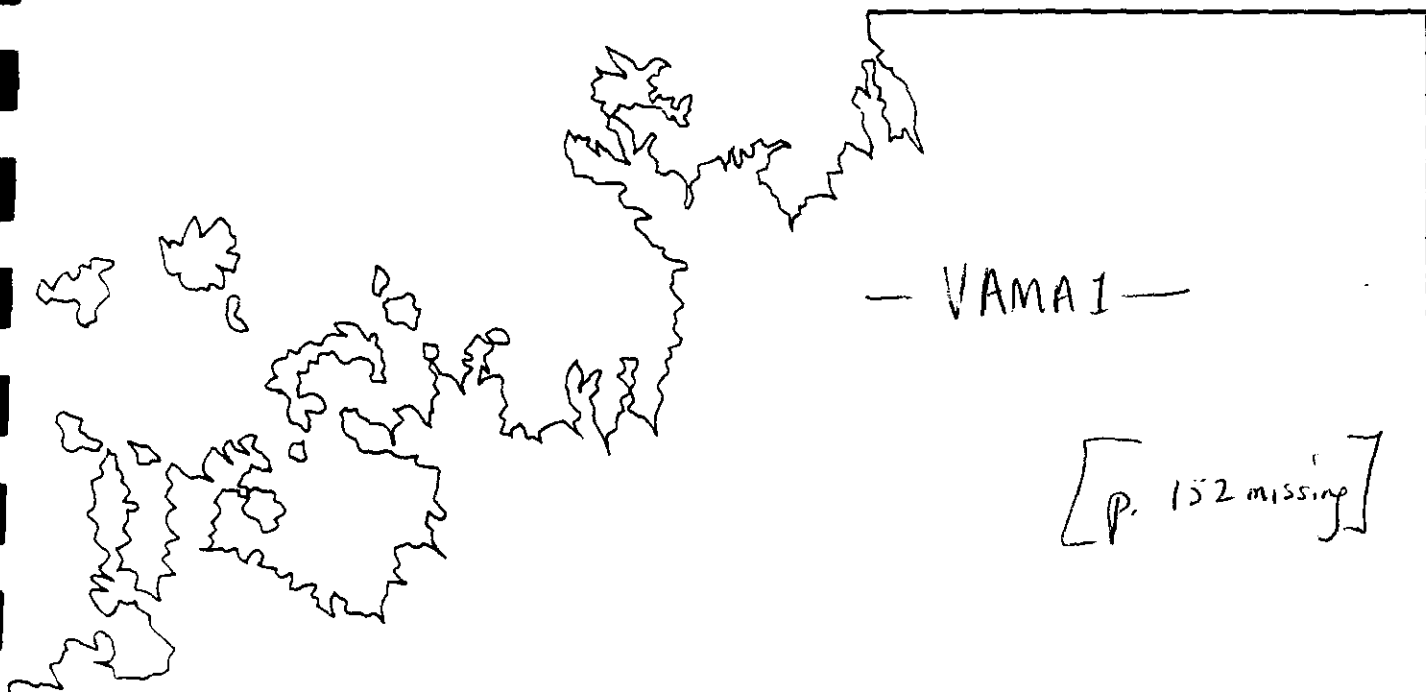




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NATURAL RESOURCE INVENTORY

VANDERBILT MANSION NATIONAL HISTORIC SITE

DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
NORTH ATLANTIC REGION
OFFICE OF SCIENTIFIC STUDIES 84-4

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Natural Resource Inventory of the
Vanderbilt Mansion National Historic Site

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ABSTRACT

A natural resource inventory was conducted at the Vanderbilt Mansion National Historic Site, Hyde Park, New York. The objective of the project was to provide information on the vegetation types present on the Estate. Most of the land is forested (40.3%), followed by areas maintained for visitor use (26.3%) and meadows (21.4%). The forested areas are predominantly sugar maple (38.3%), oak (24.4%), conifer plantations (21.4%) and hemlock (14.1%) dominated types. The oak types are growing in areas that have been repeatedly disturbed by storms, whereas the sugar maple types are in moist protected areas. This fits a pattern of succession where shade intolerant species will grow into large gaps in the overstory created by disturbances and shade tolerant species will fill small gaps in the overstory. Approximately 200 years ago when the land came into private ownership forest stands on the Estate began to change from oak to sugar maple stands. The change is probably related to the land use of the different owners.

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INTRODUCTION

The United States National Park Service was founded in 1916 to preserve and manage areas of scenic, historic or cultural value. Currently the Park Service administers approximately 31.2 million hectares of land on 321 units. Efficient management of each unit requires information on the vegetation present and the environmental factors that may be affecting the area.

A lack of such information exists at the Vanderbilt Mansion National Historic Site, Hyde Park, Dutchess County, New York. To fill this gap of knowledge on the vegetation, a natural resource inventory was conducted at the site. The purpose of the study was to: 1) define and describe the different vegetation types on the site; 2) provide importance values for each species identified in each type; 3) describe how each vegetation type may change over time (successional trends); 4) describe what environmental factors may be disturbing the vegetation on the site. The results of this study will provide resource management personnel with information that will be useful in managing the natural vegetation on the site.

History of the Estate

The study of natural vegetation is often complicated by the impacts that humans have had on the land. The vegetation present is often a result of past land use (McIntosh 1962). The land use history of the Vanderbilt Estate was summarized by Charles Snell in a series of articles from 1956 to 1960 in The Hyde Park Historian, the newsletter of The Hyde Park Historical Association. The following historical account of the Estate was taken from those articles.

In 1705 Edward Hyde, the Governor of the Province of New York, transferred ownership of land encompassing the current Estate to Peter Fauconnier. Fauconnier named the property Hyde Park in honor of Edward Hyde. Later the town around the Estate took the same name. Fauconnier died in 1746 without developing the land.

Dr. John Bard became sole owner of the Estate in 1763. In a series of letters between Bard and his son Samuel, indications that the Estate was being developed are presented. John Bard mentions planting madder (Galium spp.) (nomenclature follows Fernald 1950) as a commercial crop. Samuel Bard sent information on planning gardens, trails in the forest, planting ornamental trees and building a paper mill. Between 1768 and 1795 Bard sold a large part of the property. On the remaining land he was actively involved with forestry and planting trees. John Bard died in 1799, and ownership of his property was transferred to Samuel.

Samuel Bard erected a mansion on the Estate in the general vicinity of the present Vanderbilt mansion in 1795. He built a greenhouse and imported European trees, shrubs, vines, fruits and vegetables. Samuel Bard died in 1821 and his estate was divided up. His son William inherited 218.6 hectares and sold it to David Hosack in 1828.

An unnamed artist stayed at the mansion in 1832 and in his journal wrote of the beauty of the forest and clumps of ornamental trees and shrubs. He described the forest as dense groves of oaks (Quercus spp.) and chestnut (Castanea spp.). The forest he described is west of where the present mansion is located. Hosack continued the development of the property by enlarging the mansion built by Samuel Bard and removing some of the barns and building new

ones in different locations. The current layout of the Estate is believed to be from the improvements made by Hosack. Hosack died in 1835, and most of his property was sold by his heirs in 1840.

Walter Langdon bought part of the property in 1840 and through a series of transactions became sole owner in 1852. In 1845 Hosack's mansion was destroyed by a fire. Langdon built another mansion in 1847 on the present site of the Vanderbilt Mansion. In 1872 fire destroyed some barns and sheds on the Estate. In 1883 more barns were destroyed by fire after being struck by lightning. In December of 1890, a newspaper article reports of a fire in Langdon's forest. A newspaper account of Langdon's estate after his death in 1894 mentioned groves of trees, English elm (Ulmus spp.), maples (Acer spp.), lindens (Tilia spp.), beech (Fagus spp.), pine (Pinus spp.), tamarack (Larix spp.) and dogwoods (Cornus spp.). Frederick Vanderbilt bought the property in 1895, razed Langdon's mansion, and built the present mansion in it's place.

When David Hosack died, his heirs conveyed part of his estate to his widow before selling the rest of the property. The land was about 25.9 hectares in area and was located in the northern half of the current Estate. In 1854 Joseph Curtis was owner of this tract of land and built a mansion. In 1890 Samuel Sexton bought the land and mansion. The mansion was completely burned in 1899. In 1905 Vanderbilt bought Sexton's land.

Vanderbilt continued the development of the property by building new structures and planting ornamentals before his death in 1938. In 1940, under the direction of President Roosevelt, the government declared the Estate a National Historic Site.

Four important factors that may be influencing the current vegetation on

the Estate can be discerned from the historical accounts. First is that exotic plants have been continually introduced into the area since at least 1763, the time Dr. John Bard became owner. Some of these plants may have escaped into the natural vegetation and competed with indigenous plants for nutrients, moisture and sunlight. Second is that some forestry was practiced by Bard. He built a paper mill on the Estate and probably cut some trees on his land to supply the mill. This may have altered the composition of the forest. Third, fire may be an important factor in shaping the present forest. References are made to barns, sheds and mansions burning down. Lightning caused at least one fire, while it is unknown what caused the others or if the fires escaped into the vegetation. At least one forest fire was noted. Fourth is the description in 1832 of the forest between the site of the present mansion and the Hudson River as being composed of oak and chestnut. The present forest was established in that forest.

Vegetation Patterns

Vegetation History of New York State.

The natural vegetation present at the Estate today is a result of the past forest communities, just as the vegetation of the future will be related to what is present now. A review of the past forest communities of New York state will be useful in discussing present and probable future vegetation types.

Before the European settlers came to the Hudson River Valley, Indians inhabited the region. Early settlers in Ulster county (which is opposite Dutchess county on the Hudson River) noted that Indians commonly set forests

and fields on fire yearly (Sylvester 1880). When Henry Hudson explored the River in 1609, the forests on both sides were predominantly oaks, walnuts (Juglans spp.) and chestnuts. The Catskills and other areas were covered with beech (Fagus grandifolia), hemlock (Tsuga canadensis), sugar maple (Acer saccharum) and birch (Betula spp.) (McIntosh 1962). The difference in vegetation between the Hudson River Valley and the Catskills appears to be a result of more frequent disturbances in the Valley. Since presettlement time, there has been a decline in the numbers of hemlock, beech and chestnut, while sugar maple has been increasing its numbers (McIntosh 1972). Causes of the declines include logging of hemlock, beech bark disease, the chestnut blight, fires and severe storms (Nicholson et al. 1979).

Climatic Influences on Vegetation.

Bernabo and Webb (1977) have created maps showing the migration of vegetation types over the last 11,000 years. The movement of the types correspond to changes in the climate along the edge of the retreating Laurentide ice sheet, which at one point extended over southern New York and New England. As the glacier began receding approximately 11,000 years ago, zones of tundra-like vegetation and open spruce woodlands bordered the ice sheet. Between 11,000 and 9,000 years ago pine and oak forests moved northward as the climate warmed. Approximately 7,000 years ago the ice sheet declined dramatically creating a cooler and wetter climate. When this occurred, the pine and oak forests began to move southward, and mesic forests of birch, maple, beech and hemlocks began to increase in dominance at the expense of the pine and oak forests. During the last 300 years an increase in

herb pollen caused by European settlers cutting forests and cultivating the land is described. These vegetation types agree with those presented by Spear and Miller (1976) who reconstructed the vegetation history of a bog in western New York. They found tundra-like vegetation existed around the bog about 16,400-12,500 years ago and was replaced by open spruce woodlands. Roughly 11,000 years ago pines followed the spruce. Eventually the pines were replaced by hemlock. The hemlock forests changed into beech, birch, maple and oak forests about 4,400 years ago, but hemlock began to regain its dominance approximately 1,700 years ago. A pathogen is the most likely cause of the decline of hemlock about 5,000 years ago (Davis 1981).

Current climatic trends indicate a warming pattern. The Little Ice Age (Davis 1978) was a time when the climate became cooler. It lasted about 500 years and appears to have ended approximately 150 years ago. At that time temperatures began and continue to rise. The burning of fossil fuels has had an affect on the climate. Warmer, drier conditions, caused by increased carbon dioxide input into the atmosphere, may occur in the future with a predicted rise in global temperatures between 1.5° to 4.5° C over the next century (Nierenberg 1983).

Windthrow has been mentioned as a factor affecting the vegetation of New York (McIntosh 1972, Nicholson et al. 1979). Hurricanes that travel along the east coast have a good chance of causing some damage in New York. Ludlam (1963) and Helm (1967) give lists of hurricanes that at one point in their storm tracks crossed over New York (Table 1). Many of these storms only had significant damage around the coast or were dying out when they travelled inland. However the number of storms listed in Table 1 suggests that inland

Table 1. Years when hurricanes have hit New York for the period 1492-1870 and 1938-1967 (adapted from Ludlam (1963) and Helm (1967)).

1693	1706	1804	1938
	1749	1815	1954
	1783	1821	1957
	1785	1825	1960
	1788	1830	1962
	1795	1841	
		1846	
		1849	
		1850	
		1854	
		1856	
		1858	
		1861	
		1867	
		1869	

New York is susceptible to severe storms capable of disturbing the natural vegetation.

Successional Patterns.

The change of vegetation communities over a period of time is known as succession. Numerous articles have been written on succession and the different mechanisms involved when one plant community replaces another (Drury and Nisbet 1973). Recent articles have focused on the physiology of individual plants or species in determining future vegetation communities (Oliver and Stephens 1977, Woods and Whittaker 1980, Ehrenfeld 1980, Hibbs 1982 and 1983, Whitney 1984). These studies were conducted in areas containing hardwood and hemlock stands that were undergoing secondary succession. These stands are similar to those currently on the Vanderbilt Estate. A generalized scheme of plant succession on the Estate can be developed from these articles.

Following a large disturbance (e.g. fires or hurricanes), plants revegetate an area through stump sprouts, buried seeds or windblown seeds. Hemlock is the only species found to seed into an area up to 10 years after the cover has been removed (Hibbs 1983). As the understory matures, individual growth patterns and longevity limits determine the overstory canopy (Hibbs 1983, Drury and Nisbet 1973). Shade intolerant species will form the initial overstory. As these plants mature, grow old and die, shade tolerant plants will grow into the canopy and eventually form a new overstory (Oliver and Stephens 1977, Hibbs 1983). This process of replacement may be altered by further disturbances. Large gaps created in the overstory will most likely be

filled by shade intolerant species which may change the overstory composition. Smaller gaps created by the death of a few trees will tend to be filled by shade tolerant species (Oliver and Stephens 1977, Ehrenfeld 1980, Hibbs 1982, and 1983, Whitney 1984). Overstory composition may not change, but there might be a change in the understory (Ehrenfeld 1980). Overstory trees will compete with understory plants in filling the gap. The size of the gap and the ability of the plants to respond to the opening will determine what species will fill the space. This is a function of the rate of height growth of the understory plants versus the rate of lateral branch growth of trees in the overstory (Hibbs 1982). The creation of gaps in the overstory can form a mosaic of vegetation communities in a forest (Oliver and Stephens 1977). This process will continue until another large disturbance removes the vegetation and succession begins again.

METHODS

Study Area

The Vanderbilt Estate is located on the east bank of the Hudson River in Hyde Park, New York (Lat. 41° 37' Lon. 73° 52") (Figure 1). It is 13 kilometers north of Poughkeepsie, 113 kilometers south of Albany and 129 kilometers north of New York City. The mansion is on a plateau overlooking the River. Elevation varies from sea level to 53 meters (m). New York State Highway 9 borders the eastern edge of the property, and New York Central railroad tracks separates most of the property from the shoreline of the Hudson. The Estate includes Bard Rock, which juts out into the Hudson on the west side of the railroad tracks. Crum Elbow Creek flows through the southern part of the property. About one-third of the Estate is forested, one-third is kept in meadows and the rest is maintained for visitor use. The majority of the forested area is between the railroad tracks and the slope leading up to the plateau that the mansion is located on. A dirt service road running north-south is in the middle of this forest. Other forested areas are found on Bard Rock, and the east and south boundaries of the Estate. The east boundary is a white pine (Pinus strobus) and hemlock plantation.

The soils of the Estate are derived from glacial till, outwash and lacustrine silts and clays overlain by sand deposits. Texture ranges from a fine sandy loam to gravelly loam. Bedrock outcrops are located on the southern, western and northern edges of the Estate. Soil series on the Estate are: Nassau-Cossayuna gravelly loam complex; Staatsburg gravelly loam; Hoosic gravelly loam; Colonie fine sandy loam; and Elmwood fine sandy loam (SCS

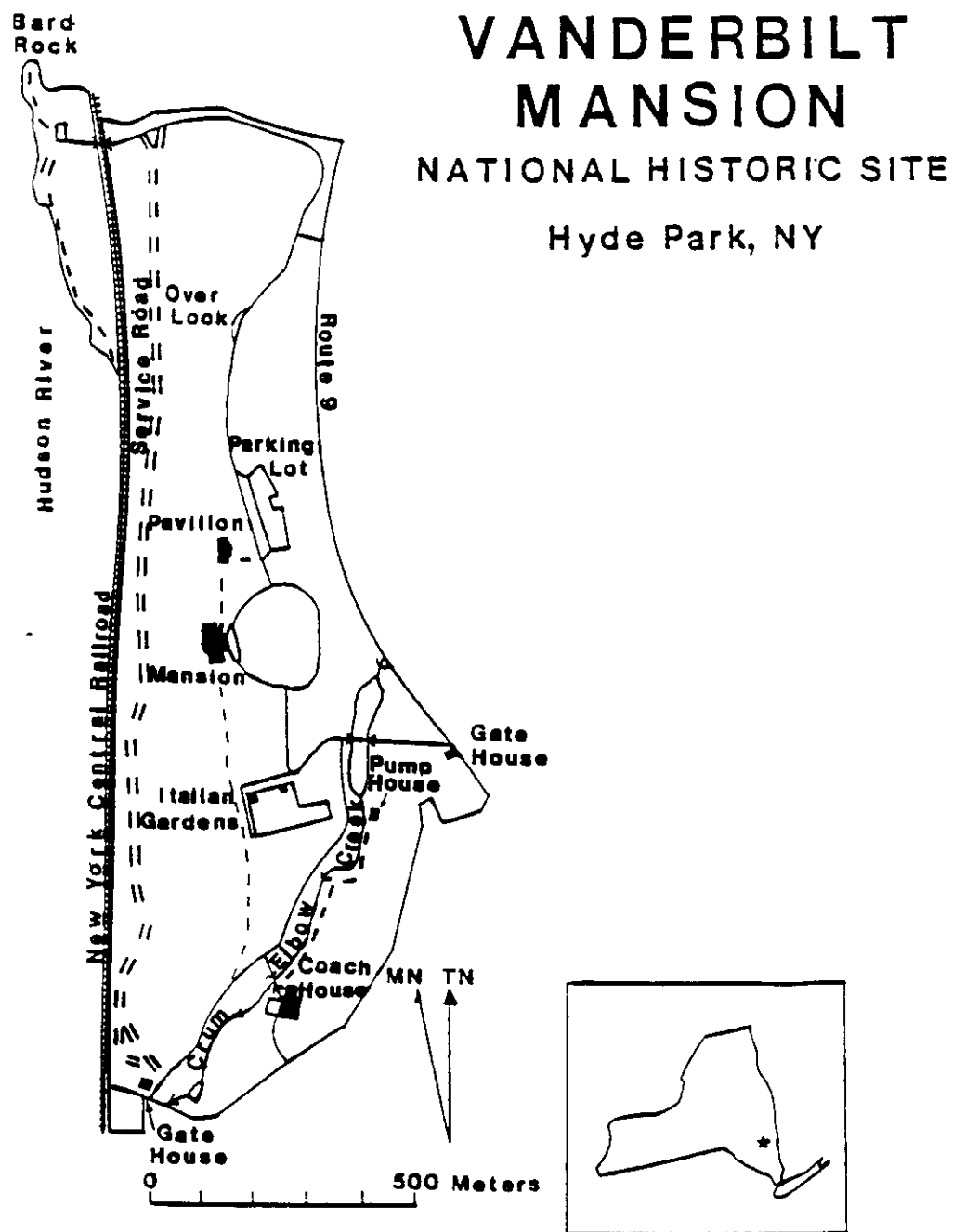


Figure 1. Property boundaries and structural features
on the Vanderbilt Estate.

1955).

Hyde Park has a continental climate characterized by moderately cold winters and warm humid summers. Average summer and winter temperatures are 21.8°C and -2.4°C respectively. The growing season lasts between 150 to 167 days. Precipitation is distributed evenly throughout the year with an average of approximately 100 centimeters (cm). About 20 to 30 thunderstorms occur in the Hudson Valley every year (SCS 1955).

Field Sampling

The study was conducted in the summer of 1984. Field sampling was facilitated by dividing the forested areas on the Estate into sampling sites. A presurvey was conducted in each site to gain information on the vegetation. From this information forest cover types that best described the forest stands encountered were selected from the Society of American Foresters (SAF) (1980) (Table 2). The remaining field work can be broken into quantitative and qualitative sampling.

Quantitative Sampling.

Each site was sampled by following a compass bearing from one end of the site to the other end. Sampling points along the bearing were selected at three chain intervals (Figure 2). Each sampling point was assigned a SAF forest cover type code. With the sampling point as the center, the diameter at breast height (DBH) (1.4 m off the ground) of all woody stems, with live and dead stems recorded separately, was measured on a 1/50 hectare (Ha) circular plot (radius of 8 m) (Figure 3). The DBH was measured to the nearest

Table 2. SAF (1980) forest cover types
used in field sampling.

SAF	Cover
<u>Code</u>	<u>Type</u>
27	Sugar Maple
52	White, Black and Red Oak
57	Tulip Poplar
44	Chestnut Oak
55	Red Oak
59	Tulip Poplar/White Oak/Red Oak
23	Hemlock
32	Red Spruce
21	White Pine
22	White Pine/Hemlock

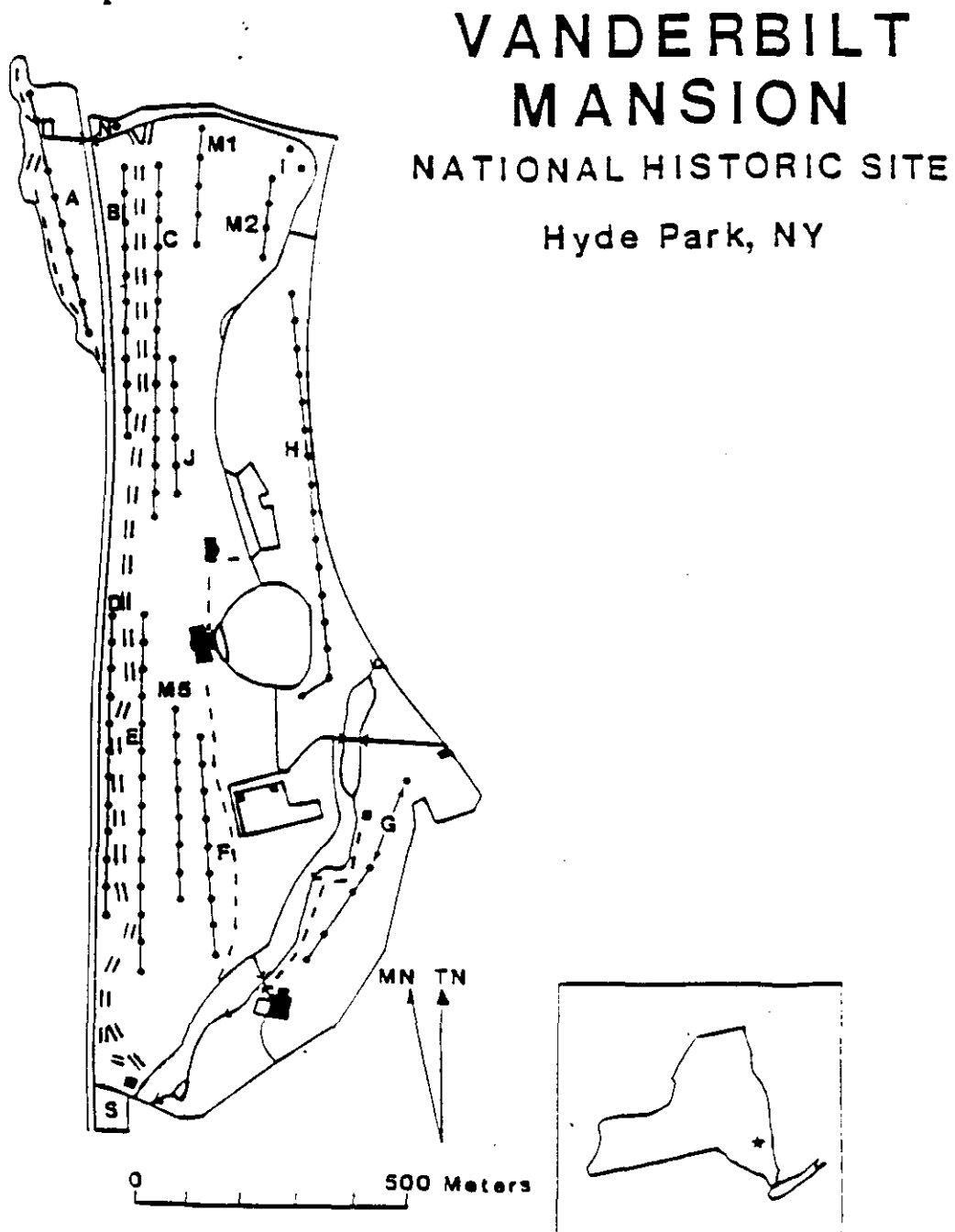


Figure 2. Location of sample sites and sampling points. No quantitative plots were measured in site S.

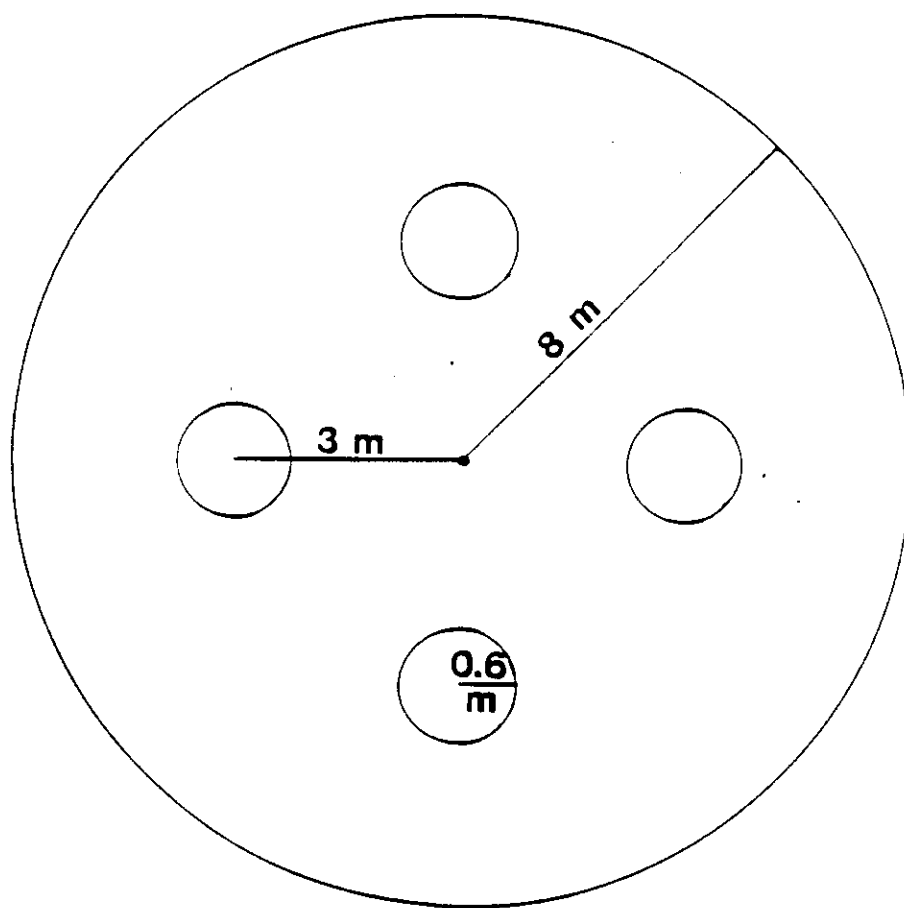


Figure 3. Sample design of each sampling point. An 8 m radius plot was used to measure trees, and four 0.6 m radius plots were used for shrubs and herbs.

0.25 cm, and the plant was classified as being dominant, codominant, intermediate or suppressed (Smith 1962). Dominant trees extend over the general canopy or occupy a large area of the canopy, codominant trees form the general canopy, intermediate trees are below the base or growing into the canopy and suppressed plants are below the intermediate stratum (Figure 4).

Four circular plots 1 m^2 in area (0.6 m in radius) were sampled 3 m north, south, east and west of the sampling point. On each plot all shrub stems (i.e. woody stems < 1.4 m tall excluding lianas and poison ivy (Rhus radicans)) were identified by species and recorded separately as live or dead. The number of stems for each plant whose root collar (the point where the stem connects to the ground) was inside the plot were counted. Sprouts off a stump were counted separately. The percent of the ground in the plot that was covered by the foliage of each species was visually estimated and recorded. Herbs (nonwoody plants, ferns, mosses, grasses, sedges, lianas and poison ivy) on each plot were identified and an estimate of the percent ground cover for each species was recorded.

In the meadows points were sampled at three chain intervals along three lines, but only the four 1 m^2 circular plots were measured.

Qualitative Sampling.

Relevé (sample stand) analysis (Mueller-Dombois and Ellenberg 1974) was used in this part of the study. Relevé plots were measured in the predominant vegetation types in each sample site (Figure 5). The size of the relevé plots varied depending upon the vegetation type. In forested areas 20 by 20 m plots were sampled and 10 by 10 m plots were sampled in the meadows. Plots were

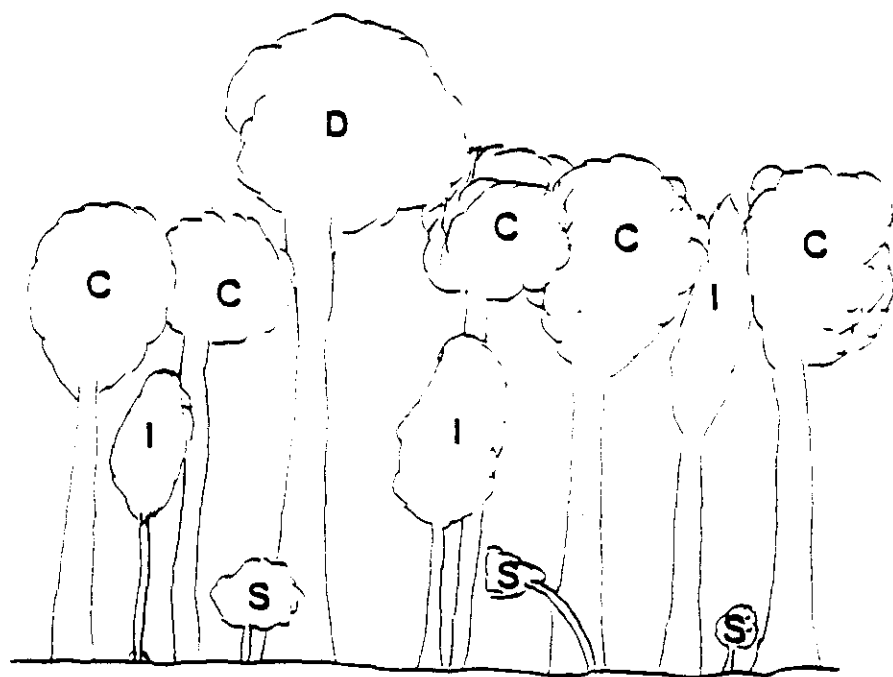


Figure 4. Profile of a stand of trees showing crown canopy classes
(s=suppressed; i=intermediate; c=codominant; d=dominant).

