU	5.75 ± 0.26	FAC	Weakly tolerant
<i>Nyssa aquatica</i>	NYAQ	2.62 ± 0.20	OBL	Most tolerant
<i>Nyssa biflora</i>	NYBI	3.04 ± 0.47	OBL	Most tolerant
<i>Nyssa ogeche</i>	NYOG	2.64 ± 0.00	OBL	
<i>Nyssa sylvatica</i>	NYSY	5.27 ± 0.65	FAC	Weakly tolerant
<i>Ostrya virginiana</i>	OSVI	6.50 ± 0.00	FACU-	Least tolerant
<i>Persea borbonia</i>	PEBO	4.35 ± 0.00	FACW	Moderately tolerant
<i>Pinus echinata</i>	PIEC	6.50 ± 0.00	UPL	Least tolerant
<i>Pinus elliotii</i>	PIEL	5.50 ± 0.00	FACW	
<i>Pinus glabra</i>	PIGL	6.24 ± 0.37	FACW	Weakly tolerant
<i>Pinus taeda</i>	PITA	6.41 ± 0.14	FAC	Moderately tolerant
<i>Planera aquatica</i>	PLAQ	3.12 ± 0.68	OBL	Most tolerant
<i>Platanus occidentalis</i>	PLOC	5.18 ± 0.00	FACW-	Moderately tolerant
<i>Quercus alba</i>	QUAL	6.50 ± 0.00	FACU	Least tolerant
<i>Quercus falcata</i>	QUFA	6.50 ± 0.00	FACU-	
<i>Quercus falcata</i> var. <i>pagodifolia</i>	QUPA	6.39 ± 0.31	FAC+	Weakly tolerant
<i>Quercus laurifolia</i>	QULA	3.89 ± 0.38	FACW	Weakly tolerant
<i>Quercus lyrata</i>	QULY	3.73 ± 0.68	OBL	Highly tolerant

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Table E1 (Continued)

Species	Species Code	FTI $\pm$ SD	NWI Status Region 2	Water Logging Tolerance Ratings (WLT)
<i>Quercus michauxii</i>	QUMI	4.81 $\pm$ 0.61	FACW	Weakly tolerant
<i>Quercus nigra</i>	QUNI	5.73 $\pm$ 0.69	FAC	
<i>Quercus nuttallii</i>	QUNU	4.50 $\pm$ 0.00	OBL	Moderately tolerant
<i>Quercus palustris</i>	QUPA	4.00 $\pm$ 0.00	FACW	Moderately tolerant
<i>Quercus phellos</i>	QUPH	4.81 $\pm$ 1.07	FACW	Moderately tolerant
<i>Quercus shumardii</i>	QUSH	5.50 $\pm$ 0.00	FACW	Weakly tolerant
<i>Quercus stellata</i>	QUST	6.50 $\pm$ 0.00	FACU	
<i>Quercus virginiana</i>	QUVI	6.50 $\pm$ 0.00	FACU+	Weakly tolerant
<i>Quercus velutina</i>	QUVE	6.50 $\pm$ 0.00		
<i>Salix nigra</i>	SANI	2.83 $\pm$ 0.58	OBL	Most tolerant
<i>Sassafras albidum</i>	SAAL	6.50 $\pm$ 0.00	FACU	Least tolerant
<i>Symplocos tinctoria</i>	SYTI	5.54 $\pm$ 0.00	FAC	
<i>Taxodium distichum</i>	TADI	2.97 $\pm$ 0.61	OBL	Most tolerant
<i>Ulmus alata</i>	ULAL	6.43 $\pm$ 0.13	FACU+	Weakly tolerant
<i>Ulmus americana</i>	ULAM	4.46 $\pm$ 0.62	FACW	Moderately tolerant
<i>Ulmus rubra</i>	ULRU	5.50 $\pm$ 0.00	FAC	Least tolerant
<i>Vaccinium arboreum</i>	VAAR	6.50 $\pm$ 0.00	FACU	

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Table E1 (Continued)