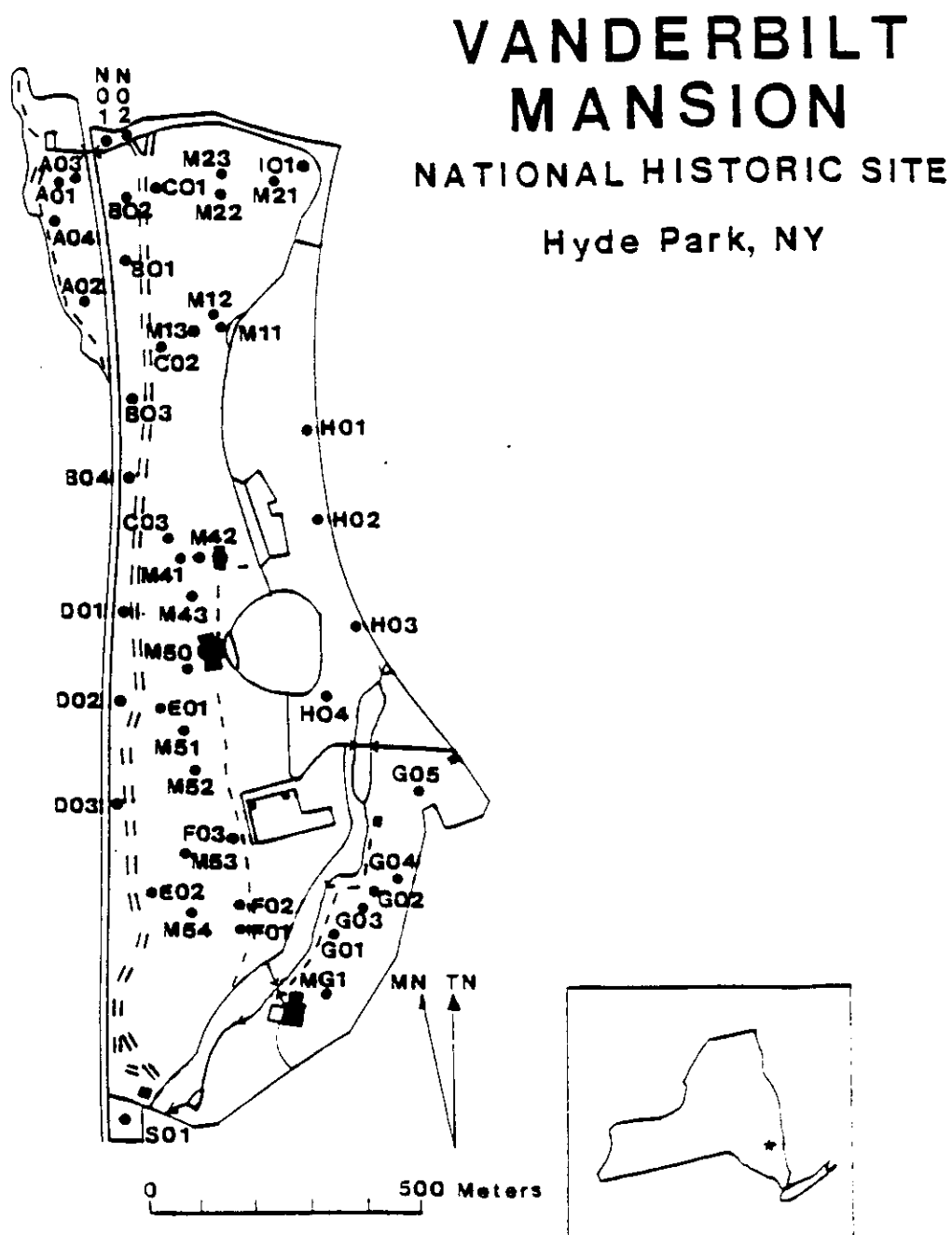


Figure 5. Location of releve plots.

coded by taking the letter of the site followed by the number of the relevé in that particular site. Thus plot C03 was the third relevé in site C. On each plot Kùchler's Physiognomic Classification and the Braun-Blanquet cover/abundance scale and sociability index (Mueller-Dombois and Ellenberg 1974) were used to separate the vegetation into different strata, provide an estimate of ground cover for each stratum and describe the ground cover and pattern of growth for the plants in each stratum (Tables 3 and 4). Kùchler's classification of vegetation types, height and coverage were used to classify each stratum within a relevé. For example D4-5C refers to a broadleaf deciduous stratum where the plants are 2-10 m tall and cover >75% of the ground within the relevé. Within each stratum, each species was classified according to the cover/abundance scale and sociability index. A rating of 4.2 refers to a species that covers 50-75% of the stratum and grows in a clumped distribution pattern (Patterson et al. 1983 and 1984). A brief description of the relevé was made noting slope, aspect, soil characteristics, successional trends and evidence of disturbances (e.g. fire scars, wind-throw mounds). Some trees on the plot were cored for age determination. When time allowed relevés were sampled in vegetation types that were not sampled in the quantitative analysis or were too small to be recognized as an individual vegetation type.

Analysis

Quantitative Data.

For each plot, tree density and basal area were calculated by canopy class, status (live or dead) and species. Average shrub density and ground

Table 3. K  chler's physiognomic classification.

Vegetation Type	Height(m)	Coverage
B broadleaf evergreen	1 <.1	c continuous (>75%)
D broadleaf deciduous	2 .1-.5	i interrupted (50-75%)
E needleleaf evergreen	3 .5-2	p parklike-patches (25-50%)
N needleleaf deciduous	4 2-5	r rare (6-25%)
A aphyllous	5 5-10	b barely present or
S semideciduous (B&D)	6 10-20	sporadic (1-5%)
M mixed (D&E)	7 20-35	a almost absent (<1%)
G graminoids	8 >35	
H forbs		
L lichens		
C climbers		
K stem succulents		
T tuft plants		
V bamboos		
X epiphytes		

Table 4. Braun-Blanquet cover/abundance scale and sociability test criteria.

Cover/Abundance		Sociability	
5	75-100%	5	growing in large, almost pure, population stands
4	50-75%	4	growing in small colonies, or forming large carpets
3	25-50%	3	forming small patches or cushions
2	5-25%	2	forming dense groups or clumps
1	<1-5%	1	growing solitarily
+	seldom, with insignificant cover		
r	solitary, with insignificant cover		

cover were computed for the four 1 m² plots at each sampling point. Average ground cover was also computed for each herb species.

The tree, shrub and herb data at each point were analyzed on the University Computer at the University of Massachusetts at Amherst. PROGIV, a computer program, calculated for each cover type average tree and shrub density, average tree basal area, average shrub and herb ground cover, and frequencies and importance values (IV) for each live species measured.

Tree IVs were computed from the sum of the relative density, relative basal area and relative frequency (Mueller-Dombois and Ellenberg 1977). A relative value (e.g. density, basal area or frequency) is computed by dividing the value for a plant in a cover type by the sum of all values in that type and multiplying the quotient by 100. Thus a relative value of a plant is an expression as a percent of the total. The maximum IV that a plant can have from this procedure is 300. Tree IVs were calculated for each canopy class and for data from all canopy classes combined together to derive an overall IV.

Shrub IVs were computed using relative density, relative ground cover and relative frequency. A maximum IV for a shrub in a cover type is also 300. Herb IVs were calculated using relative ground cover and relative frequency. The maximum IV for a herb is thus 200.

Time limitations prevented any analysis on the data from dead plants.

Qualitative Data.

Küchler and Braun-Blanquet data were analyzed using computer programs RELSUM and RELEVE, which were originally written by E.J. Cushing of the

University of Minnesota and were modified by Shujen Tsay of the University of Massachusetts. RELEVE is a listing, by individual relevés, of species occurring within Kùchler classes. Species cover/abundance (C/A) and sociability values are shown and total species diversity is calculated. Each relevé was assigned a SAF cover type code. RELSUM summarizes data for a variety of parameters for each cover type, with calculations based upon all relevés in each cover type.

Species within each relevé were assigned a numerical value according to a procedure designed by E.J. Cushing. Values were derived as follows: a) C/A values were transformed into an entirely numerical data set ($r=1$, $+=2$, $1=3$, $2=4$, $3=5$, $4=6$, $5=7$); b) the transformed values for each species were summed for each stratum within a relevé; c) the number of stratum that a species occurs in was subtracted from the previous sum; d) the value 1 was added to the differences arrived at in c) (Patterson et al. 1983 and 1984). For example, a species occurring in three strata with C/A values of 5, 3 and + would be given a numerical value of $7+5+2-3+1=12$.

AGGLOM is a computer program written by Alan Steiner of the University of Massachusetts. It is a modification of Orloci's (1967) optimal agglomeration-polythetic clustering method. AGGLOM was used to group relevés together using the numerical values of each species occurring on the plot. A hierarchical dendrogram was produced in which any class at one level is a sub-class of a higher level. Absolute and standardized distances were used to produce individual dendrograms. Both evaluate the distance between relevés in n-dimensional hyperspace where n equals the total number of species for all relevés. Absolute distances are found by computing the distances between

points. Standardized distances are obtained by projecting points representing relevés onto a unit circle centered on the origin. The standard distances are then taken as the cords between the resulting points on the circle. When absolute distances are used, more emphasis is placed on species abundance than composition. The reverse is true for standard distances (Patterson et al. 1983 and 1984). Relevés were subjectively grouped into vegetation types by cross-referencing both dendrograms and checking with field notes to see if the groupings made sense. RELSUM was run on the groups to provide a vegetative description.

Defining and Mapping New Vegetation Types

New vegetation cover types were created for the Estate using the information from the cluster analysis dendrograms and the quantitative plots. All analyses are based on the new types.

Aerial photographs of the Estate taken in 1977 were obtained. A vegetation map was made from the photos using the new vegetation types. The area of each type was estimated with a dot grid.

RESULTS

New Vegetation Types

Cluster Analysis.

The dendrogram of absolute distance can be broken into seven groups (Figure 6). The first includes plots with abundant sugar maple. Plots C03 and C02 were coded as tulip poplar (Liriodendron tulipifera) and black birch (Betula lenta) stands respectively. Both stands had a sugar maple regeneration layer which put them into this group. On the standard distance dendrogram (Figure 7) C03 is clustered with other vegetation types. Because C03 was the only releve in a tulip poplar type, it was not able to form a tulip poplar cluster. It was therefore put into the closest related group, which was sugar maple. On the standard distance dendrogram C03 is not clustered with sugar maple plots, an indication that it may belong to another group. Plot C02 was taken in a small black birch patch in the middle of a sugar maple stand. The standard distance dendrogram clustered C02 with other sugar maple plots, so C02 can be considered part of the sugar maple group. C02 was clustered with C03 because C02 had tulip poplar in it's understory.

The second group is a hemlock/hardwoods group. Plots F01 and G01 were coded as black birch and sugar maple stands respectively. F01 was surrounded by a hemlock stand and had a couple of hemlocks in the overstory. This clustered F01 with hemlock plots on the absolute dendrogram. It was also clustered with hemlock plots on the standard distance dendrogram. Plot G01 was in an all-aged stand that had white oak (Quercus alba), chestnut oak (Quercus prinus) and red oak (Quercus rubra) overtopping hemlocks. Combined

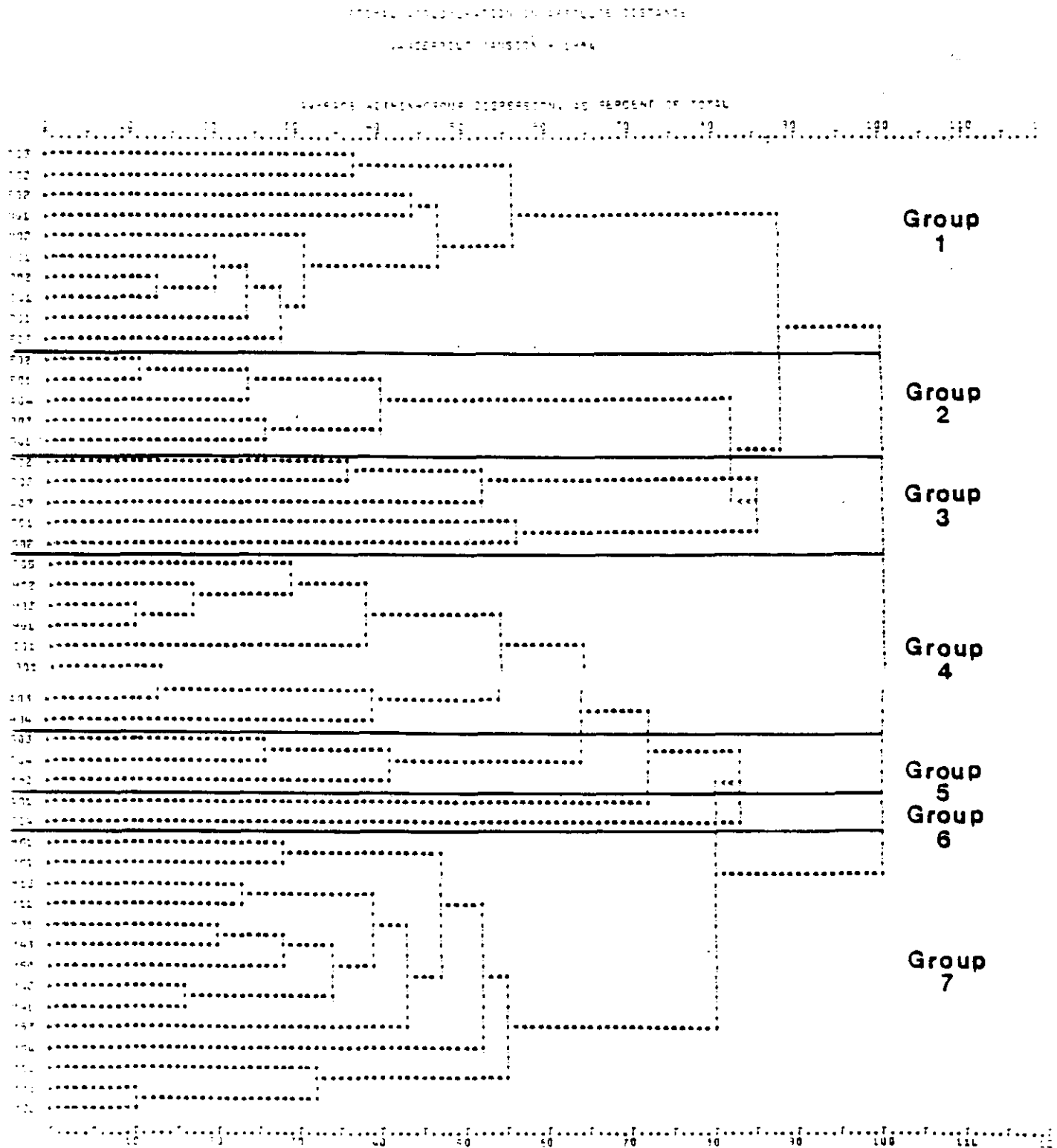


Figure 6. Dendrogram of relevé plots clustered together using absolute distances.

OPTIMAL AGGLOMERATION BY STANDARD DISTANCE
 (WANDERFULT HANSIG) - 1984

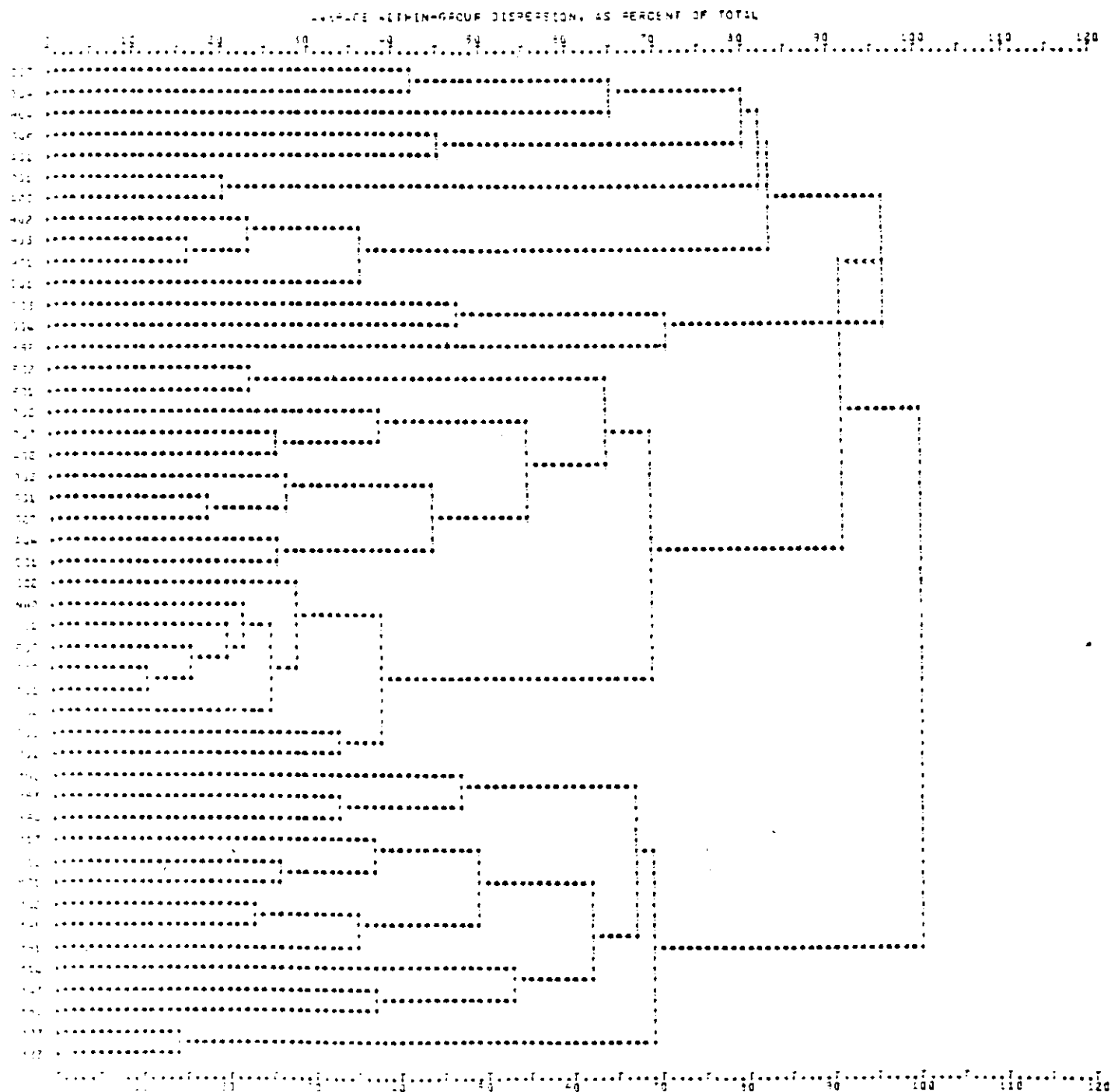


Figure 7. Dendrogram of relevé plots clustered together using standard distances.

together the oaks covered more of the plot than the hemlocks, but considered individually hemlock was more abundant, and that is what put G01 with hemlock plots. G01 was also clustered with hemlock plots on the standard distance dendrogram.

The third group is composed of five plots that have oaks in common. Plots D02 and G02 were coded as hemlock and sugar maple stands respectively. Plot D02 is in an all-aged stand that had scattered oak dominants over a hemlock codominant layer. The number of oaks were small, so the plot was recorded as a hemlock type, however the ground cover of the oak crowns was great enough for the plot to be classified with other oak plots on the absolute and standard dendrograms. Plots G02 is also an all-aged stand that has scattered oak dominants over a dense sugar maple layer. This plot clustered with oak plots for the same reason as D02.

The fourth group is a planted conifer group. These plots were sampled in the white pine and hemlock strip along the east border of the Estate, a norway spruce (Picea abies) plantation in the southeast corner of the Estate and in two red spruce (Picea rubens) plantations in the northwest corner of the Estate.

The fifth group is composed of plots in marshy areas. Plot G03 was in a common reed (Phragmites communis) stand. Plot G02 was in a purple loosestrife (Lythrum salicaria) patch and plot M52 was in a drainage area between two small knolls in the meadow south of the mansion. All plots had water on the surface of the ground. Skunk cabbage (Symplocarpus foetidus) was on all plots and was the basis for the clustering.

The sixth group is two plots in forested areas that had very little in

common with the other plots. Plot A01 was in an area that had some openings in the canopy caused by trees being knocked over. Black oak (Quercus velutina), pignut hickory (Carya glabra) and american elm (Ulmus americana) make up a sparse (6-25% ground cover) overstory. Plot B04 was in an unique area near the railroad tracks in the northwest corner of the Estate. It is a moist area that has american elm, honeylocust (Gleditsia triacanthos), sycamore (Platanus occidentalis) and willow (Salix spp.) in the overstory. A dense clump of speckled alder (Alnus rugosa) is in the understory.

The seventh group is composed of plots taken in the meadows. Rye (Secale cereale) and goldenrod (Solidago spp.) were the most frequently encountered plants.

Quantitative Analysis.

The groups produced by cluster analysis were refined using information from the quantitative plots. Some of the quantitative plots were grouped together in different combinations to see the effects on the IVs for the species present. The following changes were made to the cluster groups to create a classification scheme for the Estate.

A tulip poplar type was added for a stand that was created by a thinning operation. The overstory of this stand is pure tulip poplar.

The sugar maple group was divided into three types. The first is a sugar maple type. The second is a sugar maple/hardwoods type. This was added to cover areas in sites C and G that have a mixture of hardwood trees that together have about the same IV as sugar maple. This type is different from the sugar maple type due to the greater number of hardwoods in proportion to

sugar maple. The third type is a sugar maple/oak type developed for an area in site E that has scattered dominant oaks over a codominant sugar maple layer. There are no dominant sugar maples in this area, but not enough oaks to classify it as an oak type.

An oak/tulip poplar type was added to the oak group. This was done to cover an area in site C where these species form a mixed stand.

The planted conifer group was divided into white pine, white pine/hemlock, norway spruce and red spruce types.

Some plots were in areas that have vegetation that do not fit into any type, so an other hardwoods type was defined. These plots were in isolated areas that were recovering from some form of disturbance.

The hemlock/hardwoods, marsh and meadow groups from the cluster analysis were kept intact and are used as individual types. Table 5 lists the vegetation types developed for the Estate. The identification codes used for the new types are not necessarily the same as the SAF codes.

Breakdown of Vegetation Types

Most of the land on the Estate is forested, with maintained areas occupying the next largest area and meadows the third largest (Figure 8). Sugar maple dominated types cover 38.3% of the forested land, oak dominated types 24.4% and planted conifers 21.4% (Figure 9).

The sugar maple dominant types are found mostly east of the service road; in an area between Bard Rock and the north end of the service road; in a patch along Crum Elbow Creek; and along the slope south of the mansion (Figure 10). The oak dominant types are on Bard Rock and generally on the western and

Table 5. Vegetation types
developed for the Vanderbilt Site.

ID	Cover
<u>Code</u>	<u>Type</u>
27	Sugar Maple
28	Sugar Maple/Hardwoods
29	Sugar Maple/Oak
52	Oak
53	Oak/Tulip Poplar
57	Tulip Poplar
23	Hemlock/Hardwoods
21	White Pine
22	White Pine/Hemlock
32	Red Spruce
33	Norway Spruce
01	Other Hardwoods
98	Marsh
99	Meadow

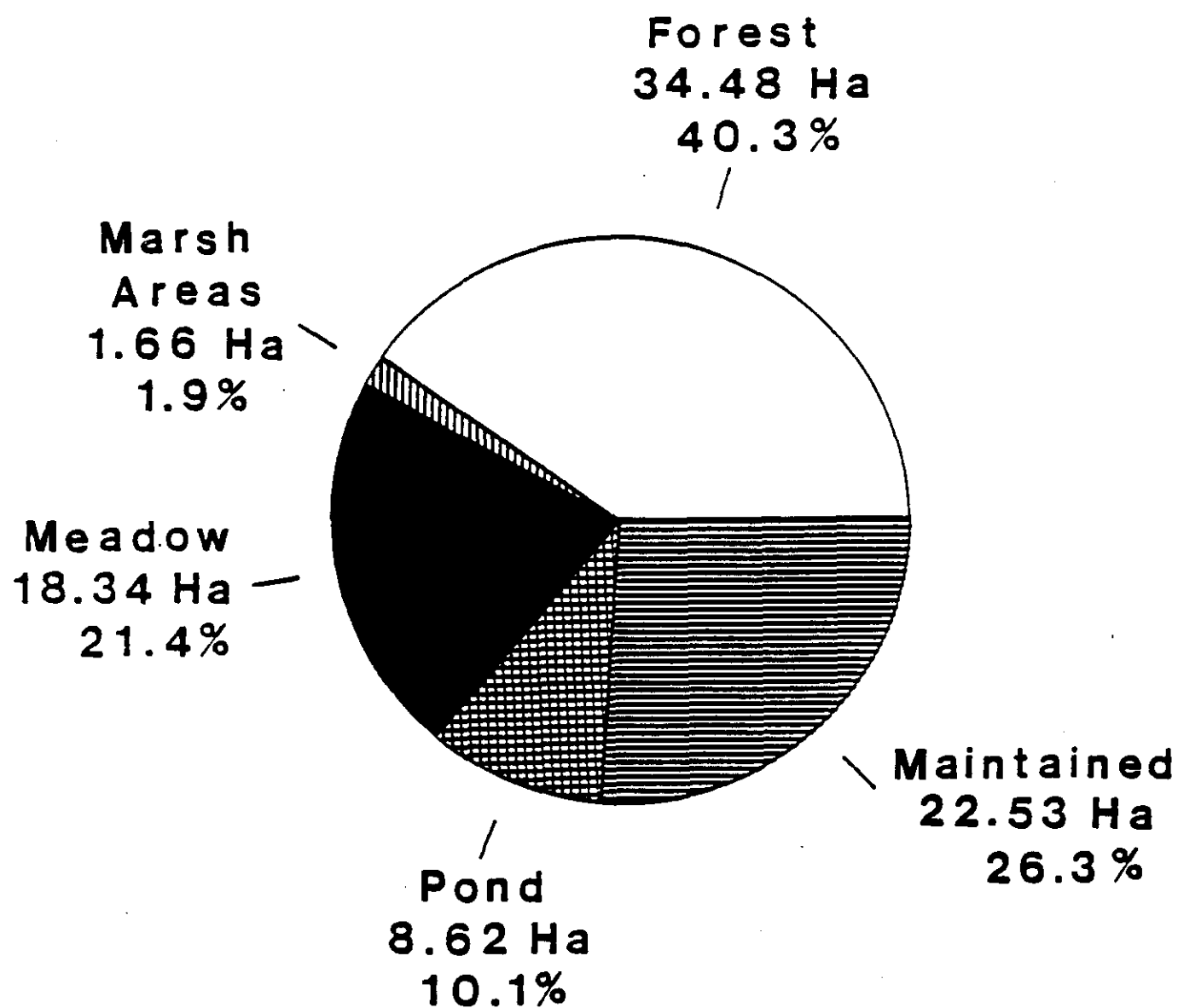


Figure 8. Breakdown of land types on the Estate.

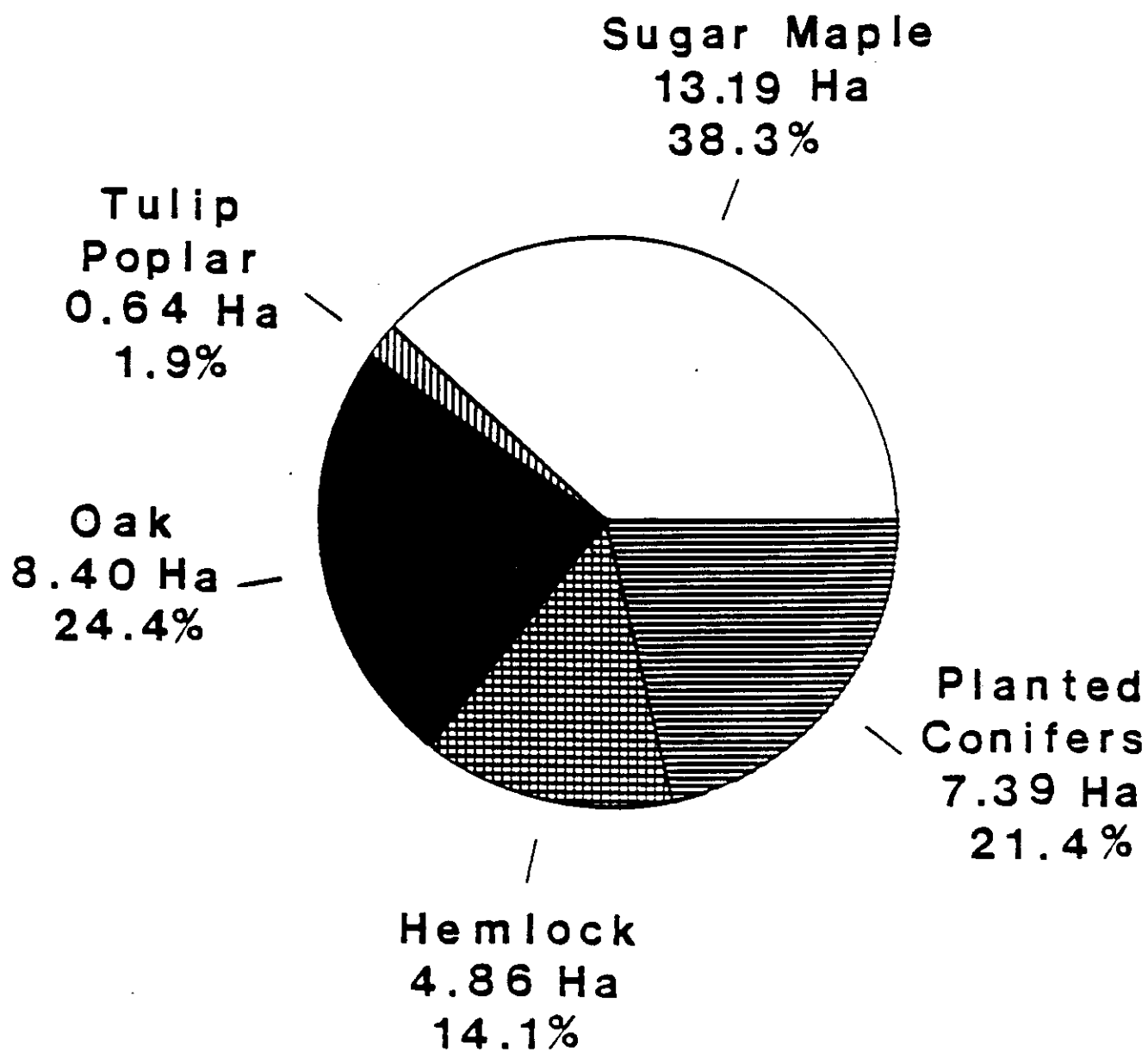


Figure 9. Breakdown of major vegetation types in the forests on the Estate.

VANDERBILT MANSION

NATIONAL HISTORIC SITE

Hyde Park, NY

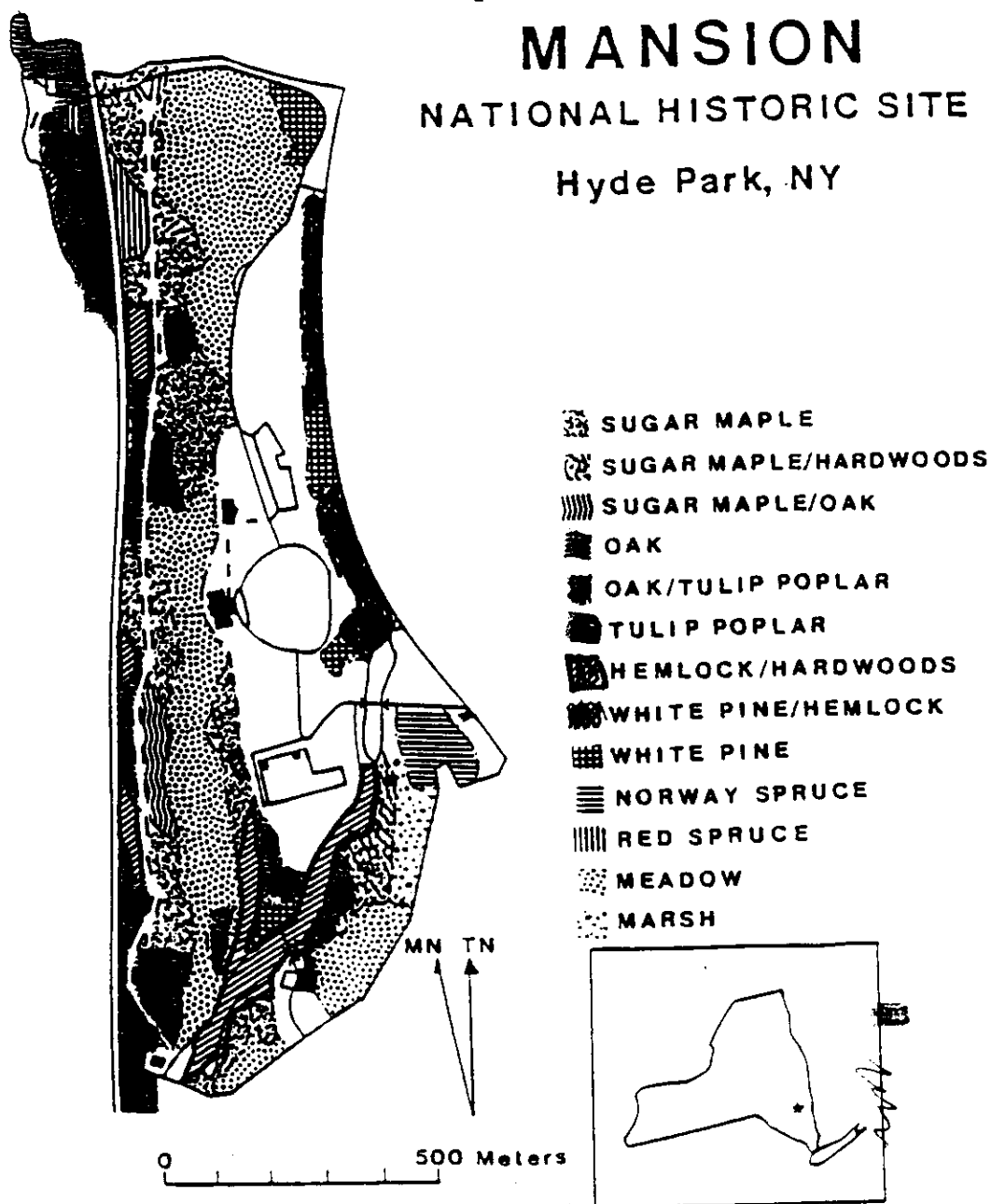


Figure 10. Vegetation map of the Estate.

southern parts of the service road. The planted conifers are along the east border of the Estate; between Bard Rock and the service road; and in a small patch on Bard Rock. Hemlock/hardwoods types are located along the slope south of the mansion; in the ravine cut by Crum Elbow Creek; in low lying areas on the west side of the service road; and along the shoreline of Bard Rock. The tulip poplar type occurs in one stand west of the pavilion. The meadows are between the forest along the River and the plateau that the mansion is on and in the southern portion of the Estate. The marsh areas are in a common reed patch bordering the railroad tracks in an area west of the pavilion; a small area in the meadow south of the mansion; a small wet plateau dominated by purple loosestrife along the southeast border of the Estate; and a small common reed stand in the middle of a sugar maple/hardwoods type west of the purple loosestrife stand. Other hardwoods stands occur in small isolated patches that were sampled, but are too small in area to be mapped.

Results from PROGIV are included in the appendices for plant IV (Appendix A), tree density, basal area and frequency (Appendix B), shrub density, ground cover and frequency (Appendix C) and herb ground cover and frequency (Appendix D). RELSUM and RELEVE output for relevé plots in marsh and other hardwoods types are in Appendices E and F respectively. Tree, shrub and herb data are summarized by coartype in Table 6. The white pine type has the greatest total basal area and the smallest total tree density. The sugar maple/hardwoods type has the lowest total basal area and the oak type has the highest total tree density. The highest shrub density is in the oak type, but the highest shrub ground cover is in the tulip poplar type. The red spruce type has the lowest shrub density and ground cover. Meadows have the highest

Table 6. Total area, herb, shrub and tree values by cover type.

Cover Type	Area* (Ha)	Herb	Shrub		Tree	
		Cover (%)	Cover (%)	Density (No./Ha)	Basal Area (m ² /Ha)	Density (No./Ha)
27	9.85	41.9	10.3	27604	21.8	2700
28	2.15	44.8	8.1	15000	19.3	4425
29	1.19	51.6	15.4	37500	47.5	4343
52	7.97	32.4	26.0	81806	28.6	4706
53	0.39	31.8	20.4	30000	39.4	1888
57	0.64	37.1	36.1	45833	50.4	2950
23	4.86	19.0	9.0	24500	43.3	2075
22	3.33	66.9	9.7	13438	49.3	638
21	1.86	72.8	6.5	9091	66.4	458
33	1.41	117.8	6.8	10000	49.4	1450
32	0.79	15.0	0.3	5833	38.4	1317
99	18.34	161.4	3.9	10441	--	--
01	**	23.8	6.8	11250	20.5	3113
98***	1.66					

* Maintained areas = 22.53 Ha; Pond = 8.62 Ha;
Total area = 85.61 Ha

** No area estimate could be made because this type was not mapped.

*** No quantitative plots were measured in this type.

herb ground cover and the red spruce type the least.

Plant Composition of the Vegetation Types

Sugar Maple Dominant Types (Cover Types 27, 28 and 29).

Sugar Maple (Cover Type 27): In this type sugar maple has the highest importance values in each of the tree canopy classes (Table A1). Sugar maple has the largest tree density and basal area in each class followed by black and red oaks (Table B1). Sugar maple also has the highest shrub importance value with spicebush (Lindera benzoin) the second highest. A high shrub density (Table C1) gives sugar maple the greatest shrub importance value. White-wood aster (Aster divaricatus), woodbind (Parthenocissus spp.), jack-in-the-pulpit (Arisaema atrorubens) and skunk cabbage are the more important herbs. Skunk cabbage covered the most area in the type, whereas white-wood aster, jack-in-the-pulpit and woodbind were the most frequent (Table D1).

Sugar Maple/Hardwoods (Cover Type 28): Sugar maple has the largest overall tree importance value (Table A2). Sycamore, tulip poplar and american elm are the more important trees in the dominant class. White ash (Fraxinus americana) has the highest value in the intermediate class. Sugar maple has the highest density in all tree classes and the greatest basal area in the suppressed, codominant,

dominant and overall classes (Table B2). White ash has the largest basal area in the intermediate class. Sycamore has a high basal area in the dominant class (Table C2). Sugar maple is the most important shrub followed by maple-leaved viburnum (Viburnum acerifolium) and hop hornbeam (Ostrya virginiana). The highest shrub density belongs to sugar maple with flowering dogwood (Cornus florida) next. Maple-leaved viburnum and hop hornbeam have large ground covers, giving them larger importance values than flowering dogwood. Poison ivy, garlic mustard (Alliaria officinalis), bittersweet (Celastrus scandens) and violet (Viola spp.) are the most important herbs. Poison ivy covers the most ground with garlic mustard, violet and poison ivy the most frequent (Table D2).

Sugar Maple/Oak (Cover Type 29): Sugar maple has the highest importance value in all tree classes except the dominant class (Table A3). Tulip poplar, sycamore and black locust (Robinia pseudo-acacia) have the largest values in the dominant class. However, sugar maple is the most important tree overall. Sugar maple has the highest density in the tree classes that it is present in and the highest basal area in the suppressed and intermediate classes (Table B3). White oak and black locust have the greatest basal area in the codominant class, whereas sycamore and tulip poplar have the highest basal areas in the dominant and total classes. The shrub layer is dominated by sugar maple and spicebush. These two plants have the greatest densities, ground covers and frequencies

(Table C3). Woodbind, skunk cabbage and violet have the three largest herb importance values. Skunk cabbage and woodbind cover the most area and woodbind and violet were the most frequent. (Table D3).

Oak Dominant Types (Cover Types 52 and 53).

Oak (Cover Type 52): Red oak has the highest importance value in the codominant, dominant and overall classes with sugar maple the highest in the intermediate class. Witch hazel (Hamamelis virginiana) and common buckthorn (Rhamnus cathartica) have the highest values in the suppressed class (Table A4). Witch hazel and common buckthorn have the greatest densities in the suppressed and total classes, sugar maple and red oak have the largest intermediate densities and red oak the highest dominant density (Table B4). Basal areas for individual plants are small in the suppressed and intermediate classes. Red oak, chestnut oak and white oak have the largest basal areas in the codominant, dominant and total classes. Sugar maple and maple-leaved viburnum have the highest shrub importance values because these plants have the largest densities, ground covers and frequencies in the shrub layer (Table C4). Woodbind, white-wood aster and grass (Gramineae) have the highest herb importance values. This is because these plants have the greatest ground cover. Woodbind was the most frequent herb (Table D4).

Oak/Tulip Poplar (Cover Type 53): Red oak, spicebush, sugar maple and tulip poplar have the highest overall importance values (Table A5). Red oak, tulip poplar and sugar maple have the largest dominant class importance values, sugar maple has the highest value in the codominant and intermediate classes, and spicebush is the most important in the suppressed class. Spicebush has the greatest density in the suppressed and total classes, with sugar maple and red oak dominating the densities of the other classes (Table B5). Basal area is low in the suppressed and intermediate classes, sugar maple has the greatest codominant basal area whereas red oak and tulip poplar have the highest basal areas in the dominant and total categories. Spicebush has the greatest shrub importance value. It has the highest density, ground cover and frequency of all shrubs (Table C5). Jack-in-the-pulpit and woodbind have the highest herb importance values. Jack-in-the-pulpit and grape (*Vitis* spp.) have the greatest ground cover with jack-in-the-pulpit and woodbind having the highest frequencies (Table D5).

Tulip Poplar (Cover Type 57).

The highest overall importance values in this type are for tulip poplar, sugar maple and spicebush (Table A6). Sugar maple and spicebush dominate the suppressed class, sugar maple and black birch have the greatest values in the intermediate class, whereas tulip poplar has the highest values in the codominant and dominant classes. Spicebush has the highest density in the suppressed class, sugar

maple the highest intermediate density and tulip poplar the highest codominant and dominant densities (Table B6). Basal area in the codominant, dominant and total categories is mostly tulip poplar. Spicebush is the most important plant in the shrub layer due to a high spicebush density, ground cover and frequency (Table C6). Large leaf violet (Viola incognita) and jack-in-the-pulpit have the highest herb importance values. These two plants have the greatest ground covers and frequencies (Table D6).

Hemlock/Hardwoods (Cover Type 23).

Hemlock importance values are the greatest in the suppressed, intermediate, codominant and overall classes (Table A7). Sugar maple and black birch also have high values overall. Chestnut oak is the most important plant in the dominant class with hemlock and black birch next. Sugar maple has the highest suppressed density, whereas hemlock has the greatest density in the other classes (Table B7). Hemlock has the highest basal area in all classes except for the dominant class where chestnut oak is the largest. In the shrub layer sugar maple and maple-leaved viburnum have the highest importance values due to these plants having the highest densities, ground covers and frequencies for this type (Table C7). White-wood aster and sedges (Carex spp.) have the largest herb importance values. White-wood aster and sedges have the largest herb ground covers and frequencies (Table D7).

Planted Conifers Types (Cover Types 22, 21, 33 and 32).

White Pine/Hemlock(Cover Type 22): White pine and hemlock have the largest importance values in the overall, dominant, codominant and intermediate classes (Table A8). In the suppressed class hemlock, spicebush and sugar maple have the greatest values. White pine and hemlock have the highest density and basal area values in all tree classes (Table B8). White pine is the most important plant in the shrub layer because it has the greatest density, ground cover and frequency (Table C8). Poison ivy dominates the herb layer and has the greatest ground cover and frequency of the herbs (Table D8).

White Pine(Cover Type 21): White pine has the greatest importance values in the overall, dominant, codominant and intermediate classes (Table A9). Sugar maple has the largest importance value in the suppressed class. Sugar maple has the highest suppressed density, whereas white pine has the highest density and basal area in the other tree classes (Table B9). Sugar maple's importance value is highest in the shrub layer due to sugar maple having the greatest density, ground cover and frequency (Table C9). Poison ivy is the most important herb because it has the largest ground cover and frequency (Table D9).

Norway Spruce(Cover Type 33): Norway spruce has the largest importance value in the codominant, dominant and overall classes

(Table A10). Sugar maple's importance value is greatest in the suppressed class. Sugar maple has the highest density in the suppressed class with norway spruce having the greatest density and basal area in the codominant, dominant and overall categories (Table B10). White ash dominates the shrub layer due to a high density and ground cover (Table C10). Spinulose woodfern (Dryopteris spinulosa) and poison ivy have the largest ground covers in this type (Table D10) and the largest herb importance values.

Red Spruce (Cover Type 32): Tree importance values for red spruce are the greatest in the overall, dominant, codominant and intermediate classes (Table A11). Tree-of-heaven (Ailanthus altissima) and red spruce are the most important plants in the suppressed class. Tree-of-heaven has the highest suppressed density with red spruce having the greatest density and basal area in the other classes (Table B11). Sugar maple has the largest shrub importance value due to it having the highest density and frequency of shrubs in this type (Table C11). Violet has the largest herb importance value, ground cover and frequency (Table D11).

Meadow (Cover Type 99).

Snowberry (Symphoricarpos albus) has the highest shrub importance value (Table A12) due to snowberry having the highest shrub density (Table C12). Sassafras (Sassafras albidum) has the highest frequency

for shrubs. In the herb layer rye, raspberry (Rubus spp.), woodbind, poison ivy and sweet vernal grass (Anthoxanthum odoratum) have the largest importance values. These plants also have high ground cover and frequency values (Table D12).

Other Hardwoods (Cover Type 01).

This cover type is composed of four plots that had vegetation which did not fit into the other cover types. Black birch and spicebush have the largest tree importance values in the overall class (Table A13). Black birch, chestnut oak, tree-of-heaven and american elm are the more important plants in the dominant class, black birch has the largest codominant and intermediate importance values, with spicebush and sugar maple having the highest suppressed importance values. Spicebush has the greatest suppressed and total density, and black birch has the largest density in the other tree classes (Table B12). Basal area for individual species is small in the suppressed and intermediate classes, but black birch has the greatest basal area in the other tree classes. Spicebush has the greatest shrub importance value, density, ground cover and frequency (Table C13). Woodbind and violet have the highest herb importance values due to these two plants having the greatest ground covers and frequencies (Table D13).

Marsh (Cover Type 98).

No quantitative plots were taken in this type. Information on the vegetation is from three relevés sampled in wet areas that were clustered together (Tables E1 and F1). The one plant shared by all three plots is skunk cabbage. Two plots have common reed on them, and a different pair have purple loosestrife in common. All plots had 100% ground cover of herbs.

DISCUSSION

Succession on the Estate

The natural forested area on the Vanderbilt Estate (this excludes the conifer plantations) has an all-aged structure. Throughout the forest are scattered old trees, some of which are over 250 years old. The majority of these old trees are red, black, white or chestnut oaks. A few sycamores are also present. These trees are the remnants of the oak/chestnut forest that the artist noted in 1832. Underneath these old trees are younger stands of sugar maple growing in protected moist areas, hemlocks in low lying spots and oaks on drier exposed terrain. Some of the oldest sugar maples are 150 to 200 years old, but the average age of younger stands is 60 to 100 years old. When Henry Hudson sailed the River in 1609, he described the banks as being oaks, walnuts and chestnuts. The forests on the Estate were comprised of oak from the early 1600's until roughly 200 years ago. At that time the current sugar maple stands on the Estate became established. Hemlocks were probably established in the low lying areas. Sugar maples started to gain dominance about the time the area began to be developed. Once the property came into private ownership, some of the disturbances (e.g. fires possibly set by Indians) that may have benefited the oak forests could have been eliminated, giving sugar maple a competitive advantage in the understory. When small gaps formed in the overstory the shade tolerant sugar maples would grow into them and begin the conversion to a new forest type. Some of the oak trees were probably cut for the paper mill or for firewood, creating small gaps that would also tend to favor sugar maple growth, accelerating the rate of

conversion.

Disturbances Affecting the Vegetation

The vegetation types on the Estate are growing under the influence of natural and anthropogenic disturbances. These disturbances affect different species in different ways, and this in turn determines the successional trends on the Estate. Part of this study was to identify different forms of disturbances on the Estate. No measurements were taken on the disturbances found, so the extent of damage cannot be estimated.

Biotic Factors.

Exotic plants introduced as ornamentals are growing in the forest and competing with the indigenous vegetation. Some of the exotics found in the forest include japanese barberry (Berberis thunbergii), kentucky coffee tree (Gymnocladus dioica) and tree-of-heaven.

Vines of bittersweet, grape and poison ivy are overtopping small trees and growing into the crowns of overstory trees. This is happening in open areas, along the edges of the forest and the northern meadow, and the forest and the service road. The vines weaken trees by cutting off the nutrient supply from the leaves to the roots, and by impairing photosynthesis from shading the tree foliage (Lutz 1943). Branches have broken off of overstory trees and in the understory the vines have covered the vegetation and snapped off the tops of small trees.

Humans are a factor affecting the vegetation. Mowing the meadows and plantations along route 9 have created a disclimax -- a community perpetuated

by a recurring disturbance. If the mowing were to stop, the meadows would grow into shrub fields and hardwoods would grow into the canopies of the conifer plantations. The mowing probably has affected the composition of the herbaceous layer.

Three lean-tos were found on the Estate. The remains of a campfire was near one of the lean-tos. The one campfire site showed no evidence of the fire escaping outside of the site, however the chance of a wildfire occurring on the Estate increases with illegal camping.

The most recent disturbance to the forest was the thinning of the tulip poplar stand about 40 to 45 years ago. Increment cores taken in the stand show that the trees left had accelerated diameter growth following the cut. If the stand was not thinned, it would probably be a mixed tulip poplar/sugar maple stand. Forestry related activities were taking place on the Estate 40 to 60 years ago. During that time the red and norway spruce stands were planted and the tulip poplar stand was thinned. These activities have changed the forest composition in discrete areas on the Estate.

Abiotic Factors.

Two actively eroding gullies are on the slope northwest of the pavilion. Trees have fallen into the gullies and the roots of plants on the sides are being undermined by the removal of soil. Some areas on the sides of the gullies are devoid of vegetation. If allowed to continue the gullies may expand out of the forest towards the visitors parking lot. Erosion has been a problem on the Estate. On the slope beneath the mansion is an old erosion gully that was dammed up about 20 years ago. The erosion was stopped and the

gully is now overgrown with vines.

Wind storms are probably the greatest environmental factor presently shaping the vegetation on the Estate. There are a number of logs from trees knocked over throughout the forest around the service road and on Bard Rock. Most of the trees were toppled away from the Hudson River. Winds coming off the Hudson would not be slowed down by any obstruction, whereas winds blowing towards the Estate from any other direction would encounter resistance from trees or buildings. Also the slope west of the mansion shelters the vegetation from easterly winds. The shallow soil on Bard Rock and around the service road increases the possibility of wind-throw. The openings created by storms would favor the growth of shade intolerant oaks into the canopy. The different stages of decay of the logs suggests that two or three strong windstorms have disturbed the vegetation within the last century.

Evidences of fire (i.e. fire scarred trees, charcoal in the soil) were found on only eight releve plots. Two of the plots were in the white pine plantations, one was in the tulip poplar stand, another was in the meadow south of the mansion in a spot where a slash pile was burned by the Park Service during the 1970's, two were in the forest on the slope south of the mansion, one was in the north meadow and the last was in the forest near the coach house. Fire does not appear to be an important element in shaping the present forest.

Description of Vegetation Types

Sugar Maple Dominant Types.

These types can be characterized as growing in protected areas throughout the Estate. Except for three stands, the sugar maple communities are along the east side of the service road. Two of the stands are east of Bard Rock and the third is on the east side of a ridge. Oaks and hickories compose the west side of the ridge. The sugar maple stands on the Estate are in areas that shelter them from the full impact of winds off of the Hudson. Bard Rock protects the trees in the north east corner of the Estate. South of Bard Rock the line of vegetation along the west side of the service road protects the sugar maple stands on the other side.

Histograms of the most important species by canopy class in each coovertype were drawn (Figures 11a to 11l). Figure 11a indicates that the sugar maple type should stay sugar maple barring any large disturbance. This type can be considered a stable community as sugar maple dominates all the tree layers. There are moist spots throughout this type where spicebush and skunk cabbage flourish. Spicebush is more common in the northern half of the Estate, whereas bladdernut (Staphylea trifolia) was found more often in the south.

The sugar maple/hardwoods type are stands that have a variety of hardwoods mixed in the overstory with sugar maple (Figure 11b). These stands generally have an open canopy. Sugar maple dominates the shrub and lower tree layers, but is not the clear dominant tree in the upper layers. Over time sugar maple should increase in dominance and convert this type into a sugar maple type.

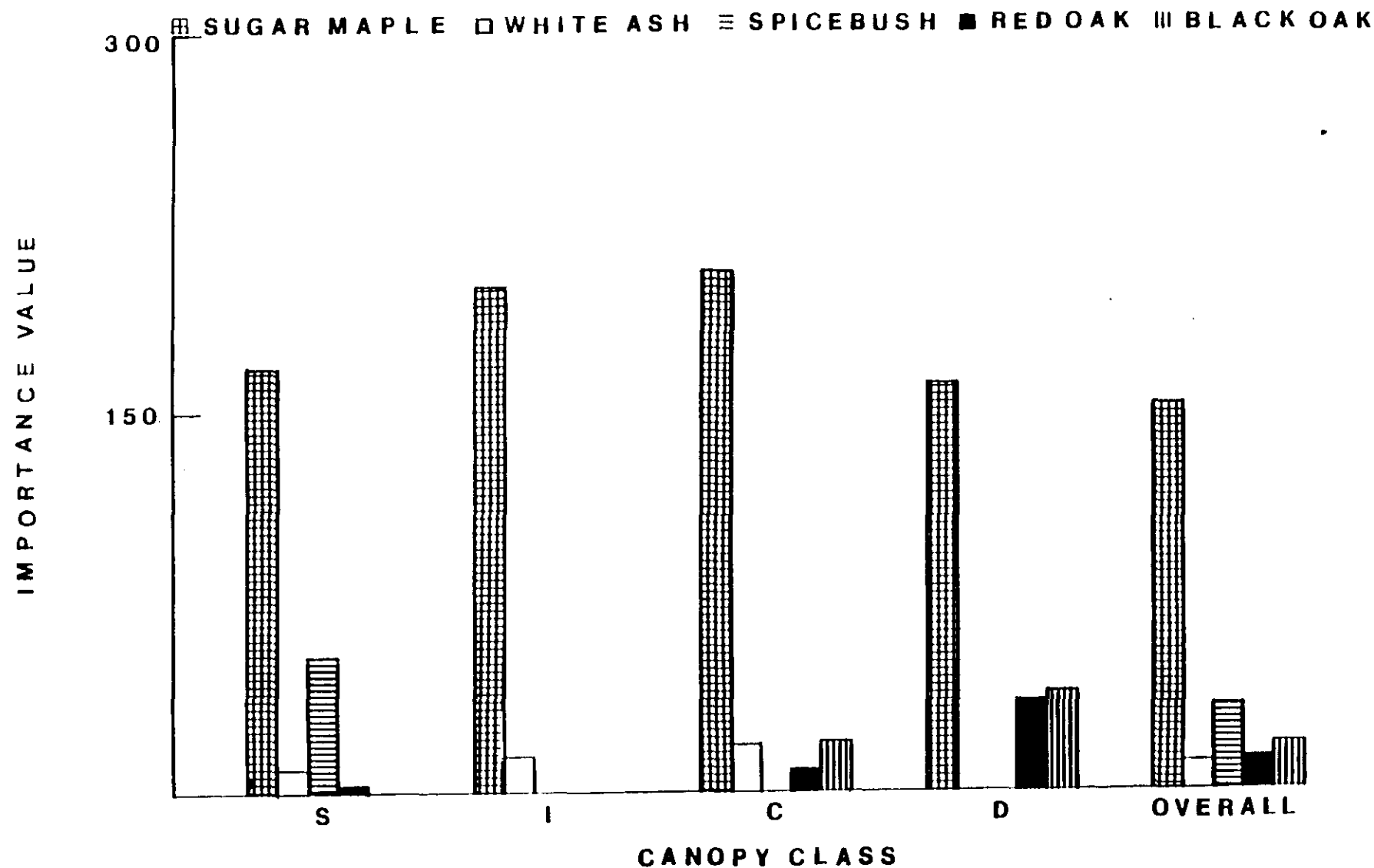


Figure 11a. Plot of species having the highest importance values by canopy classes (s=suppressed; i=intermediate; c=codominant; d=dominant; overall=importance value using data from all classes) for the

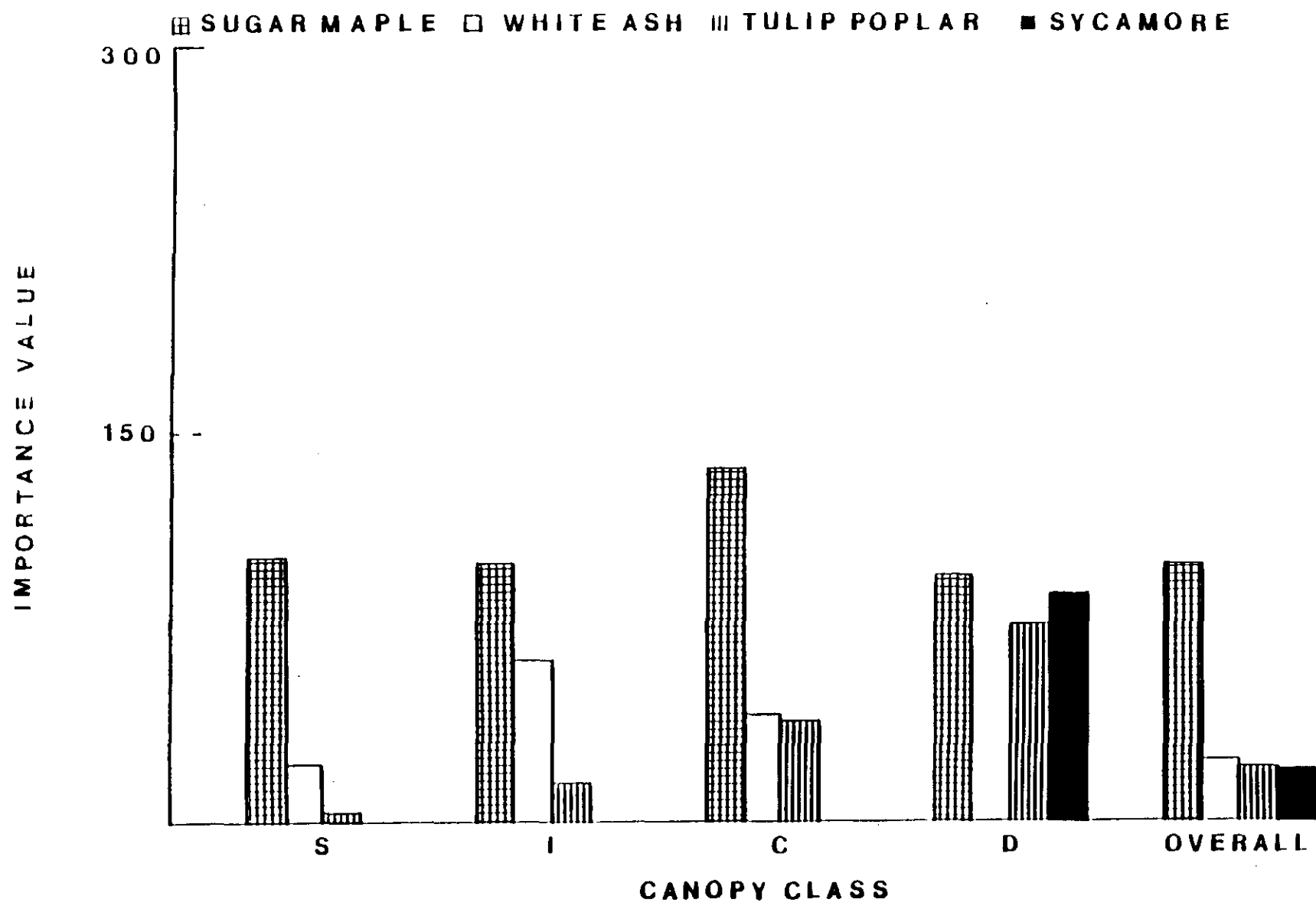


Figure 11b. Sugar Maple/Hardwoods cover type.