Species	Species Code	FTI SD	NWI Status
<u>Saplings and Shrubs</u>			
<i>Acer drummondii</i>	ACDR	3.68 ± 0.57	OBL
<i>Acer negundo</i>	ACNE	5.20 ± 0.99	FACW
<i>Acer rubrum</i>	ACRU	4.96 ± 0.94	FAC
<i>Acer saccharinum</i>	ACSA	3.50 ± 0.00	FACW
<i>Amelanchier arborea</i>	AMAB	6.50 ± 0.00	FACU
<i>Amorpha fruticosa</i>	AMFR	4.08 ± 0.59	FACW
<i>Aralia spinosa</i>	ARSP	6.50 ± 0.00	FAC
<i>Arundinaria gigantea</i>	ARGI	5.41 ± 1.66	FACW
<i>Ascyrum hypercoides</i>	ASHY	6.50 ± 0.00	
<i>Asimina parviflora</i>	ASPA	6.50 ± 0.00	FACU
<i>Asimina triloba</i>	ASTR	6.50 ± 0.00	FAC
<i>Betula nigra</i>	BENI	4.50 ± 2.00	OBL
<i>Bumelia lanuginosa</i>	BULA	5.91 ± 0.00	FACU
<i>Callicarpa americana</i>	CAAM	6.39 ± 0.20	FACU-
<i>Carpinus caroliniana</i>	CACA	5.07 ± 0.43	FAC
<i>Carya aquatica</i>	CAAQ	3.70 ± 0.38	OBL
<i>Carya glabra</i>	CACL	6.50 ± 0.00	FACU
<i>Carya illinoensis</i>	CAIL	5.00 ± 0.71	FAC+
<i>Carya tomentosa</i>	CATO	6.50 ± 0.00	UPL
<i>Castanea pumila</i>	CAPU	6.50 ± 0.00	UPL
<i>Celtis laevigata</i>	CELA	4.37 ± 0.38	FACW
<i>Cephalanthus occidentalis</i>	CEOC	3.13 ± 0.44	OBL
<i>Cercis canadensis</i>	CECA	6.37 ± 0.22	FACU
<i>Chionanthus virginicus</i>	CHVI	6.50 ± 0.00	FACU
<i>Clethra alnifolia</i>	CLAL	5.32 ± 1.67	FACW
<i>Cornus drummondii</i>	CODR	5.69 ± 0.90	FAC
<i>Cornus florida</i>	COFL	6.50 ± 0.00	FACU
<i>Cornus foemina</i>	COFO	4.70 ± 0.90	FACW-
<i>Crataegus aestivalis</i>	CRAE	2.98 ± 0.15	OBL
<i>Crataegus flava</i>	CRFL	6.50 ± 0.00	UPL
<i>Crataegus marshallii</i>	CRMA	5.37 ± 1.63	FAC
<i>Crataegus viridis</i>	CRVI	4.46 ± 0.65	FACW
<i>Cyrilla racemiflora</i>	CYRA	3.72 ± 0.00	FACW
<i>Diospyros virginiana</i>	DIVI	5.08 ± 1.18	FAC
<i>Fagus grandifolia</i>	FAGR	6.50 ± 0.00	FACU
<i>Forestiera acuminata</i>	FOAC	3.57 ± 0.54	OBL
<i>Fraxinus americana</i>	FRAN	6.50 ± 0.00	FACU
<i>Fraxinus caroliniana</i>	FRCA	2.91 ± 0.33	OBL
<i>Fraxinus pennsylvanica</i>	FRPE	4.27 ± 0.70	FACW
<i>Gaylussacia frondosa</i>	GA	6.50 ± 0.00	FAC
<i>Gleditsia aquatica</i>	GLAQ	3.15 ± 0.49	OBL
<i>Gleditsia triacanthos</i>	GLTR	6.50 ± 0.00	FAC-
<i>Gordonia lasianthus</i>	GOLA	4.50 ± 0.00	FACW
<i>Halesia carolina</i>	HACA	6.50 ± 0.00	FACU+
<i>Halesia diptera</i>	HADI	6.09 ± 0.57	FAC
<i>Hammamelis virginiana</i>	HAVI	6.50 ± 0.00	FACU
<i>Hypericum galioides</i>	HYGA	4.30 ± 0.00	OBL

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Table E1 (Continued)

Species	Species Code	FTI SD	NWI Status
<i>Ilex amelanchier</i>	ILAM	2.50 ± 0.00	OBL
<i>Ilex coriacea</i>	ILCO	4.58 ± 0.00	FACW
<i>Ilex decidua</i>	ILDE	4.57 ± 0.73	FACW-
<i>Ilex glabra</i>	ILGL	6.50 ± 0.00	FACW
<i>Ilex myrtifolia</i>	ILMY	3.5 ± 0.00	FACW
<i>Ilex opaca</i>	ILOP	5.96 ± 0.61	FACU+
<i>Ilex verticillata</i>	ILVE	2.50 ± 0.00	FACW
<i>Ilex vomitoria</i>	ILVO	6.50 ± 0.00	FAC
<i>Itea virginica</i>	ITVI	2.83 ± 0.35	FACW+
<i>Juglans nigra</i>	JUNI	6.50 ± 0.00	FACU
<i>Juniperus virginiana</i>	JUVI	6.50 ± 0.00	FACU-
<i>Leucothoe racemosa</i>	LERA	4.06 ± 1.17	FACW
<i>Lindera benzoin</i>	LIBE	5.82 ± 0.00	FACW
<i>Liquidambar styraciflua</i>	LIST	5.52 ± 0.76	FAC+
<i>Lyonia lucida</i>	LYLU	3.71 ± 0.00	FACW
<i>Magnolia grandiflora</i>	MAGR	5.43 ± 0.09	FAC+
<i>Magnolia virginiana</i>	MAVI	5.50 ± 1.41	FACW+
<i>Malus angustifolia</i>	MAAN	6.50 ± 0.00	UPL
<i>Malus coronaria</i>	MACO	6.50 ± 0.00	UPL
<i>Melia azedarach</i>	MEAZ	6.21 ± 0.00	UPL
<i>Morus rubra</i>	MORU	6.25 ± 0.50	FAC
<i>Myrica cerifera</i>	MYCE	6.19 ± 0.43	FAC+
<i>Nyssa aquatica</i>	NYAQ	3.25 ± 0.50	ORL
<i>Nyssa biflora</i>	NYBI	3.50 ± 0.00	ORL
<i>Nyssa ogeche</i>	NYOC	3.50 ± 0.00	OBL
<i>Nyssa sylvatica</i>	NYSY	5.80 ± 0.68	FAC
<i>Ostrya virginiana</i>	OSVI	6.50 ± 0.00	FACU-
<i>Persea borbonia</i>	PEBO	4.78 ± 1.23	FACW
<i>Pinus taeda</i>	PITA	6.50 ± 0.00	FAC
<i>Planera aquatica</i>	PLAQ	3.01 ± 0.64	OBL
<i>Platanus occidentalis</i>	PLOC	5.05 ± 0.00	FACW-
<i>Poncirus trifoliata</i>	POTR	6.50 ± 0.00	UPL
<i>Prunus serotina</i>	PRSE	6.26 ± 0.47	FACU
<i>Prunus umbellata</i>	PRUM	6.50 ± 0.00	UPL
<i>Quercus alba</i>	QUAL	6.50 ± 0.00	FACU
<i>Quercus falcata</i>	QUFA	6.50 ± 0.00	FACU-
<i>Quercus falcata</i> var. <i>pagodifolia</i>	QUPA	6.50 ± 0.00	FAC+
<i>Quercus laurifolia</i>	QUILA	4.39 ± 0.00	FACW
<i>Quercus lyrata</i>	QULY	3.99 ± 1.00	OBL
<i>Quercus marilandica</i>	QUMA	6.50 ± 0.00	UPL
<i>Quercus michauxii</i>	QUMI	5.34 ± 0.33	FACW
<i>Quercus nigra</i>	QUNI	5.92 ± 0.47	FAC
<i>Quercus nuttallii</i>	QUNU	4.50 ± 0.00	OBL
<i>Quercus phellos</i>	QUPH	5.29 ± 1.18	FACW-
<i>Quercus shumardii</i>	QUSH	5.50 ± 0.00	FACU
<i>Quercus stellata</i>	QUST	6.50 ± 0.00	FACU
<i>Quercus velutina</i>	QUVE	6.50 ± 0.00	UPL
<i>Quercus virginiana</i>	QUVI	5.85 ± 0.92	FACU+