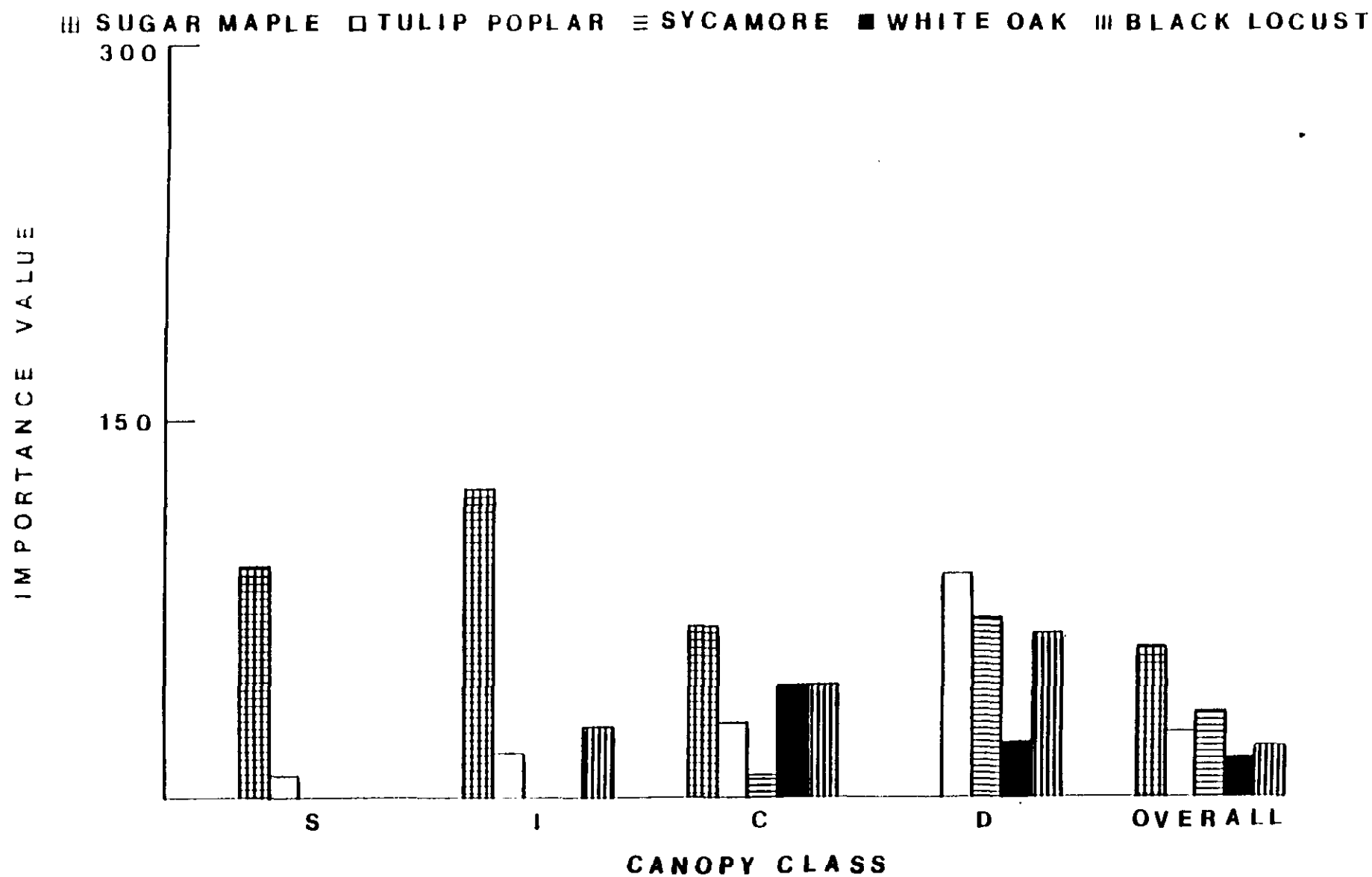


Figure 11c. Sugar Maple/Oak cover type.

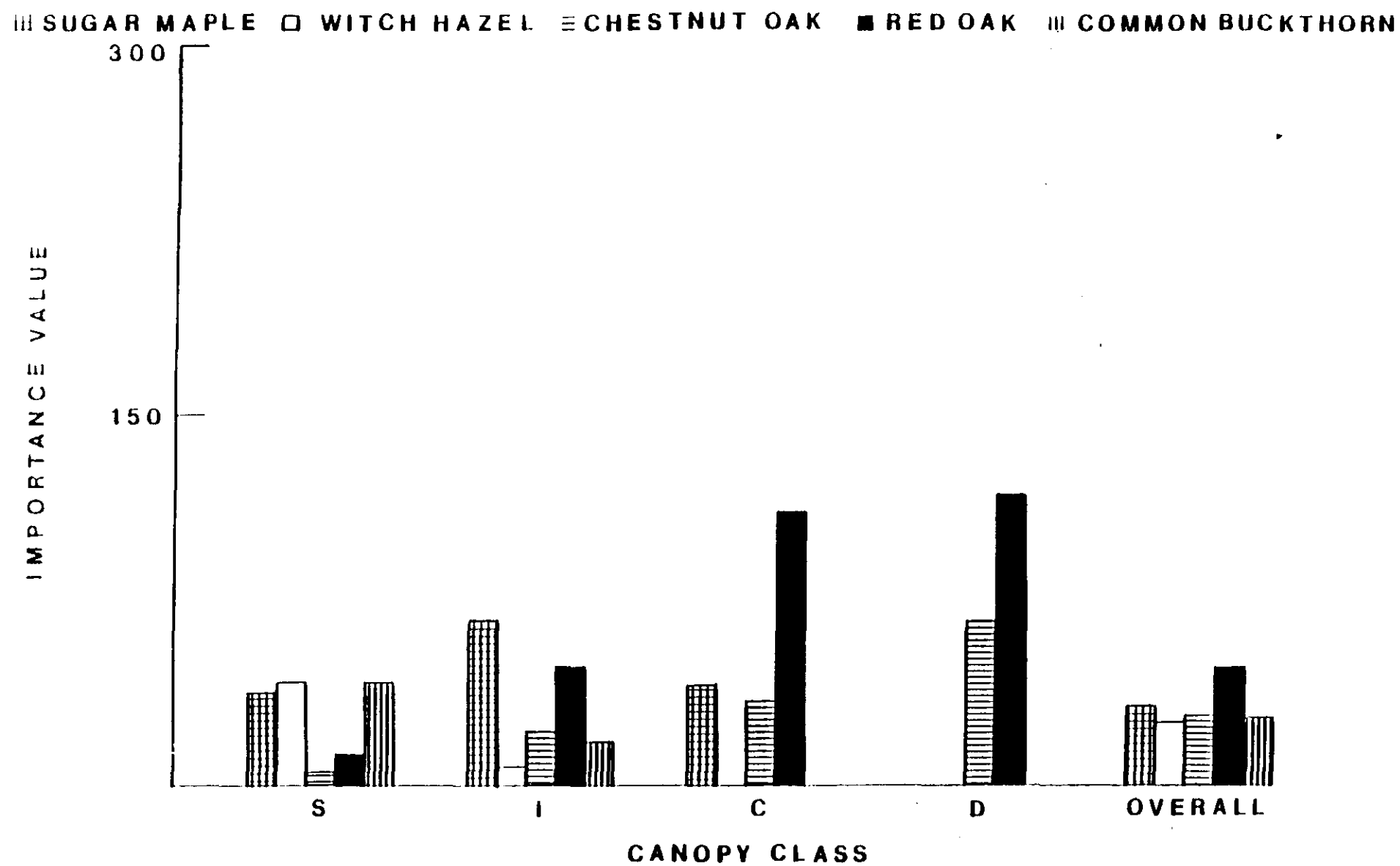


Figure 11d. Oak cover type.

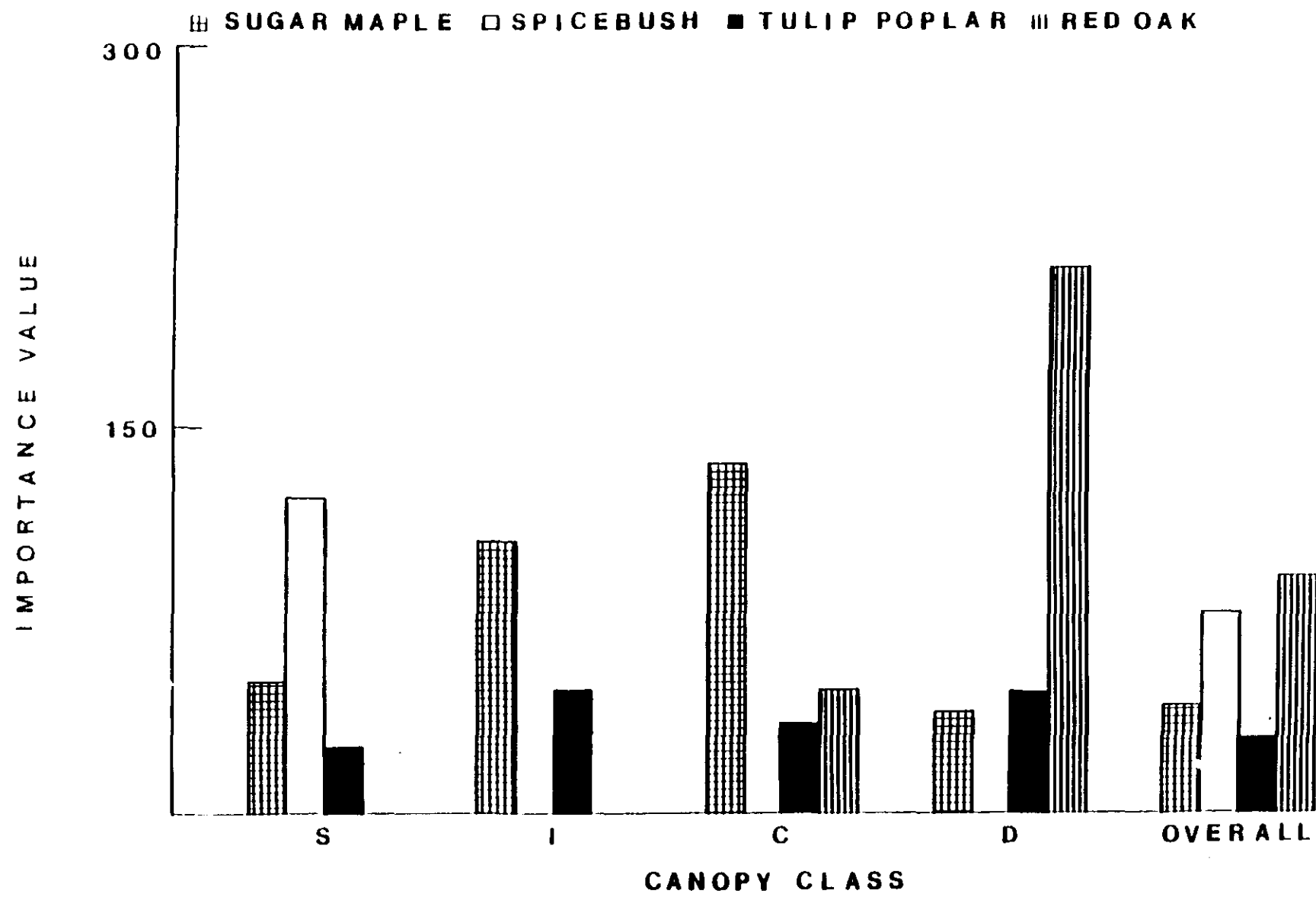


Figure 11e. Oak/Tulip Poplar cover type.

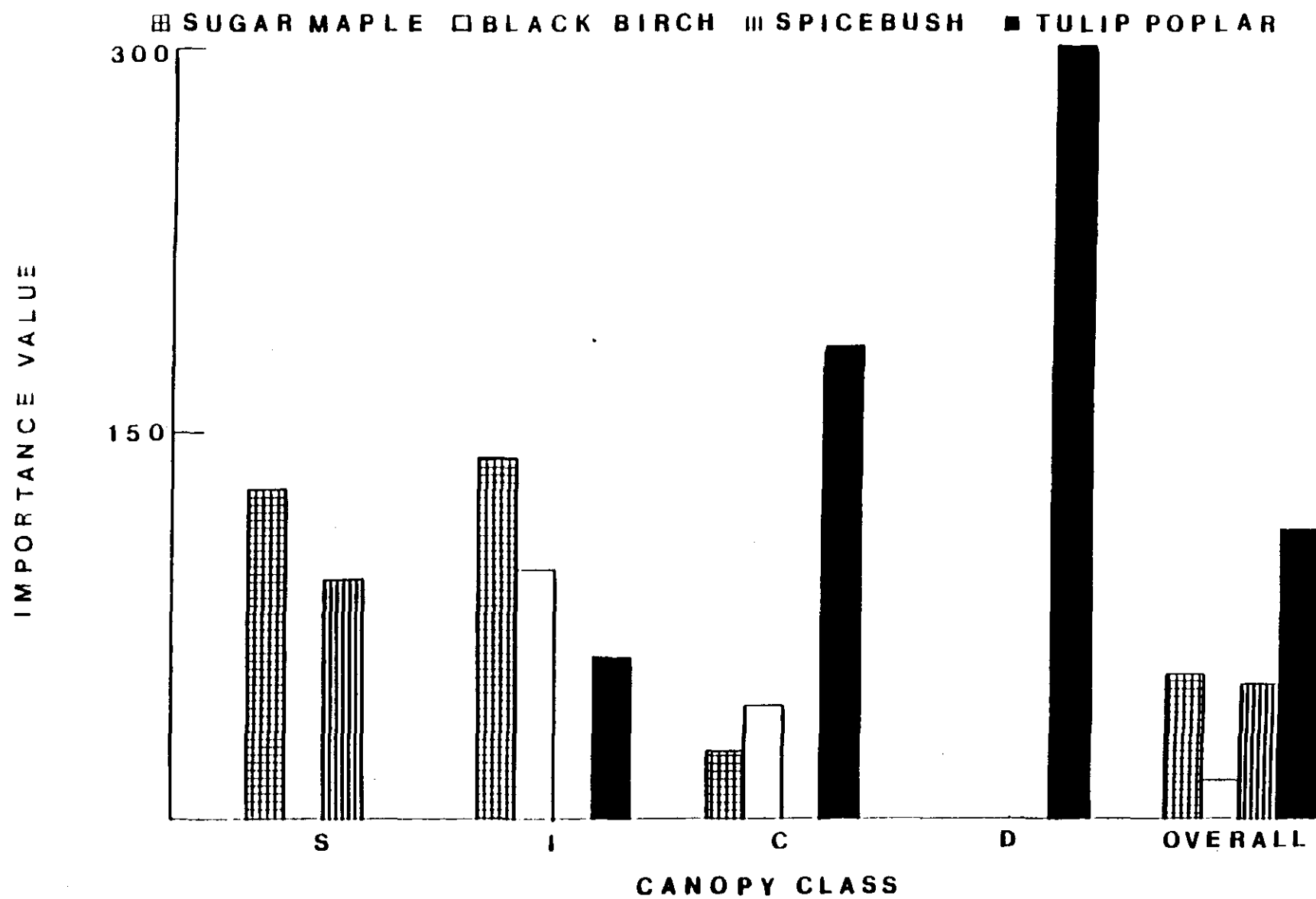


Figure 11f. Tulip Poplar cover type.

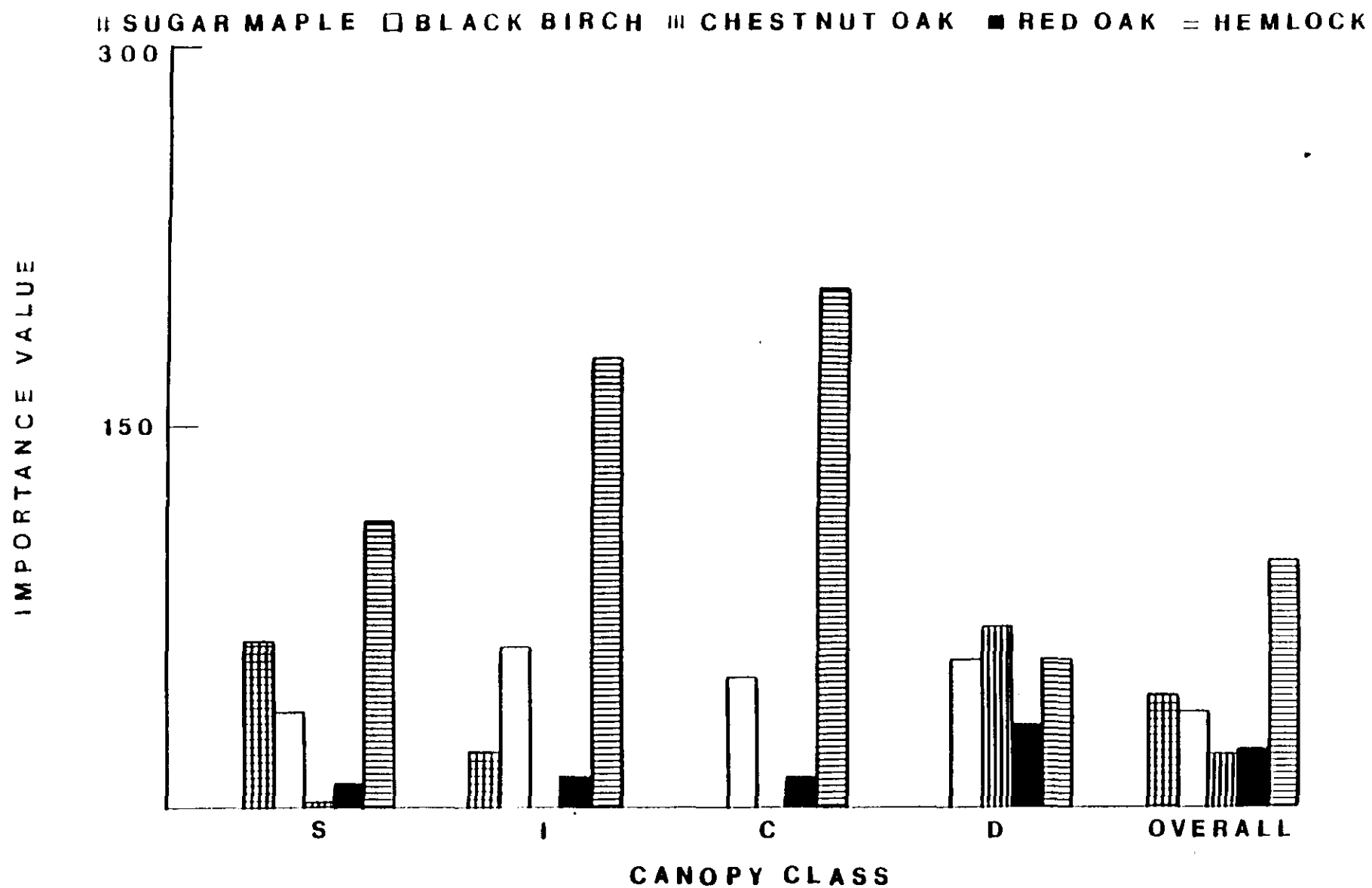


Figure 11g. Hemlock/Hardwoods cover type.

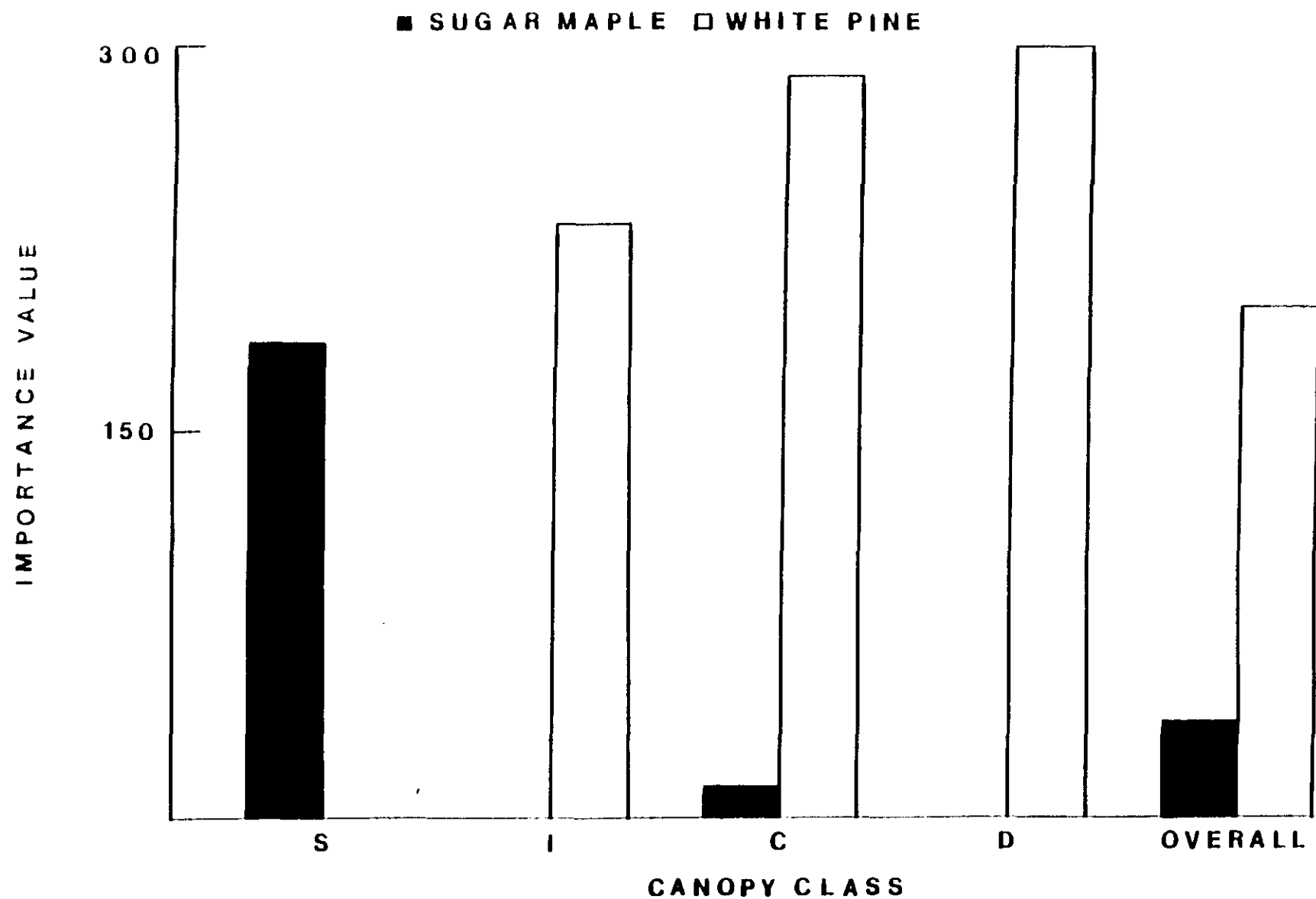


Figure 11h. White Pine cover type.

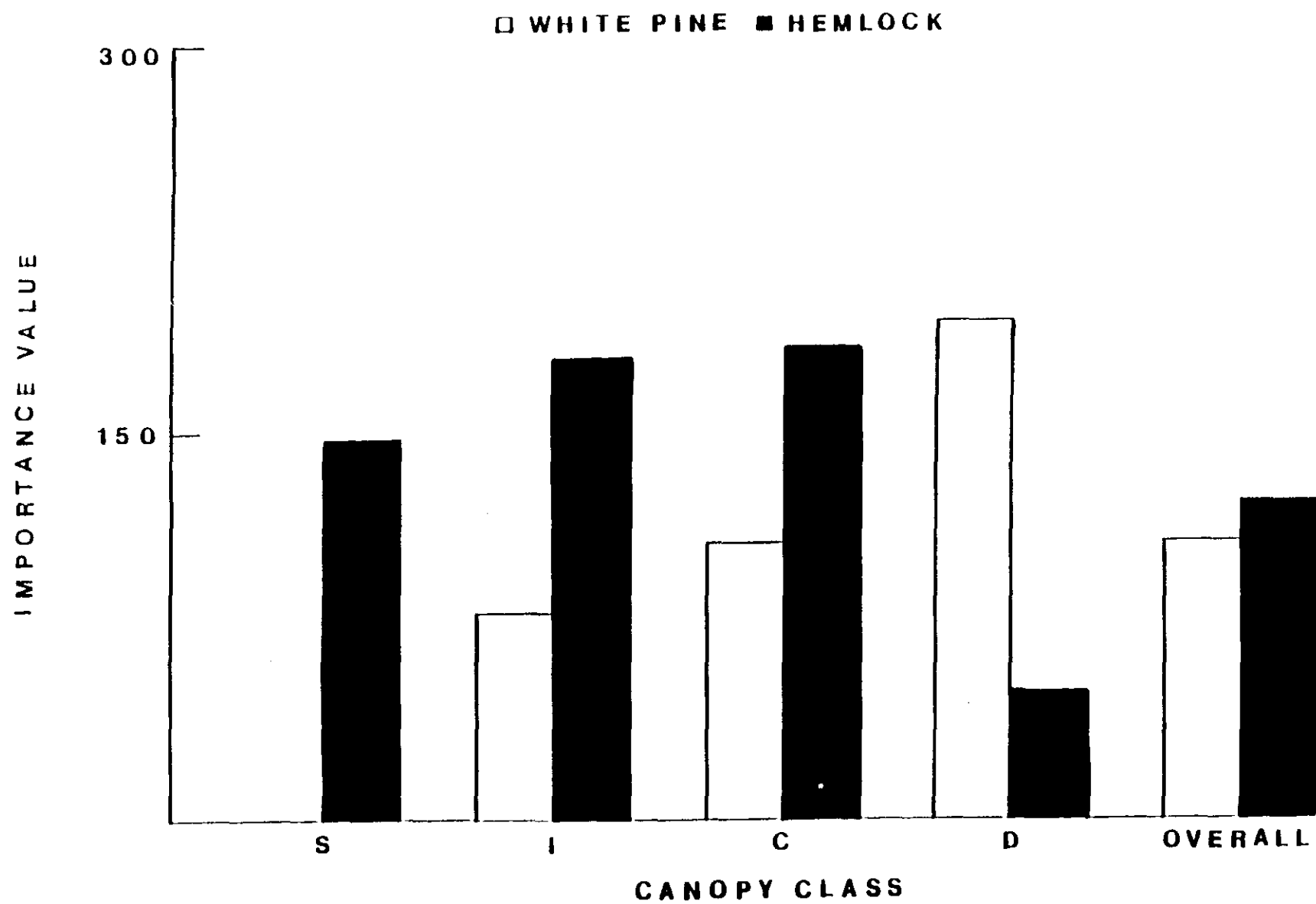


Figure 111. White Pine/Hemlock cover type.

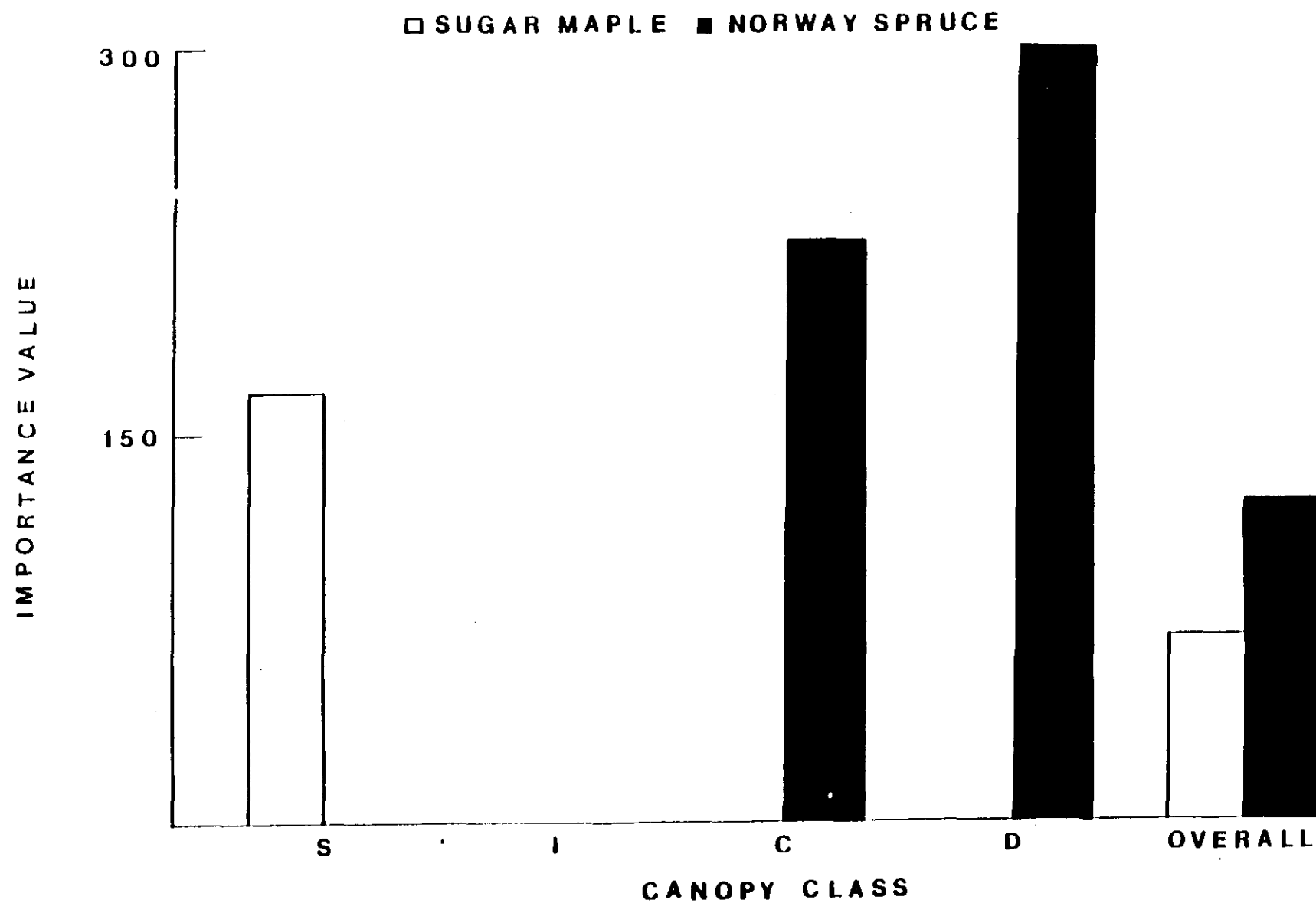


Figure 11j. Norway Spruce cover type.

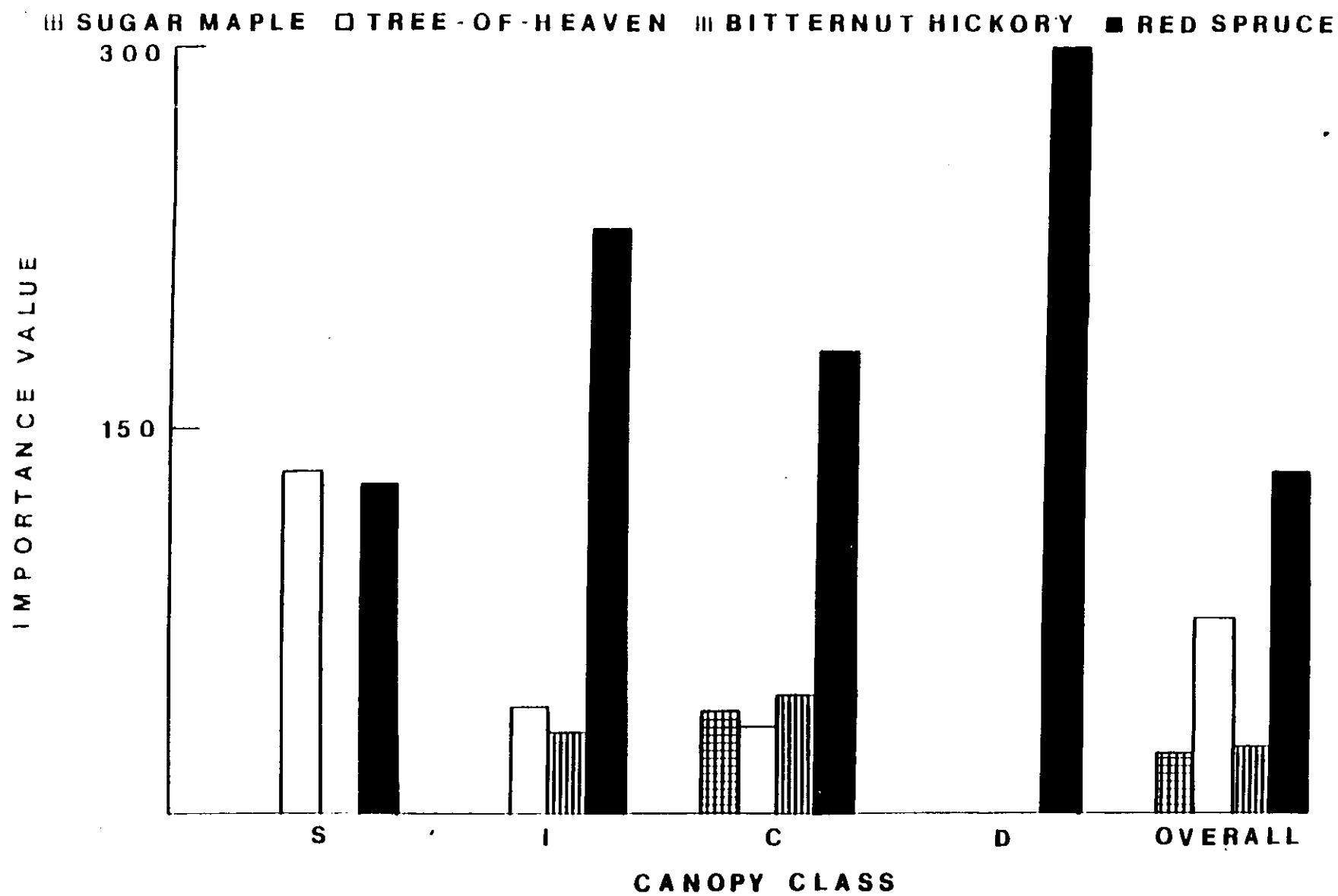


Figure 11k. Red Spruce cover type.

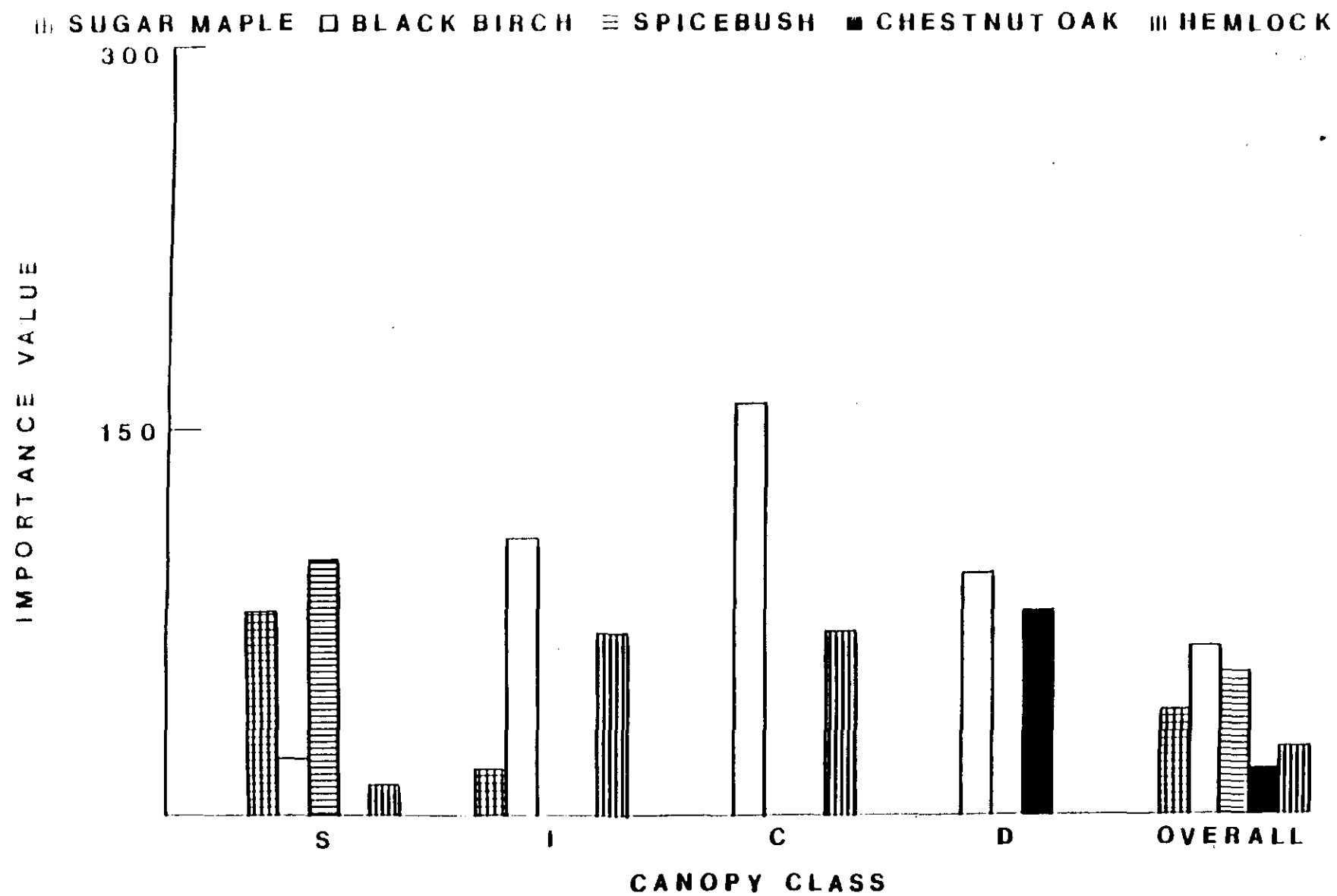


Figure 111. Other Hardwoods cover type.

The sugar maple/oak type is an area in site 2 where sugar maple forms a codominant layer with scattered big oaks overtopping them (Figure 11c). The sugar maples and oaks are continuous throughout this type, but small isolated patches of tulip poplar, black locust and black cherry (Prunus serotina) create a mosaic of small stands. These patches are too small to be broken into individual types, so they were included in this type. The dominance of sugar maple in the shrub, suppressed and intermediate layers should eventually change this type into a sugar maple type. This type is in a moist area, as is indicated by skunk cabbage and spicebush having high importance values.

Oak Dominant Types.

The oak types generally are found on dry exposed areas with shallow, gravelly soil. These types are usually dominated by red oak, however black, chestnut and white oak stands are included in this type. Thus the oak types are composites of stands dominated by different oak species.

The oak type is dominated by red and chestnut oaks in the codominant and dominant layers (Figure 11d). Sugar maple has become established in the shrub, suppressed and intermediate layers. On Bard Rock and on the dry exposed ridgetops along the west side of the service road, these stands should remain oak as they contain little sugar maple regeneration. In the other areas the oak stands may change into sugar maple unless a major disturbance occurs. Sugar maple is more abundant in the understory than oak in these areas. A complicating factor is the soil, which is shallow and rocky. The oaks seem to grow better on these sites than sugar maple, and the soil may be the reason why these sites are not currently sugar maple.

The oak/tulip poplar type is a stand located on the east side of the service road in an area near the southern edge of Bard Rock. Red oak is the major species in the dominant layer, with tulip poplar and sugar maple also present (Figure 11e). Sugar maple has established dominance in the other tree layers. The area had been disturbed by a storm, and this may have allowed the red oaks room to grow in the overstory. Because sugar maple is well established in the lower layers, this stand should change into a sugar maple type.

Tulip Poplar.

This type is on the east side of the service road in the middle of the Estate. It was created by a thinning operation about 40 to 45 years ago. The stand was probably a mixed tulip poplar/sugar maple stand before it was cut. Tulip poplars were left and now are the only species in the dominant layer, and are the most important in the codominant class (Figure 11f). The tulip poplars are over 120 years old. Sugar maple regeneration is abundant in the suppressed and intermediate classes, and a dense cover of spicebush characterizes the shrub layer. The thick spicebush cover may be inhibiting tree regeneration. This stand will convert to sugar maple once the tulip poplars drop out of the overstory. Two out of three tulip poplars cored for age determination on a releve plot had rotten centers. If the majority of the trees in this stand have rotten centers, then these trees may become susceptible to strong winds or begin to show signs of die back in the near future.

Hemlock/Hardwoods.

These stands are found in moist low-lying areas. The hemlocks form a dense cover in the suppressed, intermediate and codominant layers (Figure 11g). Isolated stems of black birches and chestnut oaks are in the dominant class along with hemlock. Soils are typically shallow and rocky, except on the slope south of the mansion. Most of the hemlocks are 60 to 80 years old, with some of the older trees about 150 to 175 years old. On Bard Rock and along the service road the hemlocks are susceptible to strong winds. Hemlocks have a shallow root system which make them easy to blow over. In some areas along the service road there is a lack of hemlock regeneration, but sugar maple and oak seedlings grow along the sides of the stand. If the hemlocks are blown over, these stands will probably be replaced by hardwood types. If no disturbance occurs, however, these stands may form pure hemlock overstories. The dense cover from the hemlock canopy plus the acid soil caused by the hemlock needles keep regeneration in these stands low.

Planted Conifers.

Most of the white pine and hemlocks bordering route 9 were planted between 1906-1937, however some of the white pines are over 130 years old. This stand was planted as a screen between route 9 and the mansion. It is mowed which keeps the understory open. White pine was planted along the stone wall and the hemlocks were later planted on the west side of the white pines near the visitors parking lot. The white pine type composition will not change in the future as white pine dominates all but the suppressed tree layers (Figure 11h). The hemlocks have moved under the white pines

(Figure 11i) and are replacing them as they die. The soil is only 15 to 20 cm deep and is underlain by a hard barrier which appears to be the remains of an old road. The hemlocks may grow better on this site than white pine because of hemlock's shallow root system. The problem of trees being blown over may be a factor on this site due to the thin soil. Because the area is mowed, no new regeneration is likely to become established. Poison ivy forms a thick ground cover.

The norway spruce stand was planted in the southeast corner of the Estate about 60 years ago. Norway spruce is the only species present in the dominant class, and is the most important in the codominant, the only layers where it is present (Figure 11j). Black locust, sugar maple and white ash form a regeneration layer. In parts of this stand nordmann firs (Abies nordmanniana) are mixed in with the norway spruce in the codominant class. The tops of some of the nordmann firs have been broken off by strong winds, creating a gap in the canopy of the stand. Hardwoods are growing into these openings, and in the future this stand will probably be dominated by sugar maple. A problem with this stand is that it is adjacent to private property. If more trees break apart or are blown down, there is a good chance they may fall onto the private property and cause damage that the Park Service will be responsible for repairing.

The red spruce stands are planted along the service road and on Bard Rock. The trees were planted approximately 50 years ago. Since the planting some sugar maples, tree-of-heavens and bitternut hickories have grown into the canopy (Figure 11k). As the hardwoods enter the overstory, they overtop smaller red spruce trees, eventually killing them. This creates room for more

hardwoods to grow into the overstory and change the stand into a hardwood type. The dense overstory has kept the understory sparse.

Meadow.

The meadows are grass dominated fields that are mowed yearly. This has kept the meadows from becoming shrub fields. American elm, white ash, black cherry, sassafras, sugar maple and snowberry were found in the meadows. If these areas were not mowed these hardwood species would start to change the character of the vegetation. On the releve plots tree-of-heaven was found on the slope by the mansion. This plant is a problem at the Estate as it would obstruct the vista to the Hudson. Mowing and cutting by hand removes the stem, but the stump sprouts profusely, creating the same problem the next year. As long as the mowing continues the meadows should remain unchanged. A large number of species of herbs and lianas are growing in the meadows, with raspberry, woodbind, and poison ivy having the highest importance values. Poison ivy was growing densely in the meadow north of the mansion and on the slope west of the pavilion, but was only sporadically encountered elsewhere.

Other Hardwoods.

The other hardwoods type occupies areas where the vegetation is in the early stages of succession. Because these are small isolated patches, it is unrealistic to describe what the future vegetation will be except to predict that it will eventually become similar to the forest surrounding the area. This is currently happening in some of these areas as sugar maple and hemlock are in the suppressed, intermediate and codominant classes (Figure 111).

Marsh.

These areas are characterized by standing water. The wet conditions inhibit growth of plants not properly adapted. Therefore these areas should not change much in the future.

RECOMMENDATIONS

Based upon the findings of this study, the following recommendations are made;

1. The two erosion gullies northwest of the pavilion are expanding and disturbing the vegetation on the sides. The rate of erosion of these gullies should be determined. Once this information is obtained, it can be decided whether any measures should be taken to control the erosion.
2. Vines that have grown into the crown of trees bordering the northern meadows and along the service road should be removed. The vines weaken the trees and increase susceptibility to wind damage.
3. The meadows should continue to be mowed. If the mowing were to stop shrubs and trees would overgrow the current vegetation. The present vegetation has been perpetuated by the mowing. If another form of treatment is to be used in the meadows, a study should be conducted to determine the effects the new treatment would have on the plants. A new treatment may favor different species of plants and change the composition of the vegetation communities in the meadows.
4. In the early 1940's a regional forester identified and tagged trees throughout the Estate. A map was made showing the location of all the trees tagged. It would be interesting to relocate these trees to see how many are still alive and what killed the others. This information will be useful in determining the extent of storm damage on the Estate and what areas may be prone to strong winds or lightning.

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Appendix A

Results from PROGIV for plant importance values.

Table A1.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 27: SUGAR MAPLE
96 HERB AND SHRUB PLOTS 24 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	128.9	168.4	205.5	206.7	160.2	153.2
AILANTHUS ALTISSIMA	.0	5.3	4.7	3.0	5.1	.0	4.8
ALLIARIA OFFICINALIS	6.9	.0	.0	.0	.0	.0	.0
ALLIUM SPP.	2.8	.0	.0	.0	.0	.0	.0
ANEMONELLA THALICTROIDES	4.4	.0	.0	.0	.0	.0	.0
ARALIA NUDICAULIS	1.8	.0	.0	.0	.0	.0	.0
ARISAEMA ATORORUBENS	21.0	.0	.0	.0	.0	.0	.0
ASTER SPP.	1.0	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	26.5	.0	.0	.0	.0	.0	.0
BETULA LENTA	.6	.0	4.5	5.9	13.7	22.2	10.4
BOEHMERIA CYLINDRICA	3.0	.0	.0	.0	.0	.0	.0
BOTRYCHIUM VIRGINIANUM	.4	.0	.0	.0	.0	.0	.0
CAREX SPP.	.7	.0	.0	.0	.0	.0	.0
CARPINUS CAROLINIANA	.0	3.9	8.9	4.6	.0	.0	5.2
CARYA CORDIFORMIS	.0	.0	6.4	12.7	4.7	9.9	7.3
CARYA GLABRA	.0	2.0	.0	.0	.0	.0	.0
CARYA TOMENTOSA	.0	.0	.0	.0	.0	11.9	2.8
CELASTRUS SCANDENS	3.7	.0	.0	.0	.0	.0	.0
CIRCAEA QUADRISULCATA	5.2	.0	.0	.0	.0	.0	.0
COLLINSONIA CANADENSIS	1.4	.0	.0	.0	.0	.0	.0
CORNUS FLORIDA	.0	.0	4.6	3.5	.1	.0	2.7
DENTARIA DIPHYLLA	1.6	.0	.0	.0	.0	.0	.0
DRYOPTERIS MARGINALIS	.8	.0	.0	.0	.0	.0	.0
DRYOPTERIS SPINULOSA	1.9	.0	.0	.0	.0	.0	.0
FAGUS GRANDIFOLIA	.0	.0	1.9	3.9	4.1	.0	3.7
FRAXINUS AMERICANA	.0	8.6	9.8	14.5	18.2	.0	11.2
GRAMINEAE	.8	.0	.0	.0	.0	.0	.0
HAMAMELIS VIRGINIANA	.0	.0	10.2	.0	.0	.0	7.1
IMPATIENS CAPENSIS	8.2	.0	.0	.0	.0	.0	.0
LICHENS SPP.	2.0	.0	.0	.0	.0	.0	.0
LINDERA BENZOIN	.0	72.8	53.7	.0	.0	.0	34.9
LIRIODENDRON TULIPIFERA	.0	1.6	.0	.0	.0	.0	.0
MAGNOLIA TRIPETALA	.0	.0	2.3	3.9	.0	.0	1.6
MOSS	11.1	.0	.0	.0	.0	.0	.0
ONOCLEA SENSIBILIS	1.1	.0	.0	.0	.0	.0	.0
OSMORHIZA CLAYTONI	2.4	.0	.0	.0	.0	.0	.0
OSTRYA VIRGINIANA	.0	1.6	1.8	8.0	.1	.0	2.6
PARTHENOCISSUS SPP.	23.4	.0	.0	.0	.0	.0	.0
PICEA RUBENS	.0	.0	7.0	3.8	.0	.0	1.6
POLYGONATUM PUBESCENS	1.3	.0	.0	.0	.0	.0	.0
POLYPODIUM VULGARE	.6	.0	.0	.0	.0	.0	.0
POLYSTICHUM ACROSTICHOIDES	2.2	.0	.0	.0	.0	.0	.0

Table A1. Continued.

PRUNUS AVIUM	.0	7.1	5.8	7.9	.0	.0	3.0
PRUNUS SEROTINA	.0	.0	.0	.0	5.2	9.7	2.1
QUERCUS ALBA	.0	.0	.0	.0	.0	11.3	2.5
QUERCUS RUBRA	.0	5.9	1.6	.0	9.6	35.2	11.0
QUERCUS VELUTINA	.0	.0	.0	.0	19.2	39.6	18.4
RHAMNUS ALNIFOLIA	.0	1.6	.0	.0	.0	.0	.0
RHUS GLABRA	.0	.0	1.6	.0	.0	.0	1.1
RHUS RADICANS	3.6	.0	.0	.0	.0	.0	.0
RHUS TYPHINA	.0	2.4	.0	.0	.0	.0	.0
ROBINIA PSEUDO-ACACIA	.0	.0	.0	.0	6.9	.0	2.1
RUBUS SPP.	1.4	.0	.0	.0	.0	.0	.0
SANICULA TRIFOLIATA	.4	.0	.0	.0	.0	.0	.0
SASSAFRAS ALBIDUM	.0	2.0	1.6	.0	.0	.0	1.1
SMILACINA RACEMOSA	4.8	.0	.0	.0	.0	.0	.0
SOLANUM DULCAMARA	.5	.0	.0	.0	.0	.0	.0
STAPHYLEA TRIFOLIA	.0	28.7	2.0	3.8	.0	.0	1.5
SYMPLOCARPUS FOETIDUS	20.9	.0	.0	.0	.0	.0	.0
THELYPTERIS NOVEBORACENSIS	.6	.0	.0	.0	.0	.0	.0
TILIA AMERICANA	.0	2.6	1.6	11.6	.0	.0	2.8
TSUGA CANADENSIS	.0	.0	.0	.0	6.4	.0	1.9
ULMUS AMERICANA	.0	.0	1.8	7.4	.0	.0	3.6
VIBURNUM ACERIFOLIUM	.0	21.8	.0	.0	.0	.0	.0
VIBURNUM DENTATUM	.0	2.9	.0	.0	.0	.0	.0
VINCA MINOR	10.3	.0	.0	.0	.0	.0	.0
VIOLA INCOGNITA	3.1	.0	.0	.0	.0	.0	.0
VIOLA SPP.	13.5	.0	.0	.0	.0	.0	.0
VITIS SPP.	.6	.0	.0	.0	.0	.0	.0
UNKNOWN GOLDENROD	2.2	.0	.0	.0	.0	.0	.0
GERANIUM MACULATUM	.4	.0	.0	.0	.0	.0	.0
GERANIUM ROBERTIANUM	.5	.0	.0	.0	.0	.0	.0
OSMUNDA CINNAMOMEA	.6	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A2.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 28: SUGAR MAPLE/HARDWOODS
16 HERB AND SHRUB PLOTS 4 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	107.6	101.6	99.2	136.4	94.9	97.7
ALLIARIA OFFICINALIS	26.3	.0	.0	.0	.0	.0	.0
ARISAEMA ATRO-RUBENS	11.1	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	4.8	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	.0	23.0	27.5	.0	.0	14.6
BOTRYCHIDIUM VIRGINIANUM	1.9	.0	.0	.0	.0	.0	.0
CAREX SPP.	12.5	.0	.0	.0	.0	.0	.0
CARYA CORDIFORMIS	.0	.0	20.1	15.0	38.4	.0	15.5
CATALPA SPECIOSA	2.4	.0	.0	.0	.0	.0	.0
CELASTRUS SCANDENS	25.4	.0	.0	.0	.0	.0	.0
CIRCAEA QUADRISULCATA	9.4	.0	.0	.0	.0	.0	.0
CORNUS FLORIDA	.0	28.9	7.9	8.9	.0	.0	5.5
DRYOPTERIS SPINULOSA	4.5	.0	.0	.0	.0	.0	.0
EUONYMUS ALATUS	.0	20.5	.0	.0	.0	.0	.0
FAGUS GRANDIFOLIA	.0	.0	18.4	19.3	46.0	.0	17.7
FRAXINUS AMERICANA	.0	32.2	22.2	60.6	41.2	.0	23.7
HAMAMELIS VIRGINIANA	.0	.0	19.4	.0	.0	.0	11.1
JUNIPERUS VIRGINIANA	.0	.0	3.9	.0	.0	.0	3.5
LINDERA BENZOIN	.0	17.4	18.5	9.2	.0	.0	15.0
LIRIODENDRON TULIPIFERA	.0	.0	4.4	14.1	38.1	74.8	21.6
MORUS ALBA	.0	.0	.0	10.4	.0	.0	3.8
MOSS	2.4	.0	.0	.0	.0	.0	.0
OSTRYA VIRGINIANA	.0	39.9	6.5	.0	.0	.0	5.0
OXALIS MONTANA	10.1	.0	.0	.0	.0	.0	.0
PARTHENOCISSUS SPP.	16.0	.0	.0	.0	.0	.0	.0
PINUS STROBUS	.0	13.3	.0	.0	.0	.0	.0
PLATANUS OCCIDENTALIS	.0	.0	.0	.0	.0	86.9	20.4
PRUNUS SEROTINA	.0	.0	3.9	.0	.0	.0	3.5
QUERCUS ALBA	.0	.0	4.0	.0	.0	.0	3.5
QUERCUS RUBRA	.0	.0	9.3	.0	.0	.0	7.7
RHAMNUS CATHARTICA	.0	.0	5.0	.0	.0	.0	4.4
RHUS RADICANS	42.2	.0	.0	.0	.0	.0	.0
SMILACINA RACEMOSA	3.7	.0	.0	.0	.0	.0	.0
SOLIDAGO SPP.	2.4	.0	.0	.0	.0	.0	.0
TSUGA CANADENSIS	.0	.0	3.9	.0	.0	.0	3.5
ULMUS AMERICANA	.0	.0	22.5	35.7	.0	43.4	17.5
VIBURNUM ACERIFOLIUM	.0	40.2	5.3	.0	.0	.0	4.6
VIOLA SPP.	18.3	.0	.0	.0	.0	.0	.0

Table A2. Continued.

VITIS SPP.	1.9	.0	.0	.0	.0	.0	.0
UNKNOWN GOLDENROD	4.8	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A3.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 29: SUGAR MAPLE/OAK
28 HERB AND SHRUB PLOTS 7 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	156.6	90.4	122.7	66.5	.0	59.1
AILANTHUS ALTISSIMA	.0	6.0	12.3	.0	12.0	3.5	7.2
ALLIARIA OFFICINALIS	12.0	.0	.0	.0	.0	.0	.0
ARISAEMA ATRORUBENS	13.5	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	10.5	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	.0	.0	.0	8.8	.0	2.3
BOEHMERIA CYLINDRICA	.9	.0	.0	.0	.0	.0	.0
CAREX SPP.	2.7	.0	.0	.0	.0	.0	.0
CARPINUS CAROLINIANA	.0	.0	7.3	7.6	.0	.0	4.4
CARYA GLABRA	.0	.0	5.2	7.8	8.0	.0	5.7
CARYA TOMENTOSA	.0	.0	3.0	.0	.0	.0	1.8
CELASTRUS SCANDENS	1.2	.0	.0	.0	.0	.0	.0
CIRCAEA QUADRISULCATA	4.1	.0	.0	.0	.0	.0	.0
COLLINSONIA CANADENSIS	2.5	.0	.0	.0	.0	.0	.0
CORNUS RACEMOSA	.0	13.1	2.7	.0	.0	.0	1.9
DENTARIA DIPHYLLA	1.2	.0	.0	.0	.0	.0	.0
EUPATORIUM PERFOLIATUM	1.2	.0	.0	.0	.0	.0	.0
FRAXINUS AMERICANA	.0	7.0	20.5	.0	.0	.0	10.3
GRAMINEAE	2.2	.0	.0	.0	.0	.0	.0
HAMAMELIS VIRGINIANA	.0	.0	26.7	.0	.0	.0	12.7
IMPATIENS CAPENSIS	9.9	.0	.0	.0	.0	.0	.0
LINDERA BENZOIN	.0	96.5	71.3	.0	.0	.0	41.2
LIRIODENDRON TULIPIFERA	.0	.0	9.5	17.5	30.4	88.0	25.3
LONICERA TATARICA	.0	.0	9.5	.0	.0	.0	6.3
LYTHRUM SALICARIA	4.4	.0	.0	.0	.0	.0	.0
MOSS	9.4	.0	.0	.0	.0	.0	.0
OSTRYA VIRGINIANA	.0	.0	.0	16.3	.0	.0	3.7
PARTHENOCISSUS SPP.	32.5	.0	.0	.0	.0	.0	.0
PLATANUS OCCIDENTALIS	.0	.0	.0	.0	9.5	71.0	33.2
POLYGONATUM PUBESCENS	1.5	.0	.0	.0	.0	.0	.0
PRUNUS AVIUM	.0	.0	2.7	18.5	.0	.0	2.8
PRUNUS SEROTINA	.0	5.8	15.7	25.7	15.4	.0	9.7
QUERCUS ALBA	.0	.0	.0	.0	43.7	21.6	15.5
QUERCUS RUBRA	.0	.0	.0	.0	9.0	27.6	7.6
QUERCUS VELUTINA	2.9	.0	.0	19.8	15.5	.0	4.1
RHUS RADICANS	1.2	.0	.0	.0	.0	.0	.0
RHUS TYPHINA	.0	.0	3.1	.0	.0	.0	2.1
ROBINIA PSEUDO-ACACIA	.0	.0	.0	27.8	43.6	64.4	20.9
RUBUS SPP.	1.5	.0	.0	.0	.0	.0	.0
SASSAFRAS ALBIDUM	.0	7.0	.0	.0	9.1	.0	2.3
SMILACINA RACEMOSA	4.6	.0	.0	.0	.0	.0	.0
SOLANUM DULCAMARA	3.8	.0	.0	.0	.0	.0	.0

Table A3. Continued.

SOLIDAGO SPP.	1.2	.0	.0	.0	.0	.0	.0
STAPHYLEA TRIFOLIA	.0	7.9	.0	.0	.0	.0	.0
SYMPLOCARPUS FOETIDUS	30.1	.0	.0	.0	.0	.0	.0
TILIA AMERICANA	.0	.0	5.5	8.9	16.5	23.9	8.1
TOVARA VIRGINIANA	3.5	.0	.0	.0	.0	.0	.0
TSUGA CANADENSIS	.0	.0	.0	.0	11.9	.0	3.2
ULMUS AMERICANA	.0	.0	14.5	27.4	.0	.0	8.6
VIOLA SPP.	20.8	.0	.0	.0	.0	.0	.0
UNKNOWN GOLDENROD	2.0	.0	.0	.0	.0	.0	.0
GERANIUM MACULATUM	12.2	.0	.0	.0	.0	.0	.0
GERANIUM ROBERTIANUM	4.4	.0	.0	.0	.0	.0	.0
SANGUINARIA CANADENSIS	2.4	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A4.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 52: OAK
72 HERB AND SHRUB PLOTS 18 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	54.6	35.2	67.4	39.1	.0	31.2
ACHILLEA MILLEFOLIUM	.6	.0	.0	.0	.0	.0	.0
AILANTHUS ALTISSIMA	.0	1.2	3.4	2.4	.0	.0	2.6
ALLIARIA OFFICINALIS	4.8	.0	.0	.0	.0	.0	.0
AMELANCHIER SPP.	.0	.0	1.0	.0	.0	.0	.7
ANEMONELLA THALICTROIDES	1.7	.0	.0	.0	.0	.0	.0
ARALIA NUDICAULIS	5.8	.0	.0	.0	.0	.0	.0
ARISAEMA ATRORUBENS	3.3	.0	.0	.0	.0	.0	.0
ASTER SPP.	4.8	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	16.6	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	5.0	4.4	16.3	20.9	.0	6.4
BOEHMERIA CYLINDRICA	1.0	.0	.0	.0	.0	.0	.0
CAREX SPP.	10.3	.0	.0	.0	.0	.0	.0
CARPINUS CAROLINIANA	.0	.0	1.3	.0	.0	.0	.7
CARYA CORDIFORMIS	.0	2.2	.0	17.7	4.8	.0	3.4
CARYA GLABRA	.0	3.1	7.3	9.8	.0	.0	5.8
CARYA OVATA	.0	.0	1.4	.0	.0	9.3	1.8
CARYA TOMENTOSA	.0	1.2	15.3	12.8	9.8	.0	11.1
CASSIA HEBECARPA	.8	.0	.0	.0	.0	.0	.0
CATALPA SPECIOSA	.0	.0	1.0	.0	.0	.0	.7
CAULOPHYLLUM THALICTROIDES	.6	.0	.0	.0	.0	.0	.0
CELASTRUS SCANDENS	.8	.0	.0	.0	.0	.0	.0
CHIMAPHILA MACULATA	.4	.0	.0	.0	.0	.0	.0
CIRCAEA QUADRISULCATA	3.3	.0	.0	.0	.0	.0	.0
COMMELINA COMMUNIS	.8	.0	.0	.0	.0	.0	.0
(CF) CONIUM MACULATUM	.4	.0	.0	.0	.0	.0	.0
CORNUS ALTERNIFOLIA	.0	10.4	1.1	.0	.0	.0	.8
CORNUS FLORIDA	.0	19.0	8.8	5.4	.0	.0	4.0
CORNUS RACEMOSA	.0	.0	1.7	.0	.0	.0	1.4
DENTARIA DIPHYLLA	1.3	.0	.0	.0	.0	.0	.0
DESCHAMPSIA SPP.	11.7	.0	.0	.0	.0	.0	.0
DRYOPTERIS MARGINALIS	.8	.0	.0	.0	.0	.0	.0
DRYOPTERIS SPINULOSA	.4	.0	.0	.0	.0	.0	.0
FAGUS GRANDIFOLIA	.0	.0	.8	.0	.0	.0	.6
FRAXINUS AMERICANA	.0	26.6	10.9	.0	15.9	.0	10.1
GALIUM APARINE	.6	.0	.0	.0	.0	.0	.0
GRAMINEAE	14.8	.0	.0	.0	.0	.0	.0
HAMAMELIS VIRGINIANA	.0	13.8	42.8	6.2	.0	.0	24.6
(CF) HEPATICA ACUTILOBA	.4	.0	.0	.0	.0	.0	.0
HIERACIUM VENOSUM	.4	.0	.0	.0	.0	.0	.0
LICHENS SPP.	3.1	.0	.0	.0	.0	.0	.0
LINDERA BENZOIN	.0	5.3	8.9	.0	.0	.0	6.8
LIRIODENDRON TULIPIFERA	.0	.0	1.2	.0	.0	.0	.7

Table A4. Continued.