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Table E1 (Continued)

Species	Species Code	FTI SD	NWI Status
<i>Rhododendron canescens</i>	RHCN	6.50 ± 0.00	UPL
<i>Rhus glabra</i>	RHGL	6.50 ± 0.00	UPL
<i>Rhus copallinum</i>	RHCO	6.50 ± 0.00	UPL
<i>Sabal minor</i>	SAMI	4.50 ± 0.00	FACW
<i>Salix nigra</i>	SANI	2.83 ± 0.58	OBL
<i>Sambucus canadensis</i>	SACA	5.95 ± 0.77	FACW-
<i>Sapium sebiferum</i>	SASE	3.50 ± 0.00	FAC
<i>Sassafras albidum</i>	SAAL	6.50 ± 0.00	FACU
<i>Sebastiania fruticosa</i>	SEFR	4.45 ± 0.67	UPL
<i>Styrax americana</i>	STAM	3.41 ± 0.64	FACW
<i>Symplocos tinctoria</i>	SYTI	6.40 ± 0.17	FAC
<i>Taxodium distichum</i>	TADI	3.33 ± 0.71	OBL
<i>Ulmus alata</i>	ULAL	6.24 ± 0.34	FACU+
<i>Ulmus americana</i>	ULAM	4.81 ± 0.74	FACW
<i>Ulmus crassifolia</i>	ULCR	6.50 ± 0.00	FAC
<i>Ulmus rubra</i>	ULRU	5.75 ± 0.50	FAC
<i>Vaccinium arboreum</i>	VAAR	6.45 ± 0.13	FACU
<i>Vaccinium corymbosum</i>	VACO	6.50 ± 0.00	
<i>Vaccinium elliotii</i>	VAEL	5.82 ± 0.96	FAC+
<i>Vaccinium fuscum</i>	VAFU	4.50 ± 0.00	FAC+
<i>Viburnum dentatum</i>	VIDE	4.87 ± 1.24	FAC
<i>Viburnum obovatum</i>	VIOB	4.50 ± 0.00	FACW+
<i>Viburnum rufidulum</i>	VIRU	6.50 ± 0.00	FACU

Woody Vines

<i>Ampelopsis arborea</i>	AMAR	3.94 ± 1.06	FAC+
<i>Ampelopsis cordata</i>	AMCO	4.50 ± 1.41	FAC+
<i>Aristolochia tomentosa</i>	ARTO	6.50 ± 0.00	FAC+
<i>Berchemia scandens</i>	BESC	4.55 ± 0.96	FACW
<i>Bignonia capreolata</i>	BICA	5.70 ± 1.05	FAC
<i>Brunnichia cirrhosa</i>	BRCI	3.58 ± 0.52	FACW
<i>Campsis radicans</i>	CARA	4.05 ± 0.97	FAC
<i>Cardiospermum halicacabum</i>	CAHA	2.50 ± 0.00	FAC
<i>Clematis ligusticifolia</i>	CLLI	6.50 ± 0.00	FACW
<i>Cocculus carolinus</i>	COCA	4.37 ± 1.01	FAC
<i>Gelsemium rankinii</i>	GERA	3.50 ± 0.00	FACW+
<i>Gelsemium sempervirens</i>	GESE	6.50 ± 0.00	FAC
<i>Ipomoea lacunosa</i>	IPIA	2.50 ± 0.00	FAC+
<i>Ipomoea wrightii</i>	IPWR	2.50 ± 0.00	FACW-
<i>Lonicera japonica</i>	LOJA	6.50 ± 0.00	FAC-
<i>Loniceria sempervirens</i>	LOSE	6.50 ± 0.00	FAC
<i>Parthenocissus quinquefolia</i>	PAQU	5.91 ± 0.79	FAC
<i>Saillax bona-nox</i>	SMBO	4.75 ± 1.30	FAC
<i>Saillax glauca</i>	SMGL	5.61 ± 1.23	FAC
<i>Saillax hispida</i>	SMHI	3.80 ± 0.87	FAC+
<i>Saillax laurifolia</i>	SMIA	4.33 ± 2.02	FACW+
<i>Saillax rotundifolia</i>	SMRO	5.18 ± 0.98	FAC
<i>Saillax walteri</i>	SMWA	3.05 ± 0.21	OBL