LONICERA TATARICA	.0	.0	1.3	.0	.0	.0	1.1
LYSIMACHIA QUADRIFOLIA	2.1	.0	.0	.0	.0	.0	.0
MAGNOLIA TRIPETALA	.0	.0	.8	.0	.0	.0	.6
MELAMPYRUM LINEARE	2.5	.0	.0	.0	.0	.0	.0
MOSS	13.1	.0	.0	.0	.0	.0	.0
OSTRYA VIRGINIANA	.0	1.6	3.4	16.1	4.8	.0	6.1
OXALIS EUROPEA	.8	.0	.0	.0	.0	.0	.0
PANICUM SPP.	.4	.0	.0	.0	.0	.0	.0
PARTHENOCISSUS SPP.	22.1	.0	.0	.0	.0	.0	.0
PHILADELPHUS GRANDIFLORUS	.0	.0	.8	.0	.0	.0	.6
PHYTOLACCA AMERICANA	.8	.0	.0	.0	.0	.0	.0
PINUS STROBUS	.0	.0	2.3	6.8	.0	10.2	3.7
POLYGONATUM PUBESCENS	7.2	.0	.0	.0	.0	.0	.0
PRUNUS AVIUM	.0	1.0	.0	.0	.0	.0	.0
PRUNUS SEROTINA	.0	6.9	4.9	4.1	.0	9.4	4.8
PRUNUS VIRGINIANA	.0	10.8	2.2	.0	.0	.0	1.6
PTERIDIUM AQUILINUM	1.9	.0	.0	.0	.0	.0	.0
QUERCUS ALBA	.0	1.2	.0	3.4	21.1	35.2	14.5
QUERCUS PRINUS	.0	6.2	5.2	21.2	33.6	66.9	26.2
QUERCUS RUBRA	.0	10.9	12.3	47.8	110.2	118.0	47.4
QUERCUS VELUTINA	.0	.0	.0	3.1	.0	17.9	4.6
RHAMNUS CATHARTICA	.0	15.4	40.8	15.9	.0	.0	26.7
RHUS GLABRA	.0	.0	.9	.0	.0	.0	.6
RHUS RADICANS	7.3	.0	.0	.0	.0	.0	.0
RHUS TYPHINA	.0	1.8	.0	.0	.0	.0	.0
ROBINIA PSEUDO-ACACIA	.0	2.5	9.9	.0	5.0	.0	4.5
RUBUS OCCIDENTALIS	2.7	.0	.0	.0	.0	.0	.0
RUBUS SPP.	2.5	.0	.0	.0	.0	.0	.0
SASSAFRAS ALBIDUM	.0	7.8	1.8	7.1	28.0	.0	6.0
SMILACINA RACEMOSA	10.1	.0	.0	.0	.0	.0	.0
SOLIDAGO SPP.	11.8	.0	.0	.0	.0	.0	.0
STAPHYLEA TRIFOLIA	.0	14.8	6.2	.0	.0	.0	4.5
STYRAX AMERICANA	.0	.0	.8	.0	.0	.0	.6
TILIA AMERICANA	.0	.0	1.5	.0	.0	.0	1.0
TSUGA CANADENSIS	.0	2.0	34.2	21.9	6.7	33.1	14.6
ULMUS AMERICANA	.0	.0	3.3	14.6	.0	.0	4.1
VACCINIUM VACILLANS	1.3	14.6	.0	.0	.0	.0	.0
VIBURNUM ACERIFOLIUM	.0	54.4	12.7	.0	.0	.0	10.3
VIBURNUM DENTATUM	.0	1.5	.0	.0	.0	.0	.0
VIBURNUM RAFINESQUIANUM	.0	1.0	3.0	.0	.0	.0	2.4
VIOLA SPP.	12.1	.0	.0	.0	.0	.0	.0
VITIS SPP.	1.2	.0	.0	.0	.0	.0	.0
GRASS 18	1.0	.0	.0	.0	.0	.0	.0

Table A4. Continued.

UNKNOWN GOLDENROD	6.6	.0	.0	.0	.0	.0	.0
GERANIUM MACULATUM	1.3	.0	.0	.0	.0	.0	.0
OENOTHERA BIENNIS	1.4	.0	.0	.0	.0	.0	.0
ROSA SPP.	.0	3.3	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A5.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 53: OAK/TULIP POPLAR
16 HERB AND SHRUB PLOTS 4 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	35.7	52.8	107.3	135.6	40.3	42.4
AGROSTIS SPP.	9.8	.0	.0	.0	.0	.0	.0
ALLIARIA OFFICINALIS	5.8	.0	.0	.0	.0	.0	.0
ARISAEMA ATRORUBENS	49.0	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	5.0	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	.0	.0	40.1	80.2	.0	17.7
BOEHMERIA CYLINDRICA	2.9	.0	.0	.0	.0	.0	.0
CAREX SPP.	2.9	.0	.0	.0	.0	.0	.0
CARYA CORDIFORMIS	.0	22.9	41.2	26.6	.0	.0	12.5
CIRCAEA QUADRISULCATA	14.6	.0	.0	.0	.0	.0	.0
CORNUS FLORIDA	.0	.0	23.3	.0	.0	.0	5.0
DENTARIA DIPHYLLA	3.9	.0	.0	.0	.0	.0	.0
DRYOPTERIS SPINULOSA	2.9	.0	.0	.0	.0	.0	.0
FAGUS GRANDIFOLIA	.0	.0	14.0	32.8	.0	.0	5.6
HAMAMELIS VIRGINIANA	.0	.0	11.3	.0	.0	.0	6.7
LINDERA BENZOIN	.0	241.4	123.2	.0	.0	.0	78.1
LIRIODENDRON TULIPIFERA	.0	.0	26.7	49.5	36.3	47.6	30.1
MOSS	5.9	.0	.0	.0	.0	.0	.0
PARTHENOCISSUS SPP.	27.2	.0	.0	.0	.0	.0	.0
POLYSTICHUM ACROSTICHOIDES	6.8	.0	.0	.0	.0	.0	.0
QUERCUS RUBRA	.0	.0	.0	.0	47.8	212.1	92.2
RUBUS OCCIDENTALIS	3.9	.0	.0	.0	.0	.0	.0
RUBUS SPP.	9.9	.0	.0	.0	.0	.0	.0
SMILACINA RACEMOSA	4.2	.0	.0	.0	.0	.0	.0
ULMUS AMERICANA	.0	.0	7.4	43.6	.0	.0	9.8
VIOLA SPP.	20.6	.0	.0	.0	.0	.0	.0
VITIS SPP.	19.6	.0	.0	.0	.0	.0	.0
SANGUINARIA CANADENSIS	5.0	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A6.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 57: TULIP POPLAR
12 HERB AND SHRUB PLOTS 3 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	26.8	127.0	140.9	26.0	.0	55.5
ALLIARIA OFFICINALIS	2.7	.0	.0	.0	.0	.0	.0
ARISAEMA ATORRUBENS	38.6	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	10.7	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	.0	.0	96.4	43.7	.0	16.2
CELASTRUS SCANDENS	16.7	.0	.0	.0	.0	.0	.0
CIRCAEA QUADRISULCATA	23.8	.0	.0	.0	.0	.0	.0
DENTARIA DIPHYLLA	2.7	.0	.0	.0	.0	.0	.0
FRAXINUS AMERICANA	.0	19.3	14.2	.0	22.3	.0	11.3
HAMAMELIS VIRGINIANA	.0	11.0	23.7	.0	.0	.0	13.0
LINDERA BENZOIN	.0	216.0	91.8	.0	.0	.0	52.9
LIRIODENDRON TULIPIFERA	.0	.0	.0	62.7	183.6	300.0	111.9
MAGNOLIA TRIPETALA	.0	.0	10.7	.0	.0	.0	7.2
PARTHENOCISSUS SPP.	25.9	.0	.0	.0	.0	.0	.0
PHILADELPHUS GRANDIFLORUS	.0	26.8	20.4	.0	.0	.0	14.6
POLYSTICHUM ACROSTICHOIDES	11.4	.0	.0	.0	.0	.0	.0
QUERCUS RUBRA	.0	.0	.0	.0	24.4	.0	9.0
SMILACINA RACEMOSA	3.6	.0	.0	.0	.0	.0	.0
SOLANUM DULCAMARA	2.7	.0	.0	.0	.0	.0	.0
SOLIDAGO SPP.	2.7	.0	.0	.0	.0	.0	.0
VACCINIUM CORYMBOSUM	.0	.0	12.3	.0	.0	.0	8.4
VIOLA INCOGNITA	50.6	.0	.0	.0	.0	.0	.0
VIOLA SPP.	5.3	.0	.0	.0	.0	.0	.0
GERANIUM ROBERTIANUM	2.7	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A7.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 23: HEMLOCK/HARDWOODS
40 HERB AND SHRUB PLOTS 10 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	113.5	64.7	22.3	.0	.0	43.5
ALLIARIA OFFICINALIS	2.9	.0	.0	.0	.0	.0	.0
ARALIA NUDICAULIS	15.1	.0	.0	.0	.0	.0	.0
ARISAEMA ATRO-RUBENS	3.6	.0	.0	.0	.0	.0	.0
ASTER SPP.	5.3	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	30.4	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	.0	37.1	66.3	58.9	57.1	38.3
BOEHMERIA CYLINDRICA	6.0	.0	.0	.0	.0	.0	.0
CAREX SPP.	23.2	.0	.0	.0	.0	.0	.0
CARPINUS CAROLINIANA	.0	.0	3.1	.0	.0	.0	2.2
CARYA CORDIFORMIS	.0	11.3	.0	.0	.0	.0	.0
CARYA GLABRA	.0	.0	2.7	.0	.0	24.1	8.0
CARYA OVATA	.0	.0	.0	5.8	.0	.0	1.7
CARYA TOMENTOSA	.0	.0	5.6	.0	9.0	.0	4.3
CELASTRUS SCANDENS	6.6	.0	.0	.0	.0	.0	.0
CELTIS OCCIDENTALIS	.0	4.0	2.8	.0	.0	.0	2.0
CIRCAEA QUADRISULCATA	7.7	.0	.0	.0	.0	.0	.0
CORNUS FLORIDA	.0	5.1	12.4	.0	.0	.0	8.9
DENTARIA DIPHYLLA	2.9	.0	.0	.0	.0	.0	.0
DESCHAMPSIA SPP.	7.4	.0	.0	.0	.0	.0	.0
FAGUS GRANDIFOLIA	.0	.0	2.4	.0	.0	.0	1.7
FRAXINUS AMERICANA	.0	25.3	7.8	.0	12.7	.0	8.5
GALIUM APARINE	2.4	.0	.0	.0	.0	.0	.0
GRAMINEAE	1.2	.0	.0	.0	.0	.0	.0
HAMAMELIS VIRGINIANA	.0	.0	18.6	.0	.0	.0	11.8
HIERACIUM CANADENSE	1.2	.0	.0	.0	.0	.0	.0
IMPATIENS CAPENSIS	3.5	.0	.0	.0	.0	.0	.0
LINDERA BENZOIN	.0	5.0	3.8	.0	.0	.0	2.7
LIRIODENDRON TULIPIFERA	.0	.0	.0	.0	7.8	.0	1.7
LONICERA TATARICA	.0	.0	2.4	.0	.0	.0	1.7
MOSS	18.0	.0	.0	.0	.0	.0	.0
ONOCLEA SENSIBILIS	3.7	.0	.0	.0	.0	.0	.0
PANICUM SPP.	1.2	.0	.0	.0	.0	.0	.0
PARTHENOCISSUS SPP.	9.2	.0	.0	.0	.0	.0	.0
PINUS STROBUS	.0	.0	4.7	8.6	15.3	14.6	8.1
POLYGONATUM PUBESCENS	1.7	.0	.0	.0	.0	.0	.0
POLYSTICHUM ACROSTICHOIDES	7.7	.0	.0	.0	.0	.0	.0
QUERCUS PRINUS	.0	17.5	2.6	.0	.0	69.8	21.8
QUERCUS RUBRA	.0	4.0	8.5	12.7	12.9	30.9	23.3
QUERCUS VELUTINA	.0	.0	.0	5.8	.0	45.7	18.1
RUBUS SPP.	3.6	.0	.0	.0	.0	.0	.0
SMILACINA RACEMOSA	1.2	.0	.0	.0	.0	.0	.0
SOLIDAGO SPP.	5.9	.0	.0	.0	.0	.0	.0

Table A7. Continued.

SYMPLOCARPUS FOETIDUS	11.8	.0	.0	.0	.0	.0	.0
TSUGA CANADENSIS	.0	.0	112.4	168.2	183.4	57.7	84.9
ULMUS AMERICANA	.0	.0	2.5	10.3	.0	.0	2.6
VACCINIUM VACILLANS	.0	5.1	.0	.0	.0	.0	.0
VIBURNUM ACERIFOLIUM	.0	109.2	5.9	.0	.0	.0	4.2
VIOLA SPP.	9.8	.0	.0	.0	.0	.0	.0
UNKNOWN GOLDENROD	2.9	.0	.0	.0	.0	.0	.0
GERANIUM ROBERTIANUM	3.6	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A8.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 22: WHITE PINE/HEMLOCK
32 HERB AND SHRUB PLOTS 3 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	30.1	40.5	26.1	.0	24.7	21.0
ALLIARIA OFFICINALIS	1.9	.0	.0	.0	.0	.0	.0
ARISAEMA ATRORUBENS	2.6	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	.0	38.8	14.2	.0	.0	9.4
CARYA CORDIFORMIS	.0	11.1	17.8	.0	.0	.0	7.0
CARYA TOMENTOSA	.0	.0	15.1	.0	.0	.0	6.0
DRYOPTERIS SPINULOSA	6.2	.0	.0	.0	.0	.0	.0
FRAXINUS AMERICANA	.0	65.9	.0	.0	.0	.0	.0
IMPATIENS CAPENSIS	12.7	.0	.0	.0	.0	.0	.0
LINDERA BENZOIN	.0	15.8	41.0	.0	.0	.0	14.8
PARTHENOCISSUS SPP.	30.2	.0	.0	.0	.0	.0	.0
PINUS STROBUS	.0	163.7	.0	79.8	116.6	193.0	106.7
POLYGONATUM PUBESCENS	2.1	.0	.0	.0	.0	.0	.0
QUERCUS RUBRA	.0	.0	.0	.0	.0	31.9	13.0
RHUS RADICANS	113.1	.0	.0	.0	.0	.0	.0
RUBUS SPP.	6.4	.0	.0	.0	.0	.0	.0
SMILACINA RACEMOSA	1.9	.0	.0	.0	.0	.0	.0
STYLOPHORUM DIPHYLLUM	1.7	.0	.0	.0	.0	.0	.0
SYMPLOCARPUS FOETIDUS	19.3	.0	.0	.0	.0	.0	.0
TILIA AMERICANA	.0	13.4	.0	.0	.0	.0	.0
TSUGA CANADENSIS	.0	.0	146.8	179.9	183.4	50.4	122.2
VIOLA SPP.	1.9	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A9.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 21: WHITE PINE
44 HERB AND SHRUB PLOTS 12 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	184.2	183.8	.0	11.5	.0	37.6
AILANTHUS ALTISSIMA	.0	.0	8.8	.0	.0	.0	4.1
ALLIARIA OFFICINALIS	11.2	.0	.0	.0	.0	.0	.0
ARALIA NUDICAULIS	5.3	.0	.0	.0	.0	.0	.0
ARISAEMA ATRORUBENS	2.5	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	2.5	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	.0	.0	24.9	.0	.0	4.2
CARYA CORDIFORMIS	.0	.0	39.4	.0	.0	.0	17.0
CARYA TOMENTOSA	.0	.0	.0	24.7	.0	.0	4.2
CELASTRUS SCANDENS	1.1	.0	.0	.0	.0	.0	.0
CIRCAEA QUADRISULCATA	1.3	.0	.0	.0	.0	.0	.0
DRYOPTERIS SPINULOSA	6.2	.0	.0	.0	.0	.0	.0
GLECOMA HEDERACEA	2.2	.0	.0	.0	.0	.0	.0
HAMAMELIS VIRGINIANA	.0	.0	12.4	.0	.0	.0	5.0
LINDERA BENZOIN	.0	13.1	.0	.0	.0	.0	.0
MAGNOLIA TRIPETALA	.0	23.6	.0	.0	.0	.0	.0
PARTHENOCISSUS SPP.	24.2	.0	.0	.0	.0	.0	.0
PINUS STROBUS	13.5	59.9	.0	224.9	288.5	300.0	197.9
PRUNUS SEROTINA	.0	.0	8.8	.0	.0	.0	4.1
QUERCUS RUBRA	.0	.0	18.1	25.5	.0	.0	12.5
RHUS RADICANS	100.7	.0	8.8	.0	.0	.0	4.1
RHUS TYPHINA	.0	19.1	11.3	.0	.0	.0	5.0
RUBUS SPP.	4.3	.0	.0	.0	.0	.0	.0
SASSAFRAS ALBIDUM	.0	.0	8.8	.0	.0	.0	4.1
SMILACINA RACEMOSA	2.4	.0	.0	.0	.0	.0	.0
STYLOPHORUM DIPHYLLUM	5.7	.0	.0	.0	.0	.0	.0
VIOLA SPP.	11.8	.0	.0	.0	.0	.0	.0
VITIS SPP.	3.9	.0	.0	.0	.0	.0	.0
UNKNOWN GOLDENROD	1.1	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A10.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 33: NORWAY SPRUCE
4 HERB AND SHRUB PLOTS 1 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	53.7	165.2	.0	.0	.0	69.7
AILANTHUS ALTISSIMA	.0	.0	35.5	.0	.0	.0	21.2
ARISAEMA ATRORUBENS	25.9	.0	.0	.0	.0	.0	.0
DENNSTAEDTIA PUNCTILOBULA	31.3	.0	.0	.0	.0	.0	.0
DRYOPTERIS SPINULOSA	72.4	.0	.0	.0	.0	.0	.0
FRAXINUS AMERICANA	.0	177.8	35.5	.0	.0	.0	21.2
LINDERA BENZOIN	.0	.0	39.6	.0	.0	.0	24.7
LIRIODENDRON TULIPIFERA	.0	.0	24.2	.0	.0	.0	17.7
PICEA ABIES	.0	.0	.0	.0	225.0	300.0	122.7
RHUS RADICANS	50.9	.0	.0	.0	.0	.0	.0
ROBINIA PSEUDO-ACACIA	.0	.0	.0	.0	75.0	.0	22.8
TAXUS CANADENSIS	.0	68.5	.0	.0	.0	.0	.0
GERANIUM ROBERTIANUM	19.6	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A11.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 32: RED SPRUCE
12 HERB AND SHRUB PLOTS 3 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	142.9	.0	.0	39.7	.0	23.6
AILANTHUS ALTISSIMA	.0	78.6	133.1	41.5	34.3	.0	75.2
ALLIARIA OFFICINALIS	15.1	.0	.0	.0	.0	.0	.0
ARISAEMA ATRORUBENS	20.1	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	8.7	.0	.0	.0	.0	.0	.0
CARYA CORDIFORMIS	.0	.0	.0	31.3	46.0	.0	25.1
CIRCAEA QUADRISULCATA	11.4	.0	.0	.0	.0	.0	.0
FRAXINUS AMERICANA	.0	.0	19.3	.0	.0	.0	11.3
GRAMINEAE	6.4	.0	.0	.0	.0	.0	.0
PARTHENOCISSUS SPP.	35.2	.0	.0	.0	.0	.0	.0
PICEA RUBENS	.0	.0	128.3	227.2	180.1	300.0	153.5
RHAMNUS ALNIFOLIA	.0	78.6	.0	.0	.0	.0	.0
RHUS RADICANS	6.4	.0	.0	.0	.0	.0	.0
ULMUS AMERICANA	.0	.0	19.3	.0	.0	.0	11.3
VIOLA SPP.	96.6	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A12.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 99: MEADOW
68 HERB AND SHRUB PLOTS 17 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	18.9	.0	.0	.0	.0	.0
ACHILLEA MILLEFOLIUM	3.2	.0	.0	.0	.0	.0	.0
AGROPYRON A	.8	.0	.0	.0	.0	.0	.0
AGROPYRON B	2.6	.0	.0	.0	.0	.0	.0
AGROSTIS SPP.	9.1	.0	.0	.0	.0	.0	.0
ALLIARIA OFFICINALIS	.7	.0	.0	.0	.0	.0	.0
ALLIUM SPP.	4.2	.0	.0	.0	.0	.0	.0
ANTHOXANTHUM ODORATUM	12.3	.0	.0	.0	.0	.0	.0
ARISAEMA ATRORUBENS	.9	.0	.0	.0	.0	.0	.0
ASCLEPIAS SYRIACA	4.3	.0	.0	.0	.0	.0	.0
ASCLEPIAS VERTICILLATA	7.5	.0	.0	.0	.0	.0	.0
ASPARAGUS OFFICINALIS	.6	.0	.0	.0	.0	.0	.0
ASTER SPP.	3.3	.0	.0	.0	.0	.0	.0
CAREX SPP.	.9	.0	.0	.0	.0	.0	.0
CELASTRUS SCANDENS	5.6	.0	.0	.0	.0	.0	.0
CERASTIUM VULGATUM	.6	.0	.0	.0	.0	.0	.0
CRUCIFERAE	1.1	.0	.0	.0	.0	.0	.0
DACTYLIS GLOMERATA	1.0	.0	.0	.0	.0	.0	.0
DAUCUS CAROTA	.5	.0	.0	.0	.0	.0	.0
DESCHAMPSIA SPP.	1.8	.0	.0	.0	.0	.0	.0
DIANTHUS ARMERIA	.2	.0	.0	.0	.0	.0	.0
EQUISETUM SPP.	2.0	.0	.0	.0	.0	.0	.0
FRAGARIA VIRGIANA	8.1	.0	.0	.0	.0	.0	.0
FRAXINUS AMERICANA	.0	34.6	.0	.0	.0	.0	.0
GALIUM APARINE	.3	.0	.0	.0	.0	.0	.0
GERANIUM BICKNELLII	.2	.0	.0	.0	.0	.0	.0
HYPERICUM PERFORATUM	.2	.0	.0	.0	.0	.0	.0
IMPATIENS CAPENSIS	.3	.0	.0	.0	.0	.0	.0
LEPIDIUM CAMPESTRE	1.2	.0	.0	.0	.0	.0	.0
LINARIA VULGARIS	.9	.0	.0	.0	.0	.0	.0
LONICERA JAPONICA	2.4	.0	.0	.0	.0	.0	.0
LYSIMACHIA NUMMULARIA	1.3	.0	.0	.0	.0	.0	.0
MELAMPYRUM LINEARE	.9	.0	.0	.0	.0	.0	.0
ONOCLEA SENSIBILIS	2.7	.0	.0	.0	.0	.0	.0
OSMORHIZA CLAYTONI	4.8	.0	.0	.0	.0	.0	.0
OXALIS EUROPEA	.2	.0	.0	.0	.0	.0	.0
OXALIS MONTANA	2.0	.0	.0	.0	.0	.0	.0
PANICUM SPP.	.6	.0	.0	.0	.0	.0	.0
PARTHENOCISSUS SPP.	15.2	.0	.0	.0	.0	.0	.0
PHLEUM PATENSE	.2	.0	.0	.0	.0	.0	.0
POLYGONUM CONVULVULUS	.2	.0	.0	.0	.0	.0	.0
POTENTILLA RECTA	.2	.0	.0	.0	.0	.0	.0
PRUNUS SEROTINA	.0	10.4	.0	.0	.0	.0	.0

Table A12. Continued.

RHUS RADICANS *	13.4	.0	.0	.0	.0	.0	.0
RIBES CYNOSBATI	.5	.0	.0	.0	.0	.0	.0
RUBUS SPP.	16.7	.0	.0	.0	.0	.0	.0
RUDBECKIA SEROTINA	.5	.0	.0	.0	.0	.0	.0
RUMEX ACETOSELLA	3.8	.0	.0	.0	.0	.0	.0
SASSAFRAS ALBIDUM	.0	74.7	.0	.0	.0	.0	.0
SATUREJA VULGARIS	5.8	.0	.0	.0	.0	.0	.0
SCIRPUS SPP.	1.0	.0	.0	.0	.0	.0	.0
SECALE CEREALE	19.3	.0	.0	.0	.0	.0	.0
SILENE CUCUBALUS	1.4	.0	.0	.0	.0	.0	.0
SISYRINCHIUM MONTANUM	.3	.0	.0	.0	.0	.0	.0
SOLANUM CAROLINENSE	3.6	.0	.0	.0	.0	.0	.0
SOLANUM DULCAMARA	.2	.0	.0	.0	.0	.0	.0
SOLIDAGO SPP.	6.1	.0	.0	.0	.0	.0	.0
STELLARIA GRAMINEA	.1	.0	.0	.0	.0	.0	.0
SYMPHORICARPOS ALBUS	.0	137.6	.0	.0	.0	.0	.0
TARAXACUM OFFICINALE	.4	.0	.0	.0	.0	.0	.0
TRIFOLIUM AGRARIUM	1.6	.0	.0	.0	.0	.0	.0
TRIFOLIUM PRATENSE	.4	.0	.0	.0	.0	.0	.0
ULMUS AMERICANA	.0	23.7	.0	.0	.0	.0	.0
VERONICA OFFICINALIS	.3	.0	.0	.0	.0	.0	.0
VICIA CRACCA	.6	.0	.0	.0	.0	.0	.0
VIOLA SPP.	1.2	.0	.0	.0	.0	.0	.0
VITIS SPP.	5.0	.0	.0	.0	.0	.0	.0
GRASS 5	1.4	.0	.0	.0	.0	.0	.0
GRASS 6	3.1	.0	.0	.0	.0	.0	.0
GRASS 7	.7	.0	.0	.0	.0	.0	.0
GRASS 8	.5	.0	.0	.0	.0	.0	.0
GRASS 9	.7	.0	.0	.0	.0	.0	.0
GRASS 10	.5	.0	.0	.0	.0	.0	.0
GRASS 11	.1	.0	.0	.0	.0	.0	.0
GRASS 16	.3	.0	.0	.0	.0	.0	.0
GRASS 19	2.8	.0	.0	.0	.0	.0	.0
UNKNOWN GOLDENROD	.2	.0	.0	.0	.0	.0	.0
ROSA SPP.	2.0	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Table A13.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
PLANT IMPORTANCE VALUES*

COVERTYPE 1: OTHER HARDWOODS
16 HERB AND SHRUB PLOTS 4 TREE PLOTS

PLANT	PLANT TYPE						
	HERB	SHRUB	TREE STRATA**				
			S	I	C	D	ALL
ACER SACCHARUM	.0	89.8	80.1	17.7	.0	.0	41.8
AILANTHUS ALTISSIMA	.0	.0	.0	.0	.0	62.9	9.9
ALLIARIA OFFICINALIS	11.5	.0	.0	.0	.0	.0	.0
ARISAEMA ATRORUBENS	18.3	.0	.0	.0	.0	.0	.0
ASTER DIVARICATUS	23.5	.0	.0	.0	.0	.0	.0
BETULA LENTA	.0	.0	22.2	114.6	161.2	95.3	67.7
CARYA CORDIFORMIS	.0	.0	6.6	17.5	.0	.0	4.8
CELASTRUS SCANDENS	10.2	.0	.0	.0	.0	.0	.0
CIRCAEA QUADRISULCATA	22.4	.0	.0	.0	.0	.0	.0
CORNUS ALTERNIFOLIA	.0	.0	8.2	.0	.0	.0	5.4
CORNUS FLORIDA	.0	.0	12.1	.0	.0	.0	8.6
DRYOPTERIS SPINULOSA	4.4	.0	.0	.0	.0	.0	.0
FRAXINUS AMERICANA	.0	65.7	23.5	.0	.0	.0	14.2
GALIUM APARINE	2.1	.0	.0	.0	.0	.0	.0
LINARIA VULGARIS	.0	.0	.0	.0	38.2	.0	10.9
LINDERA BENZOIN	.0	129.6	100.9	.0	.0	.0	56.9
LIRIODENDRON TULIPIFERA	.0	.0	6.7	.0	.0	.0	4.2
LONICERA JAPONICA	4.2	.0	.0	.0	.0	.0	.0
MAGNOLIA TRIPETALA	.0	.0	5.7	.0	.0	.0	4.1
MOSS	3.1	.0	.0	.0	.0	.0	.0
PARTHENOCISSUS SPP.	31.4	.0	.0	.0	.0	.0	.0
PINUS STROBUS	.0	.0	.0	26.7	.0	.0	5.5
POLYSTICHUM ACROSTICHOIDES	2.1	.0	.0	.0	.0	.0	.0
PRUNUS SEROTINA	.0	14.8	.0	.0	.0	.0	.0
QUERCUS PRINUS	.0	.0	.0	.0	.0	80.8	18.0
QUERCUS RUBRA	.0	.0	10.6	19.8	.0	.0	5.3
RHUS RADICANS	5.2	.0	.0	.0	.0	.0	.0
RUBUS SPP.	16.5	.0	.0	.0	.0	.0	.0
SMILACINA RACEMOSA	5.2	.0	.0	.0	.0	.0	.0
SYMPLOCARPUS FOETIDUS	3.1	.0	.0	.0	.0	.0	.0
TOVARA VIRGINIANA	2.1	.0	.0	.0	.0	.0	.0
TSUGA CANADENSIS	.0	.0	13.5	70.8	72.0	.0	26.2
ULMUS AMERICANA	.0	.0	9.7	32.9	28.5	61.1	16.4

Table A13. Continued.

VIOLA SPP.	30.6	.0	.0	.0	.0	.0	.0
UNKNOWN GOLDENROD	4.2	.0	.0	.0	.0	.0	.0

* HERB IMPORTANCE VALUE BASED ON A MAXIMUM OF 200. SHRUB AND TREE
IMPORTANCE VAULES BASED ON A MAXIMUM OF 300.

** S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT;
ALL=OVERALL IMPORTANCE VALUE BASED ON DATA FROM EACH TREE STRATA

Appendix B

Results from PROGIV for tree data.