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Table E1 (Continued)

Species	Species Code	FTI SD	NWI Status
<i>Toxicodendron radicans</i>	TORA	4.82 ± 0.91	FAC
<i>Trachelospermum difforme</i>	TRDI	4.18 ± 1.14	FAC
<i>Vitis aestivalis</i>	VIAE	6.50 ± 0.60	FAC-
<i>Vitis cinerea</i>	VICI	5.50 ± 1.41	FAC+
<i>Vitis palmata</i>	VIPA	4.07 ± 0.38	FACW-
<i>Vitis riparia</i>	VIRI	4.27 ± 0.57	FACW
<i>Vitis rotundifolia</i>	VIRO	5.71 ± 0.80	FAC
<i>Wisteria frutescens</i>	WIFR	3.65 ± 0.00	FACW

Herbs and Woody Seedlings

<i>Acalypha gracilems</i>	ACGR	3.77 ± 0.00	UPL
<i>Acalypha rhomboidea</i>	ACRH	3.85 ± 0.47	FAC-
<i>Acer drummondii</i>	ACDR	3.64 ± 0.19	OBL
<i>Acer negundo</i>	ACNE	5.58 ± 0.96	FACW
<i>Acer rubrum</i>	ACRU	4.63 ± 1.10	FAC
<i>Ageratina altissima</i>	AGAL	4.71 ± 1.53	FACU-
<i>Agrimonia pubescens</i>	AGPU	6.50 ± 0.00	UPL
<i>Agrostis hiemalis</i>	AGHI	6.50 ± 0.00	FAC
<i>Amaranthus rudis</i>	AMRU	3.50 ± 0.00	FAC
<i>Amaranthus tuberculatus</i>	AMTU	6.50 ± 0.00	FACW+
<i>Ammania coccinea</i>	AMCC	3.50 ± 0.00	FACW+
<i>Amorpha fruticosa</i>	AMFR	3.78 ± 0.00	FACW
<i>Ampelamus albidus</i>	AMAL	6.50 ± 0.00	FAC
<i>Ampelopsis arborea</i>	AMAR	3.76 ± 0.00	FAC+
<i>Ampelopsis brevipedunculata</i>	AMBR	6.50 ± 0.00	UPL
<i>Andropogon virginicus</i>	ANVI	6.50 ± 0.00	FAC-
<i>Aralia spinosa</i>	ARSP	6.50 ± 0.00	FAC
<i>Aristolochia serpentaria</i>	ARSE	5.07 ± 1.13	
<i>Arundinaria gigantea</i>	ARGI	5.34 ± 1.42	FACW
<i>Asarum arifolium</i>	ASAR	5.50 ± 0.00	FAC-
<i>Asclepias perennis</i>	ASPE	3.24 ± 0.37	OBL
<i>Ascyrum hypericoides</i>	ASHY	6.50 ± 0.00	FAC
<i>Aster lateriflorus</i>	ASLA	4.50 ± 0.00	FAC
<i>Aster simplex</i>	ASSI	3.04 ± 0.40	FACW
<i>Berchemia scandens</i>	BESC	4.72 ± 1.14	FACW
<i>Betula nigra</i>	BENI	4.50 ± 0.00	OBL
<i>Bidens cernua</i>	BICE	3.50 ± 0.00	OBL
<i>Bidens discolor</i>	BIDI	3.50 ± 0.00	FACW
<i>Bidens frondosa</i>	BIFR	4.17 ± 0.00	FACW
<i>Bignonia capreaolata</i>	BICA	5.47 ± 0.92	FAC
<i>Boehmeria cylindrica</i>	BOCY	3.34 ± 0.62	FACW+
<i>Botrychium biternatum</i>	BOBI	5.00 ± 0.71	FAC
<i>Botrychium virginianum</i>	BOVI	6.50 ± 0.00	FACU
<i>Brunnichia ciliata</i>	BRCI	3.74 ± 0.62	FACW
<i>Bumelia lanuginosa</i>	BUIA	6.50 ± 0.00	FACU
<i>Calliandra americana</i>	CAAM	6.19 ± 0.27	FACU-
<i>Campsis radicans</i>	CARA	4.34 ± 0.86	FAC
<i>Cardiospermum halicacabum</i>	CAHA	3.50 ± 1.41	FAC

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Table E1 (Continued)

Species	Species Code	FTI SD	NWI Status
<i>Carex albolutecens</i>	CAAL	6.50 ± 0.00	FAC+
<i>Carex blanda</i>	CABL	6.50 ± 0.00	FAC-
<i>Carex cephalophora</i>	CACE	6.50 ± 0.00	FAC
<i>Carex flaccidula</i>	CAFL	6.50 ± 0.00	
<i>Carex intumescens</i>	CAIN	4.50 ± 0.00	FACW
<i>Carex joorii</i>	CAJO	4.01 ± 0.00	OBL
<i>Carex louisianica</i>	CALO	4.50 ± 0.00	OBL
<i>Carex squarrosa</i>	CASQ	4.50 ± 0.00	FACW
<i>Carex torta</i>	GATR	5.83 ± 0.86	OBL
<i>Carpinus caroliniana</i>	CACA	4.84 ± 0.35	FAC
<i>Carya aquatica</i>	CAAQ	3.69 ± 0.52	OBL
<i>Carya glabra</i>	CAGL	6.50 ± 0.00	FACU
<i>Carya tomentosa</i>	CATO	6.50 ± 0.00	UPL
<i>Carya illinoensis</i>	CAIL	6.50 ± 0.00	FAC+
<i>Castanea pumila</i>	CAPU	6.50 ± 0.00	UPL
<i>Celtis laevigata</i>	CELA	4.77 ± 0.81	FACW
<i>Centella erecta</i>	GEER	3.50 ± 0.00	FACW
<i>Cephalanthus occidentalis</i>	CEOC	3.18 ± 0.49	OBL
<i>Cercis canadensis</i>	CECA	6.50 ± 0.00	FACU
<i>Chasmanthium laxum</i>	CHLA	6.50 ± 0.00	FACW-
<i>Chasmanthium sessiliflorum</i>	CHSE	6.17 ± 0.82	FAC+
<i>Chimaphila maculata</i>	CHMA	6.50 ± 0.00	UPL
<i>Chionanthus virginicus</i>	CHVI	6.50 ± 0.00	FACU
<i>Clematis crispa</i>	CLCR	4.13 ± 0.48	FACW+
<i>Clematis ligusticifolia</i>	CLLI	6.50 ± 0.00	FACW
<i>Clematis viorna</i>	CLVO	5.50 ± 0.00	UPL
<i>Clematis virginiana</i>	CLVI	4.57 ± 0.10	FAC+
<i>Clethra alnifolia</i>	CLAL	5.50 ± 1.41	FACW
<i>Cnidoscolus stimulosus</i>	CNST	6.50 ± 0.00	UPL
<i>Cocculus carolinus</i>	COCA	4.78 ± 0.90	FAC
<i>Commelina communis</i>	COCO	2.50 ± 0.00	FAC
<i>Commelina diffusa</i>	CODI	3.83 ± 1.53	FACW
<i>Commelina virginica</i>	COVI	4.02 ± 0.06	FACW
<i>Conoclinium coelestinum</i>	COCE	6.50 ± 0.00	FAC
<i>Cornus drummondii</i>	CODR	5.73 ± 0.00	FAC
<i>Cornus florida</i>	COFL	6.50 ± 0.00	FACU
<i>Cornus foemina</i>	COFO	5.25 ± 0.98	FACW-
<i>Crataegus aestivalis</i>	CRAE	3.50 ± 1.41	OBL
<i>Crataegus marshallii</i>	CRMA	6.50 ± 0.00	FAC
<i>Crataegus viridis</i>	CRVI	4.09 ± 0.77	FACW
<i>Cynoctonus mitriola</i>	CYMI	2.56 ± 0.00	FACW-
<i>Cyperus erythrorhizos</i>	CYER	2.50 ± 0.00	OBL
<i>Cyrilla racemiflora</i>	CYRA	3.79 ± 0.00	FACW
<i>Decumaria barbara</i>	DEBA	5.50 ± 0.00	FACW
<i>Desmodium glabellum</i>	DEGL	6.50 ± 0.00	UPL
<i>Desmodium paniculatum</i>	DEPA	6.50 ± 0.00	FACU
<i>Desmodium parviflorum</i>	DEPS	6.50 ± 0.00	UPL
<i>Dichanthelium coccineum</i>	DICO	4.17 ± 1.36	FAC
<i>Dichondra carolinensis</i>	DICA	6.50 ± 0.00	FACW-

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Table E1 (Continued)