Table B1.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 27: SUGAR MAPLE
24 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	1406	200	140	33	1779	1.0	1.4	4.8	8.4	13.7	100.0	95.8	91.7	37.5	100.0
AILANTHUS ALTISSIMA	31	2	2	0	35	.0	.0	.1	.0	.1	8.3	4.2	4.2	.0	12.5
BETULA LENTA	8	2	6	4	21	.0	.1	.1	.8	.8	8.3	4.2	12.5	8.3	25.0
CARPINUS CAROLINIANA	48	4	0	0	52	.0	.0	.0	.0	.1	12.5	4.2	.0	.0	12.5
CARYA CORDIFORMIS	8	6	2	2	17	.1	.1	.1	.2	.3	4.2	12.5	4.2	4.2	20.8
CARYA TOMENTOSA	0	0	0	2	2	.0	.0	.0	.4	.4	.0	.0	.0	4.2	4.2
CORNUS FLORIDA	13	2	0	0	15	.0	.0	.0	.0	.0	8.3	4.2	.0	.0	8.3
FAGUS GRANDIFOLIA	8	2	2	0	13	.0	.0	.0	.0	.0	4.2	4.2	4.2	.0	12.5
FRAXINUS AMERICANA	19	8	10	0	38	.0	.0	.3	.0	.4	20.8	16.7	12.5	.0	33.3
HAMAMELIS VIRGINIANA	79	0	0	0	79	.0	.0	.0	.0	.0	18.7	.0	.0	.0	18.7
LINDERA BENZOIN	540	0	0	0	540	.1	.0	.0	.0	.1	58.3	.0	.0	.0	58.3
MAGNOLIA TRIPETALA	10	2	0	0	13	.0	.0	.0	.0	.0	4.2	4.2	.0	.0	4.2
OSTRYA VIRGINIANA	4	6	0	0	10	.0	.0	.0	.0	.0	4.2	8.3	.0	.0	8.3
PICEA RUBENS	0	4	0	0	4	.1	.0	.0	.0	.1	.0	4.2	.0	.0	4.2
PRUNUS AVIUM	13	4	0	0	17	.0	.0	.0	.0	.1	8.3	8.3	.0	.0	8.3
PRUNUS SEROTINA	0	0	2	2	4	.0	.0	.1	.1	.2	.0	.0	4.2	4.2	4.2
QUERCUS ALBA	0	0	0	2	2	.0	.0	.0	.3	.3	.0	.0	.0	4.2	4.2
QUERCUS RUBRA	2	0	4	8	13	.0	.0	.1	1.1	1.2	4.2	.0	8.3	12.5	20.8
QUERCUS VELUTINA	0	0	0	8	8	.0	.0	1.4	2.1	3.5	.0	.0	.0	8.3	8.3
RHUS GLABRA	2	0	0	0	2	.0	.0	.0	.0	.0	4.2	.0	.0	.0	4.2
ROBINIA PSEUDO-ACACIA	0	0	2	0	2	.0	.0	.2	.0	.2	.0	.0	4.2	.0	4.2
SASSAFRAS ALBIDUM	2	0	0	0	2	.0	.0	.0	.0	.0	4.2	.0	.0	.0	4.2
STAPHYLEA TRIFOLIA	8	4	0	0	13	.0	.0	.0	.0	.0	4.2	4.2	.0	.0	4.2
TILIA AMERICANA	2	6	0	0	8	.0	.1	.0	.0	.1	4.2	8.3	.0	.0	8.3
TSUGA CANADENSIS	0	0	2	0	2	.0	.0	.2	.0	.2	.0	.0	4.2	.0	4.2
ULMUS AMERICANA	8	4	0	0	13	.0	.0	.0	.0	.0	4.2	8.3	.0	.0	12.5
TOTAL FOR COVERTYPE	2210	258	173	58	2700	1.6	1.8	7.4	11.1	21.8					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B2.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 28: SUGAR MAPLE/HARDWOODS
4 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	1575.	300.	50.	25.	1950.	1.0	.9	2.0	3.9	7.8	100.0	100.0	50.0	25.0	100.0
BETULA LENTA	300.	88.	0.	0.	388.	.3	.3	.0	.0	.6	25.0	25.0	.0	.0	25.0
CARYA CORDIFORMIS	100.	25.	13.	0.	138.	.2	.2	.2	.0	.5	75.0	25.0	25.0	.0	75.0
CORNUS FLORIDA	75.	13.	0.	0.	88.	.1	.0	.0	.0	.1	25.0	25.0	.0	.0	25.0
FAGUS GRANDIFOLIA	375.	50.	13.	0.	438.	.1	.2	.6	.0	.9	25.0	25.0	25.0	.0	25.0
FRAXINUS AMERICANA	138.	100.	13.	0.	250.	.2	1.1	.4	.0	1.8	75.0	50.0	25.0	.0	75.0
HAMAMELIS VIRGINIANA	313.	0.	0.	0.	313.	.2	.0	.0	.0	.2	25.0	.0	.0	.0	25.0
JUNIPERUS VIRGINIANA	13.	0.	0.	0.	13.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
LINDERA BENZOIN	350.	13.	0.	0.	363.	.0	.0	.0	.0	.1	50.0	25.0	.0	.0	50.0
LIRIODENDRON TULIPIFERA	13.	13.	0.	25.	50.	.0	.2	2.0	.5	2.7	25.0	25.0	.0	50.0	50.0
MORUS ALBA	0.	25.	0.	0.	25.	.0	.0	.0	.0	.0	.0	25.0	.0	.0	25.0
OSTRYA VIRGINIANA	75.	0.	0.	0.	75.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
PLATANUS OCCIDENTALIS	0.	0.	0.	25.	25.	.0	.0	.0	3.2	3.2	.0	.0	.0	25.0	25.0
PRUNUS SEROTINA	13.	0.	0.	0.	13.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
QUERCUS ALBA	13.	0.	0.	0.	13.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
QUERCUS RUBRA	50.	0.	0.	0.	50.	.0	.0	.0	.0	.0	50.0	.0	.0	.0	50.0
RHAMNUS CATHARTICA	50.	0.	0.	0.	50.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
TSUGA CANADENSIS	13.	0.	0.	0.	13.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
ULMUS AMERICANA	63.	38.	0.	13.	113.	.3	.6	.0	.8	1.8	50.0	50.0	.0	25.0	50.0
VIBURNUM ACERIFOLIUM	63.	0.	0.	0.	63.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
TOTAL FOR COVERTYPE	3588.	663.	88.	88.	4426.	2.3	3.4	5.2	8.4	19.3					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B3.

VANDERBILT MANSION NHS 'VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 29: SUGAR MAPLE/OAK
7 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	1488.	207.	86.	0.	1779.	.6	1.1	1.7	.0	3.3	100.0	100.0	71.4	.0	100.0
AILANTHUS ALTISSIMA	38.	0.	14.	0.	50.	.1	.0	.3	1.0	1.4	28.6	.0	14.3	.0	28.6
BETULA LENTA	0.	0.	7.	0.	7.	.0	.0	.2	.0	.2	.0	.0	14.3	.0	14.3
CARPINUS CAROLINIANA	43.	7.	0.	0.	50.	.0	.0	.0	.0	.1	28.6	14.3	.0	.0	28.6
CARYA GLABRA	7.	7.	7.	0.	21.	.0	.0	.1	.0	.2	14.3	14.3	14.3	.0	42.9
CARYA TOMENTOSA	7.	0.	0.	0.	7.	.0	.0	.0	.0	.0	14.3	.0	.0	.0	14.3
CORNUS RACEMOSA	14.	0.	0.	0.	14.	.0	.0	.0	.0	.0	14.3	.0	.0	.0	14.3
FRAXINUS AMERICANA	93.	0.	0.	0.	93.	.1	.0	.0	.0	.1	71.4	.0	.0	.0	71.4
HAMAMELIS VIRGINIANA	329.	0.	0.	0.	329.	.2	.0	.0	.0	.2	42.9	.0	.0	.0	42.9
LINDERA BENZOIN	1279.	0.	0.	0.	1279.	.3	.0	.0	.0	.3	100.0	.0	.0	.0	100.0
LIRIODENDRON TULIPIFERA	14.	14.	21.	29.	79.	.1	.1	1.3	7.4	8.9	28.6	28.6	42.9	28.6	42.9
LONICERA TATARICA	138.	0.	0.	0.	138.	.0	.0	.0	.0	.0	28.6	.0	.0	.0	28.6
OSTRYA VIRGINIANA	0.	14.	0.	0.	14.	.0	.1	.0	.0	.1	.0	28.6	.0	.0	28.6
PLATANUS OCCIDENTALIS	0.	0.	7.	7.	14.	.0	.0	.3	13.7	14.1	.0	.0	14.3	14.3	28.6
PRUNUS AVIUM	7.	14.	0.	0.	21.	.0	.3	.0	.0	.3	14.3	14.3	.0	.0	14.3
PRUNUS SEROTINA	79.	29.	21.	0.	129.	.1	.4	.4	.0	.9	42.9	14.3	14.3	.0	42.9
QUERCUS ALBA	0.	0.	0.	7.	7.	.0	.0	6.5	.0	6.5	.0	.0	.0	14.3	14.3
QUERCUS RUBRA	0.	0.	7.	7.	14.	.0	.0	.3	1.7	1.9	.0	.0	14.3	14.3	28.6
QUERCUS VELUTINA	0.	29.	21.	0.	50.	.0	.2	.4	.0	.7	.0	14.3	14.3	.0	14.3
RHUS TYPHINA	21.	0.	0.	0.	21.	.0	.0	.0	.0	.0	14.3	.0	.0	.0	14.3
ROBINIA PSEUDO-ACACIA	0.	21.	43.	21.	86.	.0	.6	2.1	3.4	6.0	.0	14.3	42.9	28.6	57.1
SASSAFRAS ALBIDUM	0.	0.	7.	0.	7.	.0	.0	.3	.0	.3	.0	.0	14.3	.0	14.3
TILIA AMERICANA	21.	14.	14.	7.	57.	.0	.0	.3	.6	1.0	28.6	14.3	28.6	14.3	42.9
TSUGA CANADENSIS	0.	0.	7.	0.	7.	.0	.0	.7	.0	.7	.0	.0	14.3	.0	14.3
ULMUS AMERICANA	43.	29.	0.	0.	71.	.1	.2	.0	.0	.3	42.9	42.9	.0	.0	57.1
TOTAL FOR COVERTYPE	3814.	388.	284.	79.	4343.	1.6	3.2	15.0	27.8	47.5					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B4.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*COVERTYPE 52: OAK
18 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	619	94	28	0	742	2	7	7	0	16	88.9	72.2	33.3	0	94.4
AILANTHUS ALTISSIMA	38	3	0	0	39	0	0	0	0	0	16.7	5.6	0	0	16.7
AMELANCHIER SPP.	6	0	0	0	6	0	0	0	0	0	5.6	0	0	0	5.6
BETULA LENTA	22	19	14	0	55	0	1	5	0	7	22.2	22.2	16.7	0	27.8
CARPINUS CAROLINIANA	8	0	0	0	8	0	0	0	0	0	5.6	0	0	0	5.6
CARYA CORDIFORMIS	0	8	3	0	11	0	4	0	0	4	0	11.1	5.6	0	16.7
CARYA GLABRA	50	17	0	0	67	0	1	0	0	1	38.9	11.1	0	0	38.9
CARYA OVATA	22	0	0	3	25	0	0	0	2	2	5.6	0	0	5.6	5.6
CARYA TOMENTOSA	114	14	11	0	139	1	1	2	0	3	61.1	22.2	5.6	0	68.7
CATALPA SPECIOSA	3	0	0	0	3	0	0	0	0	0	5.6	0	0	0	5.6
CORNUS ALTERNIFOLIA	11	0	0	0	11	0	0	0	0	0	5.6	0	0	0	5.6
CORNUS FLORIDA	44	8	0	0	53	1	0	0	0	2	22.2	5.6	0	0	22.2
CORNUS RACEMOSA	39	0	0	0	39	0	0	0	0	0	5.6	0	0	0	5.6
FAGUS GRANDIFOLIA	3	0	0	0	3	0	0	0	0	0	5.6	0	0	0	5.6
FRAXINUS AMERICANA	131	0	17	0	147	0	0	5	0	5	50.0	0	5.6	0	50.0
HAMAMELIS VIRGINIANA	781	8	0	0	789	4	0	0	0	4	61.1	11.1	0	0	61.1
LINDERA BENZOIN	158	0	0	0	158	0	0	0	0	0	33.3	0	0	0	33.3
LIRIODENDRON TULIPIFERA	3	0	0	0	3	0	0	0	0	0	5.6	0	0	0	5.6
LONICERA TATARICA	22	0	0	0	22	0	0	0	0	0	5.6	0	0	0	5.6
MAGNOLIA TRIPETALA	3	0	0	0	3	0	0	0	0	0	5.6	0	0	0	5.6
OSTRYA VIRGINIANA	72	28	3	0	103	1	2	0	0	3	27.8	11.1	5.6	0	27.8
PHILADELPHUS GRANDIFLORUS	3	0	0	0	3	0	0	0	0	0	5.6	0	0	0	5.6
PINUS STROBUS	6	8	0	3	14	0	1	0	3	5	11.1	5.6	0	5.6	16.7
PRUNUS SEROTINA	67	8	0	3	78	0	0	0	2	2	22.2	5.6	0	5.6	22.2
PRUNUS VIRGINIANA	19	0	0	0	19	0	0	0	0	0	11.1	0	0	0	11.1
QUERCUS ALBA	0	3	8	8	17	0	0	1.1	2.2	3.4	0	5.6	11.1	11.1	22.2
QUERCUS PRINUS	60	38	11	17	114	0	2	1.7	3.4	5.3	16.7	22.2	16.7	27.8	50.0
QUERCUS RUBRA	111	61	100	28	300	1	8	3.0	5.6	9.3	55.6	44.4	55.6	55.6	83.3
QUERCUS VELUTINA	0	3	0	8	8	0	0	0	9	9	0	5.6	0	5.6	11.1
RHAMNUS CATHARTICA	1042	31	0	0	1072	3	1	0	0	4	22.2	11.1	0	0	22.2
RHUS GLABRA	3	0	0	0	3	0	0	0	0	0	5.6	0	0	0	5.6
ROBINIA PSEUDO-ACACIA	42	0	3	0	44	1	0	1	0	2	27.8	0	5.6	0	27.8
SASSAFRAS ALBIDUM	8	8	22	0	38	0	0	8	0	8	11.1	11.1	16.7	0	22.2
STAPHYLEA TRIFOLIA	125	0	0	0	125	0	0	0	0	0	16.7	0	0	0	16.7
STYRAX AMERICANA	3	0	0	0	3	0	0	0	0	0	5.6	0	0	0	5.6
TILIA AMERICANA	19	0	0	0	19	0	0	0	0	0	5.6	0	0	0	5.6
TSUGA CANADENSIS	14	28	3	8	53	8	2	2	1.4	2.5	22.2	27.8	5.6	16.7	44.4
ULMUS AMERICANA	11	17	0	0	28	0	2	0	0	2	22.2	16.7	0	0	27.8
VIBURNUM ACERIFOLIUM	319	0	0	0	319	0	0	0	0	0	33.3	0	0	0	33.3
VIBURNUM RAFINESQUIANUM	31	0	0	0	31	0	0	0	0	0	16.7	0	0	0	16.7
TOTAL FOR COVERTYPE	4011	400	219	75	4708	2.5	3.0	8.8	14.3	28.6					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B5.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 53: OAK/TULIP POPLAR
4 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	188.	38.	63.	13.	300.	.2	.3	2.5	1.2	4.1	75.0	75.0	50.0	25.0	100.0
BETULA LENTA	0.	13.	25.	0.	38.	.0	.1	1.3	.0	1.6	.0	25.0	50.0	.0	75.0
CARYA CORDIFORMIS	63.	13.	0.	0.	75.	.2	.0	.0	.0	.2	50.0	25.0	.0	.0	50.0
CORNUS FLORIDA	13.	0.	0.	0.	13.	.1	.0	.0	.0	.1	25.0	.0	.0	.0	25.0
FAGUS GRANDIFOLIA	13.	13.	0.	0.	25.	.1	.1	.0	.0	.1	25.0	25.0	.0	.0	25.0
HAMAMELIS VIRGINIANA	60.	0.	0.	0.	50.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
LINDERA BENZOIN	1163.	0.	0.	0.	1163.	.2	.0	.0	.0	.2	100.0	.0	.0	.0	100.0
LIRIODENDRON TULIPIFERA	100.	13.	13.	13.	138.	.1	.2	.5	3.5	4.3	50.0	25.0	25.0	25.0	75.0
QUERCUS RUBRA	0.	0.	13.	60.	63.	.0	.0	1.1	27.7	28.7	.0	.0	25.0	75.0	100.0
ULMUS AMERICANA	13.	13.	0.	0.	25.	.0	.2	.0	.0	.2	25.0	25.0	.0	.0	50.0
TOTAL FOR COVERTYPE	1800.	100.	113.	75.	1888.	.8	.9	5.3	32.4	39.4					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table Bb.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 67: TULIP POPLAR
3 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	800.	50.	17.	0.	867.	.7	1.0	1.3	.0	3.1	100.0	66.7	33.3	.0	100.0
BETULA LENTA	0.	33.	50.	0.	83.	.0	.9	2.5	.0	3.4	.0	33.3	33.3	.0	33.3
FRAXINUS AMERICANA	100.	0.	17.	0.	117.	.0	.0	.3	.0	.4	33.3	.0	33.3	.0	33.3
HAMAMELIS VIRGINIANA	183.	0.	0.	0.	183.	.1	.0	.0	.0	.1	33.3	.0	.0	.0	33.3
LINDERA BENZOIN	1150.	0.	0.	0.	1150.	.3	.0	.0	.0	.3	66.7	.0	.0	.0	66.7
LIRIODENDRON TULIPIFERA	0.	17.	150.	67.	233.	.0	.5	21.0	20.8	42.3	.0	33.3	100.0	100.0	100.0
MAGNOLIA TRIPETALA	17.	0.	0.	0.	17.	.0	.0	.0	.0	.0	33.3	.0	.0	.0	33.3
PHILADELPHUS GRANDIFLORUS	233.	0.	0.	0.	233.	.0	.0	.0	.0	.0	33.3	.0	.0	.0	33.3
QUERCUS RUBRA	0.	0.	17.	0.	17.	.0	.0	.9	.0	.9	.0	.0	33.3	.0	33.3
VACCINIUM CORYMBOSUM	50.	0.	0.	0.	50.	.0	.0	.0	.0	.0	33.3	.0	.0	.0	33.3
TOTAL FOR COVERTYPE	2533.	100.	250.	67.	2950.	1.1	2.4	26.0	20.8	50.4					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B7.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 23: HEMLOCK/HARDWOODS
10 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	590.	20.	0.	0.	610.	.1	.2	.0	.0	.3	90.0	30.0	.0	.0	90.0
BETULA LENTA	150.	90.	50.	20.	310.	.2	.8	.9	2.8	4.3	70.0	60.0	50.0	40.0	90.0
CARPINUS CAROLINIANA	15.	0.	0.	0.	15.	.0	.0	.0	.0	.0	10.0	.0	.0	.0	10.0
CARYA GLABRA	5.	0.	0.	10.	15.	.0	.0	.0	1.9	1.9	10.0	.0	.0	10.0	20.0
CARYA OVATA	0.	5.	0.	0.	5.	.0	.0	.0	.0	.0	.0	10.0	.0	.0	10.0
CARYA TOMENTOSA	15.	0.	5.	0.	20.	.0	.0	.1	.0	.2	20.0	.0	10.0	.0	20.0
CELTIS OCCIDENTALIS	10.	0.	0.	0.	10.	.0	.0	.0	.0	.0	10.0	.0	.0	.0	10.0
CORNUS FLORIDA	80.	0.	0.	0.	80.	.0	.0	.0	.0	.0	40.0	.0	.0	.0	40.0
FAGUS GRANDIFOLIA	5.	0.	0.	0.	5.	.0	.0	.0	.0	.0	10.0	.0	.0	.0	10.0
FRAXINUS AMERICANA	50.	0.	5.	0.	55.	.0	.0	.8	.0	.8	20.0	.0	10.0	.0	30.0
HAMAMELIS VIRGINIANA	150.	0.	0.	0.	150.	.0	.0	.0	.0	.0	30.0	.0	.0	.0	30.0
LINDERA BENZOIN	25.	0.	0.	0.	25.	.0	.0	.0	.0	.0	10.0	.0	.0	.0	10.0
LIRIODENDRON TULIPIFERA	0.	0.	5.	0.	5.	.0	.0	.0	.0	.0	.0	.0	10.0	.0	10.0
LONICERA TATARICA	5.	0.	0.	0.	5.	.0	.0	.0	.0	.0	10.0	.0	.0	.0	10.0
PINUS STROBUS	5.	5.	5.	5.	20.	.0	.1	.9	.7	1.8	10.0	10.0	10.0	10.0	20.0
QUERCUS PRINUS	5.	0.	0.	25.	30.	.0	.0	.0	8.2	8.2	10.0	.0	.0	30.0	40.0
QUERCUS RUBRA	25.	10.	10.	5.	50.	.0	.1	.3	4.8	5.2	30.0	20.0	10.0	10.0	60.0
QUERCUS VELUTINA	0.	5.	0.	10.	15.	.0	.0	.0	5.8	5.8	.0	10.0	.0	20.0	30.0
TSUGA CANADENSIS	320.	165.	120.	25.	630.	1.5	3.8	8.7	3.2	17.2	70.0	90.0	90.0	30.0	100.0
ULMUS AMERICANA	5.	10.	0.	0.	15.	.0	.1	.0	.0	.1	10.0	10.0	.0	.0	10.0
VIBURNUM ACERIFOLIUM	25.	0.	0.	0.	25.	.0	.0	.0	.0	.0	20.0	.0	.0	.0	20.0
TOTAL FOR COVERTYPE	1465.	310.	200.	100.	2075.	2.0	4.9	11.5	25.0	43.3					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B8.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 22: WHITE PINE/HEMLOCK
8 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	31.	13.	0.	8.	50.	.0	.1	.0	1.6	1.6	26.0	26.0	.0	12.6	26.0
BETULA LENTA	19.	8.	0.	0.	25.	.1	.1	.0	.0	.2	12.5	12.5	.0	.0	12.5
CARYA CORDIFORMIS	13.	0.	0.	0.	13.	.0	.0	.0	.0	.0	12.5	.0	.0	.0	12.5
CARYA TOMENTOSA	8.	0.	0.	0.	8.	.0	.0	.0	.0	.0	12.5	.0	.0	.0	12.5
LINDERA BENZOIN	63.	0.	0.	0.	63.	.0	.0	.0	.0	.0	12.5	.0	.0	.0	12.5
PINUS STROBUS	0.	31.	56.	50.	138.	.0	1.8	5.7	19.7	27.2	.0	37.5	50.0	62.5	75.0
QUERCUS RUBRA	0.	0.	0.	8.	8.	.0	.0	.0	3.4	3.4	.0	.0	.0	12.5	12.5
TSUGA CANADENSIS	106.	88.	131.	13.	338.	.4	3.3	9.9	3.2	16.9	26.0	87.5	60.0	26.0	87.5
TOTAL FOR COVERTYPE	238.	138.	188.	75.	638.	.6	5.4	15.8	27.8	49.3					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B9.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 21: WHITE PINE
12 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	91.	0.	4.	0.	95.	.1	.0	.4	.0	.5	41.7	.0	8.3	.0	41.7
AILANTHUS ALTISSIMA	4.	0.	0.	0.	4.	.0	.0	.0	.0	.0	8.3	.0	.0	.0	8.3
BETULA LENTA	0.	4.	0.	0.	4.	.0	.0	.0	.0	.0	.0	8.3	.0	.0	8.3
CARYA CORDIFORMIS	33.	0.	0.	0.	33.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
CARYA TOMENTOSA	0.	4.	0.	0.	4.	.0	.0	.0	.0	.0	.0	8.3	.0	.0	8.3
HAMAMELIS VIRGINIANA	8.	0.	0.	0.	8.	.0	.0	.0	.0	.0	8.3	.0	.0	.0	8.3
PINUS STROBUS	0.	29.	200.	46.	275.	.0	1.8	32.2	32.0	65.8	.0	41.7	91.7	50.0	100.0
PRUNUS SEROTINA	4.	0.	0.	0.	4.	.0	.0	.0	.0	.0	8.3	.0	.0	.0	8.3
QUERCUS RUBRA	8.	4.	0.	0.	13.	.0	.1	.0	.0	.1	16.7	8.3	.0	.0	25.0
RHUS RADICANS	4.	0.	0.	0.	4.	.0	.0	.0	.0	.0	8.3	.0	.0	.0	8.3
RHUS TYPHINA	8.	0.	0.	0.	8.	.0	.0	.0	.0	.0	8.3	.0	.0	.0	8.3
SASSAFRAS ALBIDUM	4.	0.	0.	0.	4.	.0	.0	.0	.0	.0	8.3	.0	.0	.0	8.3
TOTAL FOR COVERTYPE	166.	42.	204.	46.	458.	.2	1.7	32.5	32.0	66.4					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B10.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 33: NORWAY SPRUCE
1 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	800.	0.	0.	0.	800.	.1	.0	.0	.0	.1	100.0	.0	.0	.0	100.0
AILANTHUS ALTISSIMA	100.	0.	0.	0.	100.	.0	.0	.0	.0	.0	100.0	.0	.0	.0	100.0
FRAXINUS AMERICANA	100.	0.	0.	0.	100.	.0	.0	.0	.0	.0	100.0	.0	.0	.0	100.0
LINDERA BENZOIN	150.	0.	0.	0.	150.	.0	.0	.0	.0	.0	100.0	.0	.0	.0	100.0
LIRIODENDRON TULIPIFERA	50.	0.	0.	0.	50.	.0	.0	.0	.0	.0	100.0	.0	.0	.0	100.0
PICEA ABIES	0.	0.	150.	50.	200.	.0	.0	29.6	17.1	46.7	.0	.0	100.0	100.0	100.0
ROBINIA PSEUDO-ACACIA	0.	0.	50.	0.	50.	.0	2.5	.0	.0	2.5	.0	.0	100.0	.0	100.0
TOTAL FOR COVERTYPE	1200.	0.	200.	50.	1450.	.1	2.5	29.6	17.1	49.4					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B11.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 32: RED SPRUCE
3 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	0.	0.	33.	0.	33.	.0	.0	.4	.0	.4	.0	.0	66.7	.0	66.7
AILANTHUS ALTISSIMA	667.	17.	33.	0.	617.	.1	1.0	2.2	.0	3.2	66.7	33.3	33.3	.0	66.7
CARYA CORDIFORMIS	0.	17.	50.	0.	67.	.0	.2	3.6	.0	3.9	.0	33.3	33.3	.0	33.3
FRAXINUS AMERICANA	17.	0.	0.	0.	17.	.0	.0	.0	.0	.0	33.3	.0	.0	.0	33.3
PICEA RUBENS	33.	163.	250.	100.	567.	.8	5.7	13.8	10.6	30.9	66.7	100.0	100.0	100.0	100.0
ULMUS AMERICANA	17.	0.	0.	0.	17.	.0	.0	.0	.0	.0	33.3	.0	.0	.0	33.3
TOTAL FOR COVERTYPE	633.	217.	367.	100.	1317.	.9	6.9	20.0	10.6	38.4					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Table B12.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF TREE DATA*

COVERTYPE 1: OTHER HARDWOODS
4 TREE PLOTS

PLANT	DENSITY (#/HA)					BASAL AREA (M. SQ./HA)					FREQUENCY				
	S	I	C	D	TOTAL	S	I	C	D	TOTAL	S	I	C	D	TOTAL
ACER SACCHARUM	863.	13.	0.	0.	876.	.6	.1	.0	.0	.6	75.0	25.0	.0	.0	75.0
AILANTHUS ALTISSIMA	0.	0.	0.	13.	13.	.0	.0	.0	1.2	1.2	.0	.0	.0	25.0	25.0
BETULA LENTA	75.	163.	138.	13.	388.	.1	.9	3.0	4.2	8.3	50.0	50.0	100.0	25.0	100.0
CARYA CORDIFORMIS	13.	13.	0.	0.	26.	.0	.1	.0	.0	.1	25.0	25.0	.0	.0	25.0
CORNUS ALTERNIFOLIA	50.	0.	0.	0.	50.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
CORNUS FLORIDA	38.	0.	0.	0.	38.	.0	.0	.0	.0	.0	50.0	.0	.0	.0	50.0
FRAXINUS AMERICANA	88.	0.	0.	0.	88.	.1	.0	.0	.0	.1	75.0	.0	.0	.0	75.0
LINARIA VULGARIS	0.	0.	13.	0.	13.	.0	.0	1.4	.0	1.4	.0	.0	25.0	.0	25.0
LINDERA BENZOIN	1350.	0.	0.	0.	1350.	.5	.0	.0	.0	.5	75.0	.0	.0	.0	75.0
LIRIODENDRON TULIPIFERA	13.	0.	0.	0.	13.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
MAGNOLIA TRIPETALA	13.	0.	0.	0.	13.	.0	.0	.0	.0	.0	25.0	.0	.0	.0	25.0
PINUS STROBUS	0.	13.	0.	0.	13.	.0	.3	.0	.0	.3	.0	25.0	.0	.0	25.0
QUERCUS PRINUS	0.	0.	0.	13.	13.	.0	.0	.0	2.8	2.8	.0	.0	.0	25.0	25.0
QUERCUS RUBRA	0.	25.	0.	0.	25.	.2	.0	.0	.0	.2	.0	25.0	.0	.0	25.0
TSUGA CANADENSIS	50.	38.	38.	0.	125.	.1	.9	2.0	.0	3.0	25.0	50.0	50.0	.0	60.0
ULMUS AMERICANA	25.	25.	13.	13.	76.	.1	.3	.7	1.0	2.1	25.0	25.0	25.0	25.0	25.0
TOTAL FOR COVERTYPE	2576.	288.	200.	50.	3113.	1.5	2.8	7.1	9.2	20.5					

* S=SUPPRESSED; I=INTERMEDIATE; C=CODOMINANT; D=DOMINANT; TOTAL=OVERALL VALUE

Appendix C

Results from PROGIV for shrub data.