Species	Species Code	FTI SD	NWI Status
<i>Dichondra repens</i>	DIRE	6.50 ± 0.00	FACU
<i>Dicliptera brachiata</i>	DIBR	5.80 ± 0.00	FACW
<i>Dioclea multiflora</i>	DIMU	5.50 ± 1.41	FAC+
<i>Diodia virginiana</i>	DIVR	3.60 ± 0.98	FACW
<i>Dioscorea quaternata</i>	DIQU	5.50 ± 1.41	FAC
<i>Diospyros virginiana</i>	DIVI	4.59 ± 0.94	FAC
<i>Duchesnea indica</i>	DUIN	5.50 ± 0.00	UPL
<i>Echinodorus cordifolius</i>	ECCO	3.00 ± 0.70	EL
<i>Eleocharis microcarpa</i>	ELMI	2.50 ± 0.00	OBL
<i>Elytraria carolinensis</i>	ELCA	5.00 ± 0.70	FACW
<i>Erechtites hieracifolia</i>	ERHI	3.50 ± 0.00	FAC
<i>Erigeron philadelphicus</i>	ERPH	6.50 ± 0.00	FAC
<i>Eragrostis hypnoides</i>	ERHY	2.50 ± 0.00	OBL
<i>Eupatorium serotinum</i>	EUSE	4.27 ± 1.15	FAC
<i>Fagus grandifolia</i>	FAGR	6.50 ± 0.00	FACU
<i>Forestiera acuminata</i>	FOAC	3.32 ± 0.36	FACW+
<i>Fraxinus caroliniana</i>	FRCA	3.00 ± 0.45	OBL
<i>Fraxinus pennsylvanica</i>	FRPE	4.00 ± 1.29	FACW
<i>Galium aparine</i>	GAAP	6.50 ± 0.00	FACU
<i>Galium circaeans</i>	GACI	6.50 ± 0.00	FACU-
<i>Galium trifidum</i>	GATR	6.50 ± 0.00	UPL
<i>Galium uniflorum</i>	GAUN	6.50 ± 0.00	UPL
<i>Gaylussacia frondosa</i>	GAFR	6.50 ± 0.00	FAC
<i>Gelsemium rankinii</i>	GERA	3.50 ± 0.00	FACW+
<i>Gelsemium sempervirens</i>	GESE	6.31 ± 0.38	FAC
<i>Geum canadense</i>	GECA	5.32 ± 0.96	FAC
<i>Gleditsia aquatica</i>	GLAQ	3.27 ± 0.00	OBL
<i>Gratiola virginiana</i>	GRVI	2.50 ± 0.00	OBL
<i>Hamamelis virginiana</i>	HAVI	6.50 ± 0.00	FAC
<i>Halesia diptera</i>	HADI	6.50 ± 0.00	FAC
<i>Heliotropium indicum</i>	HEIN	2.50 ± 0.00	FAC+
<i>Hibiscus laevis</i>	HILA	3.50 ± 0.00	OBL
<i>Hypericum galioides</i>	HYGA	4.53 ± 0.00	OBL
<i>Hypericum hypericoides</i>	HYHY	5.25 ± 1.50	UPL
<i>Hypoxis leptocarpa</i>	HYLE	3.80 ± 0.99	FACW
<i>Hyptis mutabilis</i>	HYMU	6.50 ± 0.00	FAC
<i>Ilex coriacea</i>	ILCO	5.50 ± 1.41	FACW
<i>Ilex decidua</i>	ILDE	4.46 ± 0.89	FACW-
<i>Ilex opaca</i>	ILOP	6.09 ± 0.51	FACU+
<i>Ilex vomitoria</i>	ILVO	6.50 ± 0.00	FAC
<i>Iposoa lacunosa</i>	IPLA	3.03 ± 0.00	FAC+
<i>Iposoa wrightii</i>	IIPR	2.50 ± 0.00	FACW-
<i>Itea virginica</i>	ITVI	4.03 ± 0.50	FACW+
<i>Iva annua</i>	IVAN	4.50 ± 0.00	FAC
<i>Juniperus virginiana</i>	JUVI	6.50 ± 0.00	FACU-
<i>Justicia americana</i>	JUAN	3.81 ± 0.67	OBL
<i>Justicia ovata</i>	JUOV	6.50 ± 0.00	OBL
<i>Lactuca floridana</i>	LAFL	3.67 ± 0.76	FACU
<i>Lactuca serriola</i>	LASE	6.50 ± 0.00	FAC

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Table E1 (Continued)

Species	Species Code	FTI SD	NWI Status
<i>Leersia lenticularis</i>	LELE	3.65 ± 0.72	OBL
<i>Leersia oryzoides</i>	LEOR	3.50 ± 0.00	OBL
<i>Leersia virginica</i>	LEVI		FACW
<i>Leucothoe axillaris</i>	LEAX	4.50 ± 0.00	FACW
<i>Lindera benzoin</i>	LIBE	6.23 ± 0.00	FACW
<i>Lindernia dubia</i>	LIDU	3.50 ± 0.00	OBL
<i>Liquidambar styraciflua</i>	LIST	4.87 ± 0.75	FAC+
<i>Lonicera japonica</i>	LOJA	6.50 ± 0.00	FAC-
<i>Lonicera sempervirens</i>	LOSE	6.50 ± 0.00	FAC
<i>Ludwigia decurrens</i>	LUDE	2.50 ± 0.00	OBL
<i>Lygodium japonicum</i>	LYJA	5.17 ± 0.14	FAC
<i>Lysimachia radicans</i>	LYRA	3.86 ± 0.44	OBL
<i>Malus coronaria</i>	MACO	6.50 ± 0.00	UPL
<i>Matelea gonocarpa</i>	MAGO	4.50 ± 0.00	UPL
<i>Melia azedarach</i>	MEAZ	4.50 ± 0.00	UPL
<i>Melothria pendula</i>	MEPE	3.50 ± 1.41	FACW-
<i>Mikania scandens</i>	MISC	4.30 ± 0.84	FACW+
<i>Mimosa strigillosa</i>	MIST	3.50 ± 0.00	FAC
<i>Mitchella repens</i>	MIRE	5.32 ± 0.83	FACU+
<i>Morus rubra</i>	MORU	5.70 ± 0.84	FAC
<i>Myrica cerifera</i>	MYCE	6.50 ± 0.00	FAC+
<i>Nyssa aquatica</i>	NYAQ	2.93 ± 0.79	OBL
<i>Nyssa biflora</i>	NYBI	3.42 ± 0.12	OBL
<i>Nyssa ogeche</i>	NYOG	2.50 ± 0.00	OBL
<i>Nyssa sylvatica</i>	NYSY	4.99 ± 1.47	FAC
<i>Onoclea sensibilis</i>	ONSE	4.62 ± 1.82	FACW
<i>Oplismenus hirtellus</i>	OPHI	5.74 ± 1.00	FACU+
<i>Osmunda cinnamomea</i>	OSCI	4.50 ± 0.00	FACW+
<i>Ostrya virginiana</i>	OSVI	6.50 ± 0.00	FACU-
<i>Oxalis debilis</i>	OXDI	6.50 ± 0.00	UPL
<i>Oxalis stricta</i>	OXST	5.66 ± 1.00	UPL
<i>Panicum rigidulum</i>	PARI	3.83 ± 0.45	FACW
<i>Parietaria pennsylvanica</i>	PAPE	4.50 ± 0.00	FAC-
<i>Parthenocissus quinquefolia</i>	PAQU	3.51 ± 0.93	FAC
<i>Paspalum fluitans</i>	PAFL	2.50 ± 0.00	OBL
<i>Paspalum urvillei</i>	PAUR	2.50 ± 0.00	OBL
<i>Passiflora lutea</i>	PALU	4.50 ± 0.00	UPL
<i>Persea borbonia</i>	PELO	5.29 ± 0.00	FACW
<i>Phanopyrum gymnocarpon</i>	PHGY	3.00 ± 0.71	OBL
<i>Phytolacca americana</i>	PHAM	6.50 ± 0.00	FACU+
<i>Pilea pumila</i>	PIPU	3.50 ± 1.41	FACW
<i>Pinus glabra</i>	PIGL	6.29 ± 0.30	FACW
<i>Pinus taeda</i>	PITA	6.50 ± 0.00	FAC
<i>Planera aquatica</i>	PIAQ	3.07 ± 0.56	OBL
<i>Platanthera flava</i>	PLFL	6.00 ± 0.71	FACW
<i>Pluchea camphorata</i>	PLCA	3.41 ± 0.13	FACW
<i>Polygonum hydropiperoides</i>	PONY	3.50 ± 1.41	OBL
<i>Polygonum virginianum</i>	POVI	5.87 ± 0.52	FAC
<i>Polypodium a. argens</i>	POSC	6.50 ± 0.00	UPL

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Table E1 (Continued)

Species	Species Code	FTL SD	NWL Status
<i>Poncirus trifoliata</i>	POTR	6.50 ± 0.00	UPL
<i>Prunus serotina</i>	PRSE	6.50 ± 0.00	FACU
<i>Prunus umbellata</i>	PRUM	6.50 ± 0.00	UPL
<i>Quercus alba</i>	QUAL	6.50 ± 0.00	FACU
<i>Quercus falcata</i>	QUFA	6.50 ± 0.00	FAC+
var. <i>pagodifolia</i>			
<i>Quercus laurifolia</i>	QULA	3.81 ± 0.45	FACW
<i>Quercus lyrata</i>	QULY	3.80 ± 1.01	OBL
<i>Quercus michauxii</i>	QUMI	5.00 ± 1.00	FACW-
<i>Quercus nigra</i>	QUNI	5.85 ± 0.70	FAC
<i>Quercus nuttallii</i>	QUNU	4.50 ± 0.00	OBL
<i>Quercus phellos</i>	QUPH	5.43 ± 1.07	FACW-
<i>Quercus shumardii</i>	QUSH	5.77 ± 0.00	FACW
<i>Quercus stellata</i>	QUST	6.50 ± 0.00	FACU
<i>Quercus velutina</i>	QUVE	6.50 ± 0.00	UPL
<i>Quercus virginiana</i>	QUVI	6.50 ± 0.00	FACU+
<i>Rhododendron canescens</i>	RHCN	6.50 ± 0.00	FACW
<i>Rhus copallinum</i>	RHCO	6.50 ± 0.00	
<i>Ricciocarpus natans</i>	RINA	2.50 ± 0.00	OBL
<i>Robinia nana</i>	RONA	6.50 ± 0.00	UPL
<i>Robinia psuedoacacia</i>	ROPS	6.50 ± 0.00	UPL
<i>Rorippa islandica</i>	ROIS	2.50 ± 0.00	OBL
<i>Rubus argutus</i>	RUAR	6.17 ± 0.58	FACU+
<i>Rubus occidentalis</i>	RUOC	6.50 ± 0.00	UPL
<i>Rubus trivialis</i>	RUTR	5.20 ± 0.80	FACU+
<i>Sabatia calycina</i>	SACA	5.00 ± 2.12	OBL
<i>Sabal minor</i>	SAMI	5.01 ± 0.77	FACW
<i>Salix nigra</i>	SANI	2.50 ± 0.00	OBL
<i>Sambucus canadensis</i>	SACA	5.85 ± 0.94	FACW-
<i>Sanicula canadensis</i>	SACN	6.39 ± 0.00	FACU
<i>Sassafras albidum</i>	SAAL	6.07 ± 1.13	FACU
<i>Saururus cernuus</i>	SACE	3.65 ± 0.45	OBL
<i>Scleria triglomerata</i>	SCTR	6.50 ± 0.00	FACU+
<i>Sebatia calycina</i>	SECA	5.50 ± 0.00	
<i>Sebastiania fruticosa</i>	SEFR	5.26 ± 1.16	FACW
<i>Senecio glabellus</i>	SEGL	4.36 ± 0.00	FACW+
<i>Sesbania exaltata</i>	SEEX	2.50 ± 0.00	FACW-
<i>Smallanthus uvedalia</i>	SMUV	6.50 ± 0.00	
<i>Smilax bona-nox</i>	SMRO	5.32 ± 0.94	FAC
<i>Smilax glauca</i>	SMGL	5.62 ± 0.95	UPL
<i>Smilax hispida</i>	SMHI	3.95 ± 0.95	FAC+
<i>Smilax laurifolia</i>	SMLA	3.50 ± 0.00	FACW+
<i>Smilax pumila</i>	SMPU	6.50 ± 0.00	UPL
<i>Smilax rotundifolia</i>	SMRO	5.06 ± 0.89	FAC
<i>Smilax walteri</i>	SMWA	4.11 ± 0.11	OBL
<i>Solanum carolinense</i>	SOCA	5.50 ± 1.41	FACU
<i>Solidago altissima</i>	SOAL	5.50 ± 0.00	FACU+
<i>Solidago odorata</i>	SOOD	6.50 ± 0.00	UPL
<i>Spermacoce glabra</i>	SPGL	3.50 ± 1.00	FACW

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Table E1 (Concluded)

Species	Species Code	FTI SD	NWI Status
<i>Spilanthes americana</i>	SPAM	3.00 ± 0.71	FACW
<i>Stylisma humistrata</i>	STHU	6.50 ± 0.00	UPL
<i>Styrax americana</i>	STAM	3.29 ± 0.86	FACW
<i>Symplocos tinctoria</i>	SYTI	6.18 ± 0.46	FAC
<i>Taxodium distichum</i>	TADI	3.09 ± 0.66	OBL
<i>Thelypteris kunthii</i>	THKU	5.50 ± 0.00	FACW
<i>Toxicodendron radicans</i>	TORA	4.94 ± 0.71	
<i>Trachelospermum difforme</i>	TRDI	4.26 ± 0.85	FAC
<i>Triadinum walteri</i>	TRWA	3.50 ± 1.41	OBL
<i>Tragia urens</i>	TRUR	6.50 ± 0.00	
<i>Trepocarpus aethusae</i>	TRAE	6.50 ± 0.00	FACW
<i>Ulmus alata</i>	ULAL	5.66 ± 0.84	FACU+
<i>Ulmus americana</i>	ULAM	4.35 ± 0.59	FACW
<i>Ulmus rubra</i>	ULRU	6.50 ± 0.00	FAC
<i>Urtica chamaedryoides</i>	URCH	4.42 ± 0.00	FAC
<i>Vaccinium arboreum</i>	VAAR	6.50 ± 0.00	FACU
<i>Vaccinium corymbosum</i>	VACO	4.50 ± 0.00	FACW
<i>Vaccinium elliotii</i>	VAEL	6.06 ± 0.53	FAC+
<i>Vernonia gigantea</i>	VEGI	4.75 ± 0.00	FAC+
<i>Viburnum dentatum</i>	VIDE	6.05 ± 0.78	FAC
<i>Viburnum cassinoides</i>	VICA	6.50 ± 0.00	FACW
<i>Viburnum obovatum</i>	VIOB	6.50 ± 0.00	FACW+
<i>Viburnum rufidulum</i>	VIRU	6.50 ± 0.00	FACU
<i>Viola floridana</i>	VIFL	5.69 ± 0.45	FACW-
<i>Viola missouriensis</i>	VIMI	4.83 ± 0.58	FAC+
<i>Viola papilionacea</i>	VIPA	3.58 ± 0.75	FAC
<i>Viola triloba</i>	VITR	6.50 ± 0.00	UPL
<i>Vitis aestivalis</i>	VIAE	6.50 ± 0.00	FAC-
<i>Vitis cinerea</i>	VICI	3.50 ± 0.00	FAC+
<i>Vitis palmata</i>	VIPA	3.58 ± 0.75	FACW
<i>Vitis riparia</i>	VIRI	4.37 ± 1.06	FACW
<i>Vitis rotundifolia</i>	VIRO	5.89 ± 0.68	FAC
<i>Vitis vulpina</i>	VIVU	3.53 ± 0.00	FAC+
<i>Woodwardia areolata</i>	WOAR	4.50 ± 0.00	OBL
<i>Woodwardia virginica</i>	WOVI	3.97 ± 0.00	OBL

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Definitions for Waterlogging Tolerance Rating

Most tolerant

Those species capable of living from seedling to maturity in soils that are waterlogged almost continually year after year except for short durations during droughts. The soils are typically anaerobic in character but are less so where the water is moving. Some species in this group adapt by producing soil water roots that oxidize their rhizosphere, accelerate anaerobic metabolism but at a controlled rate, and tolerate the toxic compounds typical of highly reduced waterlogging soils.

Highly tolerant

Those species capable of living from seedling to maturity in soils that are waterlogged for 50 to 75 percent of the year. Waterlogging typically occurs during the winter, spring, and 1-3 months of summer.

Moderately tolerant

Those species capable of living from seedling to maturity in soils that are waterlogged about 50 percent of the time. Waterlogging typically occurs in portions of the winter, spring, and early summer.

Weakly tolerant

Those species capable of living from seedling through maturity in soils that are temporarily waterlogged for durations of 1-4 weeks, usually accounting for 10 percent of the growing season.

Least tolerant

Those species that are capable of living from seedling through maturity in soils that are occasionally waterlogged for durations of a few days only, usually accounting for less than 2 percent of the growing season.

Definitions for NWI Status Descriptions

Obligate wetland (OBL)

Occur almost always (estimated probability >99 percent) under natural conditions in wetlands.

Facultative wetland (FACW)

Usually occur in wetlands (estimated probability 67 to 99 percent), but occasionally found in nonwetlands.

Facultative (FAC)

Equally likely to occur in wetlands or nonwetlands (estimated probability 34 to 66 percent).

Facultative upland (FACU)

Usually occur in nonwetlands (estimated probability 67 to 99 percent), but occasionally found in wetlands (estimated probability 1 to 33 percent).

Obligate upland (UPL)

Occur in wetlands in another region, but almost always (estimated probability >99 percent) found under natural conditions in nonwetlands in the region specified. If a species does not occur in wetlands in any region, it is not on the *National List*.

A positive (+) or negative (-) symbol was used with the Facultative Indicator categories to define more specifically the regional frequency of occurrence in wetlands. The positive sign indicates a frequency toward the higher end of the category (more frequently found in wetlands), and a negative sign indicates a frequency toward the lower end of the category (less frequently found in wetlands).

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