Table C1.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 27: SUGAR MAPLE
96 SHRUB PLOTS

DENSITY = 27604. STEMS/HA GROUND COVER = 10.3%

PLANT	DENSITY (#/HA)	% GROUND COVER	FREQUENCY
ACER SACCHARUM	13542.	3.3	42.7
AILANTHUS ALTISSIMA	417.	.0	3.1
CARPINUS CAROLINIANA	208.	.2	1.0
CARYA GLABRA	104.	.1	1.0
FRAXINUS AMERICANA	417.	.4	3.1
LINDERA BENZOIN	4792.	3.3	20.8
LIRIODENDRON TULIPIFERA	104.	.0	1.0
OSTRYA VIRGINIANA	104.	.0	1.0
PRUNUS AVIUM	208.	.4	2.1
QUERCUS RUBRA	417.	.2	2.1
RHAMNUS ALNIFOLIA	104.	.0	1.0
RHUS TYPHINA	208.	.1	1.0
SASSAFRAS ALBIDUM	104.	.1	1.0
STAPHYLEA TRIFOLIA	3333.	1.4	3.1
TILIA AMERICANA	104.	.1	1.0
VIBURNUM ACERIFOLIUM	3229.	.7	3.1
VIBURNUM DENTATUM	208.	.1	1.0

Table C2.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 28: SUGAR MAPLE/HARDWOODS
16 SHRUB PLOTS

DENSITY = 15000. STEMS/HA GROUND COVER = 3.1%

PLANT	DENSITY (#/HA)	% GROUND COVER	FREQUENCY
ACER SACCHARUM	5000.	2.6	31.3
CORNUS FLORIDA	2500.	.3	6.3
EUONYMOUS ALATUS	1250.	.3	6.3
FRAXINUS AMERICANA	1250.	1.3	6.3
LINDERA BENZOIN	1250.	.1	6.3
OSTRYA VIRGINIANA	1250.	1.9	6.3
PINUS STROBUS	625.	.1	6.3
VIBURNUM ACERIFOLIUM	1875.	1.6	6.3

Table C3.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 29: SUGAR MAPLE/OAK
28 SHRUB PLOTS

DENSITY = 37500. STEMS/HA GROUND COVER = 15.4%

PLANT	DENSITY (#/HA)	% GROUND COVER	FREQUENCY
ACER SACCHARUM	22857.	7.5	60.7
AILANTHUS ALTISSIMA	357.	.4	3.6
CORNUS RACEMOSA	2143.	.7	3.6
FRAXINUS AMERICANA	714.	.4	3.6
LINDERA BENZOIN	8929.	5.6	46.4
PRUNUS SEROTINA	714.	.2	3.6
SASSAFRAS ALBIDUM	714.	.4	3.6
STAPHYLEA TRIFOLIA	1071.	.4	3.6

Table C4.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 52: OAK

72 SHRUB PLOTS

DENSITY = 81806. STEMS/HA

GROUND COVER = 26.0%

PLANT	DENSITY (#/HA)	% GROUND COVER	FREQUENCY
ACER SACCHARUM	15556.	4.5	33.3
AILANTHUS ALTISSIMA	139.	.1	1.4
BETULA LENTA	1528.	.4	2.8
CARYA CORDIFORMIS	278.	.1	2.8
CARYA GLABRA	833.	.1	2.8
CARYA TOMENTOSA	139.	.1	1.4
CORNUS ALTERNIFOLIA	2917.	1.4	2.8
CORNUS FLORIDA	7361.	2.0	4.2
FRAXINUS AMERICANA	3472.	2.8	20.8
HAMAMELIS VIRGINIANA	3611.	1.3	8.3
LINDERA BENZOIN	694.	.6	4.2
OSTRYA VIRGINIANA	278.	.1	1.4
PRUNUS AVIUM	139.	.0	1.4
PRUNUS SEROTINA	1667.	.5	5.6
PRUNUS VIRGINIANA	2639.	.8	8.3
QUERCUS ALBA	139.	.1	1.4
QUERCUS PRINUS	972.	.3	6.9
QUERCUS RUBRA	1806.	1.1	8.3
RHAMNUS CATHARTICA	4167.	1.1	11.1
RHUS TYPHINA	417.	.1	1.4
ROBINIA PSEUDO-ACACIA	694.	.0	2.8
SASSAFRAS ALBIDUM	2500.	.2	6.9
STAPHYLEA TRIFOLIA	2778.	2.4	4.2
TSUGA CANADENSIS	278.	.0	2.8
VACCINIUM VACILLANS	5833.	.8	8.3
VIBURNUM ACERIFOLIUM	19583.	4.8	22.2
VIBURNUM DENTATUM	417.	.1	1.4
VIBURNUM RAFINESQUIANUM	139.	.0	1.4
ROSA SPP.	833.	.2	2.8

Table C5.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 53: OAK/TULIP POPLAR
16 SHRUB PLOTS

DENSITY = 30000. STEMS/HA GROUND COVER = 20.4%

<u>PLANT</u>	<u>DENSITY (#/HA)</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ACER SACCHARUM	3125.	1.6	18.8
CARYA CORDIFORMIS	1875.	1.0	12.5
LINDERA BENZOIN	25000.	17.9	75.0

Table C6.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 57: TULIP POPLAR

12 SHRUB PLOTS

DENSITY = 45833. STEMS/HA GROUND COVER = 36.1%

<u>PLANT</u>	<u>DENSITY (#/HA)</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ACER SACCHARUM	4167.	1.3	16.7
FRAXINUS AMERICANA	1667.	.5	16.7
HAMAMELIS VIRGINIANA	1667.	.1	8.3
LINDERA BENZOIN	32500.	31.8	66.7
PHILADELPHUS GRANDIFLORUS	5833.	2.5	8.3

Table C7.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 23: HEMLOCK/HARDWOODS
40 SHRUB PLOTS

DENSITY = 24500. STEMS/HA GROUND COVER = 9.0%

PLANT	DENSITY (#/HA)	% GROUND COVER	FREQUENCY
ACER SACCHARUM	7750.	3.7	37.5
CARYA CORDIFORMIS	750.	.3	5.0
CELTIS OCCIDENTALIS	250.	.0	2.5
CORNUS FLORIDA	250.	.1	2.5
FRAXINUS AMERICANA	1500.	.8	10.0
LINDERA BENZOIN	500.	.0	2.5
QUERCUS PRINUS	1250.	.6	5.0
QUERCUS RUBRA	250.	.0	2.5
VACCINIUM VACILLANS	250.	.1	2.5
VIBURNUM ACERIFOLIUM	11750.	3.3	22.5

Table C8.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 22: WHITE PINE/HEMLOCK
32 SHRUB PLOTS

DENSITY = 13438. STEMS/HA GROUND COVER = 9.7%

<u>PLANT</u>	<u>DENSITY (#/HA)</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ACER SACCHARUM	938.	.6	9.4
CARYA CORDIFORMIS	313.	.3	3.1
FRAXINUS AMERICANA	1875.	2.3	15.6
LINDERA BENZOIN	938.	.3	3.1
PINUS STROBUS	8750.	5.8	21.9
TILIA AMERICANA	625.	.3	3.1

Table C9.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 21: WHITE PINE

44 SHRUB PLOTS

DENSITY = 9091. STEMS/HA GROUND COVER = 6.5%

<u>PLANT</u>	<u>DENSITY (#/HA)</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ACER SACCHARUM	6591.	3.5	18.2
LINDERA BENZOIN	227.	.2	2.3
MAGNOLIA TRIPETALA	227.	.9	2.3
PINUS STROBUS	1591.	1.4	6.8
RHUS TYPHINA	455.	.5	2.3

Table C10.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 33: NORWAY SPRUCE

4 SHRUB PLOTS

DENSITY = 10000. STEMS/HA GROUND COVER = 6.8%

<u>PLANT</u>	<u>DENSITY (#/HA)</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ACER SACCHARUM	2500.	.3	25.0
FRAXINUS AMERICANA	5000.	5.3	50.0
TAXUS CANADENSIS	2500.	1.3	25.0

Table C11.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 32: RED SPRUCE
12 SHRUB PLOTS

DENSITY = 5833. STEMS/HA GROUND COVER = .3%

<u>PLANT</u>	<u>DENSITY (#/HA)</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ACER SACCHARUM	2500.	.2	16.7
AILANTHUS ALTISSIMA	1667.	.1	8.3
RHAMNUS ALNIFOLIA	1667.	.1	8.3

Table C12.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 99: MEADOW

68 SHRUB PLOTS

DENSITY = 10441. STEMS/HA GROUND COVER = 3.9%

<u>PLANT</u>	<u>DENSITY (#/HA)</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ACER SACCHARUM	441.	.3	1.5
FRAXINUS AMERICANA	588.	.3	4.4
PRUNUS SEROTINA	147.	.1	1.5
SASSAFRAS ALBIDUM	2059.	1.0	5.9
SYMPHORICARPOS ALBUS	6618.	2.1	4.4
ULMUS AMERICANA	588.	.1	2.9

Table C13.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF SHRUB DATA

COVERTYPE 1: OTHER HARDWOODS
16 SHRUB PLOTS

DENSITY = 11250. STEMS/HA GROUND COVER = 6.8%

<u>PLANT</u>	<u>DENSITY (#/HA)</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ACER SACCHARUM	3750.	1.6	25.0
FRAXINUS AMERICANA	1875.	1.6	18.8
LINDERA BENZOIN	5000.	3.5	25.0
PRUNUS SEROTINA	625.	.1	6.3

Appendix D

Results from PROGIV for herb data.

Table D1.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 27: SUGAR MAPLE
96 HERB PLOTS
GROUND COVER = 41.9%

PLANT	% GROUND COVER	FREQUENCY
ALLIARIA OFFICINALIS	.9	14.6
ALLIUM SPP.	.5	5.2
ANEMONELLA THALICTROIDES	.4	10.4
ARALIA NUDICAULIS	.2	4.2
ARISAEMA ATRORUBENS	4.0	34.4
ASTER SPP.	.1	2.1
ASTER DIVARICATUS	5.7	38.5
BETULA LENTA	.1	1.0
BOEHMERIA CYLINDRICA	.7	4.2
BOTRYCHUM VIRGINIANUM	.0	1.0
CAREX SPP.	.0	2.1
CELASTRUS SCANDENS	1.3	2.1
CIRCAEA QUADRISULCATA	.9	9.4
COLLINSONIA CANADENSIS	.3	2.1
DENTARIA DIPHYLLA	.2	3.1
DRYOPTERIS MARGINALIS	.1	2.1
DRYOPTERIS SPINULOSA	.2	4.2
GRAMINEAE	.1	2.1
IMPATIENS CAPENSIS	2.0	10.4
LICHENS SPP.	.1	5.2
MOSS	2.0	18.8
ONOCLEA SENSIBILIS	.3	1.0
OSMORHIZA CLAYTONI	.4	4.2
PARTHENOCISSUS SPP.	5.5	31.3
POLYGONATUM PUBESCENS	.1	3.1
POLYPODIUM VULGARE	.1	1.0
POLYSTICHUM ACROSTICHOIDES	.5	3.1
RHUS RADICANS	.5	7.3
RUBUS SPP.	.3	2.1
SANICULA TRIFOLIATA	.0	1.0
SMILACINA RACEMOSA	.4	11.5
SOLANUM DULCAMARA	.1	1.0
SYMPLOCARPUS FOETIDUS	6.4	16.7
THELYPTERIS NOVEBORACENSIS	.1	1.0
VINCA MINOR	3.8	4.2
VIOLA INCOGNITA	.7	4.2
VIOLA SPP.	2.3	24.0
VITIS SPP.	.1	1.0
UNKNOWN GOLDENROD	.3	4.2
GERANIUM MACULATUM	.0	1.0
GERANIUM ROBERTIANUM	.1	1.0
OSMUNDA CINNAMOMEA	.1	1.0

Table D2.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 28: SUGAR MAPLE/HARDWOODS
16 HERB PLOTS
GROUND COVER = 44.8%

PLANT	% GROUND COVER	FREQUENCY
ALLIARIA OFFICINALIS	5.6	50.0
ARISAEMA ATORRUBENS	1.9	25.0
ASTER DIVARICATUS	.6	12.5
BOTRYCHUM VIRGINIANUM	.1	6.3
CAREX SPP.	2.5	25.0
CATALPA SPECIOSA	.3	6.3
CELASTRUS SCANDENS	7.5	31.3
CIRCAEA QUADRISULCATA	1.9	18.8
DRYOPTERIS SPINULOSA	1.3	6.3
MOSS	.3	6.3
OXALIS MONTANA	2.2	18.8
PARTHENOCISSUS SPP.	4.1	25.0
RHUS RADICANS	13.5	43.8
SMILACINA RACEMOSA	.1	12.5
SOLIDAGO SPP.	.3	6.3
VIOLA SPP.	2.0	50.0
VITIS SPP.	.1	6.3
UNKNOWN GOLDENROD	.6	12.5

Table D3.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 29: SUGAR MAPLE/OAK
28 HERB PLOTS
GROUND COVER = 51.6%

PLANT	% GROUND COVER	FREQUENCY
ALLIARIA OFFICINALIS	2.0	35.7
ARISAEMA ATRORUBENS	2.4	39.3
ASTER DIVARICATUS	2.5	25.0
BOEHMERIA CYLINDRICA	.0	3.6
CAREX SPP.	.5	7.1
CELASTRUS SCANDENS	.2	3.6
CIRCAEA QUADRISULCATA	.9	10.7
COLLINSONIA CANADENSIS	.9	3.6
DENTARIA DIPHYLLA	.2	3.6
EUPATORIUM PERFOLIATUM	.2	3.6
GRAMINEAE	.7	3.6
IMPATIENS CAPENSIS	2.2	25.0
LYTHRUM SALICARIA	1.4	7.1
MOSS	1.5	28.6
PARTHENOCISSUS SPP.	9.3	64.3
POLYGONATUM PUBESCENS	.4	3.6
QUERCUS VELUTINA	1.1	3.6
RHUS RADICANS	.2	3.6
RUBUS SPP.	.4	3.6
SMILACINA RACEMOSA	.7	14.3
SOLANUM DULCAMARA	.7	10.7
SOLIDAGO SPP.	.2	3.6
SYMPLOCARPUS FOETIDUS	13.0	21.4
TOVARA VIRGINIANA	.6	10.7
VIOLA SPP.	5.3	46.4
UNKNOWN GOLDENROD	.2	7.1
GERANIUM MACULATUM	3.4	25.0
GERANIUM ROBERTIANUM	.2	17.9
SANGUINARIA CANADENSIS	.4	7.1

Table D4.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 52: OAK

72 HERB PLOTS

GROUND COVER = 32.4%

PLANT	% GROUND COVER	FREQUENCY
ACHILLEA MILLEFOLIUM	.1	1.4
ALLIARIA OFFICINALIS	.7	9.7
ANEMONELLA THALICTROIDES	.4	1.4
ARALIA NUDICAULIS	1.3	6.9
ARISAEMA ATRORUBENS	.3	8.3
ASTER SPP.	.8	8.3
ASTER DIVARICATUS	2.9	26.4
BOEHMERIA CYLINDRICA	.1	2.8
CAREX SPP.	1.8	16.7
CASSIA HEBECARPA	.1	1.4
CAULOPHYLLUM THALICTROIDES	.1	1.4
CELASTRUS SCANDENS	.1	1.4
CHIMAPHILA MACULATA	.0	1.4
CIRCAEA QUADRISULCATA	.4	6.9
COMMELINA COMMUNIS	.1	1.4
(CF) CONIUM MACULATUM	.0	1.4
DENTARIA DIPHYLLA	.0	4.2
DESCHAMPSIA SPP.	2.5	13.9
DRYOPTERIS MARGINALIS	.1	1.4
DRYOPTERIS SPINULOSA	.0	1.4
GALIUM APARINE	.1	1.4
GRAMINEAE	3.8	11.1
(CF) HEPATICA ACUTILOBA	.0	1.4
HIERACIUM VENOSUM	.0	1.4
LICHENS SPP.	.4	6.9
LYSIMACHIA QUADRIFOLIA	.2	5.6
MELAMPYRUM LINEARE	.2	6.9
MOSS	1.7	27.8
OXALIS EUROPEA	.1	1.4
PANICUM SPP.	.0	1.4
PARTHENOCISSUS SPP.	4.1	33.3
PHYTOLACCA AMERICANA	.1	1.4
POLYGONATUM PUBESCENS	1.1	13.9
PTERIDIUM AQUILINUM	.2	4.2
RHUS RADICANS	1.5	9.7
RUBUS OCCIDENTALIS	.5	4.2
RUBUS SPP.	.4	4.2
SMILACINA RACEMOSA	1.3	20.8
SOLIDAGO SPP.	1.4	26.4
VACCINIUM VACILLANS	.3	1.4
VIOLA SPP.	1.9	22.2

Table D4. Continued.

VITIS SPP.	.1	2.3
GRASS 18	.1	2.8
UNKNOWN GOLDENROD	.8	15.3
GERANIUM MACULATUM	.0	4.2
OENOTHERA BIENNIS	.2	2.3

Table D5.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 53: OAK/TULIP POPLAR
16 HERB PLOTS
GROUND COVER = 31.8%

PLANT	% GROUND COVER	FREQUENCY
AGROSTIS SPP.	1.9	12.5
ALLIARIA OFFICINALIS	.6	12.5
ARISAEMA ATORRUBENS	7.6	81.3
ASTER DIVARICATUS	.4	12.5
BOEHMERIA CYLINDRICA	.3	6.3
CAREX SPP.	.3	6.3
CIRCAEA QUADRISULCATA	2.2	25.0
DENTARIA DIPHYLLA	.6	6.3
DRYOPTERIS SPINULOSA	.3	6.3
MOSS	1.3	6.3
PARTHENOCISSUS SPP.	3.8	50.0
POLYSTICHUM ACROSTICHOIDES	1.6	6.3
RUBUS OCCIDENTALIS	.6	6.3
RUBUS SPP.	1.3	18.8
SMILACINA RACEMOSA	.1	12.5
VIOLA SPP.	3.5	31.3
VITIS SPP.	5.0	12.5
SANGUINARIA CANADENSIS	.4	12.5

Table D6.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 57: TULIP POPLAR
12 HERB PLOTS
GROUND COVER = 37.1%

PLANT	% GROUND COVER	FREQUENCY
ALLIARIA OFFICINALIS	.1	8.3
ARISAEMA ATRORUBENS	7.1	66.7
ASTER DIVARICATUS	2.2	16.7
CELASTRUS SCANDENS	2.6	33.3
CIRCAEA QUADRISULCATA	3.4	50.0
DENTARIA DIPHYLLA	.1	8.3
PARTHENOCISSUS SPP.	4.2	50.0
POLYSTICHUM ACROSTICHOIDES	3.3	8.3
SMILACINA RACEMOSA	.4	8.3
SOLANUM DULCAMARA	.1	8.3
SOLIDAGO SPP.	.1	8.3
VIOLA INCOGNITA	13.3	50.0
VIOLA SPP.	.2	16.7
GERANIUM ROBERTIANUM	.1	8.3

Table D7.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 23: HEMLOCK/HARDWOODS

40 HERB PLOTS

GROUND COVER = 19.0%

<u>PLANT</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ALLIARIA OFFICINALIS	.2	5.0
ARALIA NUDICAULIS	1.7	15.0
ARISAEMA ATORRUBENS	.3	5.0
ASTER SPP.	.4	7.5
ASTER DIVARICATUS	3.1	32.5
BOEHMERIA CYLINDRICA	.5	7.5
CAREX SPP.	2.6	22.5
CELASTRUS SCANDENS	.7	7.5
CIRCAEA QUADRISULCATA	.5	12.5
DENTARIA DIPHYLLA	.2	5.0
DESCHAMPSIA SPP.	.8	7.5
GALIUM APARINE	.3	2.5
GRAMINEAE	.0	2.5
HIERACIUM CANADENSE	.0	2.5
IMPATIENS CAPENSIS	.3	5.0
MOSS	2.4	12.5
ONOCLEA SENSIBILIS	.5	2.5
PANICUM SPP.	.0	2.5
PARTHENOCISSUS SPP.	.3	17.5
POLYGONATUM PUBESCENS	.1	2.5
POLYSTICHUM ACROSTICHOIDES	1.3	2.5
RUBUS SPP.	.3	5.0
SMILACINA RACEMOSA	.0	2.5
SOLIDAGO SPP.	.5	7.5
SYMPLOCARPUS FOETIDUS	1.6	7.5
VIOLA SPP.	.4	17.5
UNKNOWN GOLDENROD	.2	5.0
GERANIUM ROBERTIANUM	.1	7.5

Table D8.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 22: WHITE PINE/HEMLOCK

32 HERB PLOTS

GROUND COVER = 66.9%

PLANT	% GROUND COVER	FREQUENCY
ALLIARIA OFFICINALIS	.2	3.1
ARISAEMA ATRORUBENS	.6	3.1
DRYOPTERIS SPINULOSA	.8	9.4
IMPATIENS CAPENSIS	5.2	9.4
PARTHENOCISSUS SPP.	3.5	46.9
POLYGONATUM PUBESCENS	.3	3.1
RHUS RADICANS	46.6	81.3
RUBUS SPP.	.9	9.4
SMILACINA RACEMOSA	.2	3.1
STYLOPHORUM DIPHYLLUM	.0	3.1
SYMPLOCARPUS FOETIDUS	8.4	12.5
VIOLA SPP.	.2	3.1

Table D9.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 21: WHITE PINE
44 HERB PLOTS
GROUND COVER = 72.8%

PLANT	% GROUND COVER	FREQUENCY
ALLIARIA OFFICINALIS	2.9	15.9
ARALIA NUDICAULIS	1.6	6.8
ARISAEMA ATRORUBENS	.3	4.5
ASTER DIVARICATUS	.3	4.5
CELASTRUS SCANDENS	.0	2.3
CIRCAEA QUADRISULCATA	.2	2.3
DRYOPTERIS SPINULOSA	2.3	6.8
GLECOMA HEDERACEA	.1	4.5
PARTHENOCISSUS SPP.	4.1	40.9
PINUS STROBUS	6.8	9.1
RHUS RADICANS	49.3	72.7
RUBUS SPP.	.9	6.8
SMILACINA RACEMOSA	.2	4.5
STYLOPHORUM DIPHYLLUM	.4	11.4
VIOLA SPP.	2.6	18.2
VITIS SPP.	.6	6.8
UNKNOWN GOLDENROD	.0	2.3

Table D10.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 33: NORWAY SPRUCE
4 HERB PLOTS
GROUND COVER = 117.8%

<u>PLANT</u>	<u>% GROUND COVER</u>	<u>FREQUENCY</u>
ARISAEMA ATRORUBENS	5.3	75.0
DENNSTAEDTIA PUNCTILOBULA	20.0	50.0
DRYOPTERIS SPINULOSA	60.0	75.0
RHUS RADICANS	26.3	100.0
GERANIUM ROBERTIANUM	6.3	50.0

Table D11.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATACOVERTYPE 32: RED SPRUCE
12 HERB PLOTS
GROUND COVER = 15.0%

PLANT	% GROUND COVER	FREQUENCY
ALLIARIA OFFICINALIS	.5	16.7
ARISAEMA ATRORUBENS	1.3	16.7
ASTER DIVARICATUS	.4	8.3
CIRCAEA QUADRISULCATA	.8	8.3
GRAMINEAE	.1	8.3
PARTHENOCISSUS SPP.	1.8	33.3
RHUS RADICANS	.1	8.3
VIOLA SPP.	10.1	41.7

Table D12.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 99: MEADOW
68 HERB PLOTS
GROUND COVER = 161.4%

PLANT	% GROUND COVER	FREQUENCY
ACHILLEA MILLEFOLIUM	2.1	20.6
AGROPYRON A	.4	5.9
AGROPYRON B	1.2	20.6
AGROSTIS SPP.	6.7	52.9
ALLIARIA OFFICINALIS	.2	5.9
ALLIUM SPP.	1.3	36.8
ANTHOXANTHUM ODORATUM	9.2	70.6
ARISAEMA ATORORUBENS	.6	5.9
ASCLEPIAS SYRIACA	2.9	26.5
ASCLEPIAS VERTICILLATA	8.6	23.5
ASPARAGUS OFFICINALIS	.4	4.4
ASTER SPP.	2.5	19.1
CAREX SPP.	.4	7.4
CELASTRUS SCANDENS	5.2	25.0
CERASTIUM VULGATUM	.5	2.9
CRUCIFERAE	.5	8.8
DACTYLIS GLOMERATA	.8	5.9
DAUCUS CAROTA	.2	4.4
DESCHAMPSIA SPP.	.9	13.2
DIANTHUS ARMERIA	.1	1.5
EQUISETUM SPP.	2.1	7.4
FRAGARIA VIRGIANA	6.0	47.1
GALIUM APARINE	.1	2.9
GERANIUM BICKNELLII	.1	1.5
HYPERICUM PERFORATUM	.1	1.5
IMPATIENS CAPENSIS	.1	2.9
LEPIDIUM CAMPESTRE	.4	10.3
LINARIA VULGARIS	.6	5.9
LONICERA JAPONICA	1.8	13.2
LYSIMACHIA NUMMULARIA	1.0	7.4
MELAMPYRUM LINEARE	.8	4.4
ONOCLEA SENSIBILIS	2.6	11.8
OSMORHIZA CLAYTONI	5.1	17.6
OXALIS EUROPEA	.1	1.5
OXALIS MONTANA	.8	16.2
PANICUM SPP.	.2	4.4
PARTHENOCISSUS SPP.	14.2	69.1
PHLEUM PATENSE	.1	1.5
POLYGONUM CONVULVULUS	.1	1.5
POTENTILLA RECTA	.1	1.5
RHUS RADICANS	15.2	42.6
RIBES CYNOSBATI	.3	2.9
RUBUS SPP.	16.3	70.6

Table D12. Continued.

RUDBECKIA SEROTINA	.4	2.9
RUMEX ACETOSELLA	2.2	26.5
SATUREJA VULGARIS	3.8	36.8
SCIRPUS SPP.	.7	5.9
SECALE CEREALE	21.3	66.2
SILENE CUCUBALUS	1.4	5.9
SISYRINCHIUM MONTANUM	.1	2.9
SOLANUM CAROLINENSE	1.7	27.9
SOLANUM DULCAMARA	.1	1.5
SOLIDAGO SPP.	5.0	32.4
STELLARIA GRAMINEA	.0	1.5
TARAXACUM OFFICINALE	.1	2.9
TRIFOLIUM AGRARIUM	1.0	10.3
TRIFOLIUM PRATENSE	.1	2.9
VERONICA OFFICINALIS	.0	2.9
VICIA CRACCA	.4	4.4
VIOLA SPP.	.4	10.3
VITIS SPP.	4.3	25.0
GRASS 5	.5	11.8
GRASS 6	1.5	23.5
GRASS 7	.2	5.9
GRASS 8	.3	2.9
GRASS 9	.3	5.9
GRASS 10	.1	4.4
GRASS 11	.0	1.5
GRASS 16	.0	2.9
GRASS 19	1.0	23.5
UNKNOWN GOLDENROD	.1	1.5
ROSA SPP.	1.4	11.8

Table D13.

VANDERBILT MANSION NHS VEGETATION STUDY 1984
SUMMARY OF HERB DATA

COVERTYPE 1: OTHER HARDWOODS
16 HERB PLOTS
GROUND COVER = 23.8%

PLANT	% GROUND COVER	FREQUENCY
ALLIARIA OFFICINALIS	1.0	25.0
ARISAEMA ATORUBENS	2.2	31.3
ASTER DIVARICATUS	3.4	31.3
CELASTRUS SCANDENS	1.6	12.5
CIRCAEA QUADRISULCATA	2.3	43.8
DRYOPTERIS SPINULOSA	.6	6.3
GALIUM APARINE	.1	6.3
LONICERA JAPONICA	.1	12.5
MOSS	.3	6.3
PARTHENOCISSUS SPP.	4.4	43.8
POLYSTICHUM ACROSTICHOIDES	.1	6.3
RHUS RADICANS	.4	12.5
RUBUS SPP.	2.2	25.0
SMILACINA RACEMOSA	.4	12.5
SYMPLOCARPUS FOETIDUS	.3	6.3
TOVARA VIRGINIANA	.1	6.3
VIOLA SPP.	4.3	43.8
UNKNOWN GOLDENROD	.1	12.5

Appendix E

Results from RELSUM on marsh and other hardwoods types.

MAP UNIT 98 NO. RELEVES = 3

TAXON	NAME	# RLV	% PRESENCE	# RELEVES IN HEIGHT CLASS								AV-IMPORT	MODAL-SOCI.
				1	2	3	4	5	6	7	8		
173	SYMPLOCARPUS FOETIDUS	3	100.00	3	3	3	1	0	0	0	0	1.000	1
106	LYTHRUM SALICARIA	2	66.67	2	2	2	1	0	0	0	0	3.667	2
92	IMPATIENS CAPENSIS	2	66.67	2	2	2	1	0	0	0	0	2.000	1
64	CRUCIFERAE	2	66.67	2	2	2	1	0	0	0	0	1.333	1
2	ACHILLEA MILLEFOLIUM	2	66.67	2	2	2	1	0	0	0	0	1.333	1
122	PHRAGMITES COMMUNIS	2	66.67	2	2	2	2	0	0	0	0	2.333	1
69	ERIGERON PHILADELPHICUS	1	33.33	1	1	1	0	0	0	0	0	1.000	1
29	CAREX SPP.	1	33.33	1	1	1	1	0	0	0	0	0.333	1
98	LINDERA BENZOIN	1	33.33	1	1	1	0	0	0	0	0	0.667	1
209	GRASS 10	1	33.33	1	1	1	0	0	0	0	0	0.667	1
208	GRASS 9	1	33.33	1	1	1	0	0	0	0	0	0.667	1
63	DESCHAMPSIA SPP.	1	33.33	1	1	1	0	0	0	0	0	1.000	1
100	LONICERA JAPONICA	1	33.33	1	1	1	0	0	0	0	0	1.000	1
191	VERONICA SERPYLLIFOLIA	1	33.33	1	1	1	0	0	0	0	0	0.667	1
128	PILEA PUMILA	1	33.33	1	1	1	0	0	0	0	0	1.333	3
111	MOSS	1	33.33	1	1	1	0	0	0	0	0	1.000	2
198	VIOLA SPP.	1	33.33	1	1	1	0	0	0	0	0	0.667	1
46	CLEMATIS VIRGINIANA	1	33.33	1	1	1	0	0	0	0	0	0.667	1
119	PARTHENOCISSUS SPP.	1	33.33	1	1	1	1	0	0	0	0	1.333	1
199	VITIS SPP.	1	33.33	1	1	1	0	0	0	0	0	0.667	1
112	MYOSOTIS SCORPIOIDES	1	33.33	1	1	1	0	0	0	0	0	1.333	2
118	OXALIS EUROPEA	1	33.33	1	1	1	0	0	0	0	0	0.667	1
113	ONOCLEA SENSIBILIS	1	33.33	1	1	1	1	0	0	0	0	0.333	1
162	RUBUS SPP.	1	33.33	1	1	1	0	0	0	0	0	1.333	1
163	RUDBECKIA SEROTINA	1	33.33	1	1	1	0	0	0	0	0	0.667	1
219	UNKNOWN GOLDENROD	1	33.33	1	1	1	1	0	0	0	0	0.667	1
218	GRASS 19	1	33.33	1	1	1	0	0	0	0	0	1.000	1
147	RHUS RADICANS	1	33.33	1	1	1	1	0	0	0	0	1.333	2
225	ROSA SPP.	1	33.33	1	1	1	0	0	0	0	0	1.333	1
7	AGROSTIS SPP.	1	33.33	1	1	1	0	0	0	0	0	1.667	2
177	THELYPTERIS PALUSTRIS	1	33.33	1	1	1	0	0	0	0	0	0.667	1
76	FRAXINUS AMERICANA	1	33.33	1	1	1	0	0	0	0	0	0.667	1
165	SOLANUM DULCAMARA	1	33.33	1	1	1	0	0	0	0	0	0.667	1
169	SCIRPUS SPP.	1	33.33	1	1	1	0	0	0	0	0	2.000	4
164	SOLANUM CAROLINENSE	1	33.33	1	1	1	0	0	0	0	0	0.667	1

Table E1.

UP UNIT 01		NO. RELEVES = 2		# RLV %PRESENCE #		RELEVE IN HEIGHT CLASS.								AV-IMPORT MODAL-SOCI.	
						1	2	3	4	5	6	7	8		
IXON	NAME														
82	GRAMINEAE	2	100.00	2	2	1	0	0	0	0	0	0	0	2.000	3
199	VITIS SPP.	2	100.00	1	1	2	2	2	0	0	0	0	0	3.000	1
9	ALLIARIA OFFICINALIS	2	100.00	2	2	2	0	0	0	0	0	0	0	4.500	1
78	GALIUM APARINE	2	100.00	2	2	1	0	0	0	0	0	0	0	1.500	1
18	ARISAEMA ATRORUBENS	2	100.00	2	2	1	0	0	0	0	0	0	0	2.000	1
184	ULMUS AMERICANA	2	100.00	0	0	1	1	1	2	0	0	0	0	8.500	1
163	SHILACINA RACEMOSA	2	100.00	2	2	1	0	0	0	0	0	0	0	2.000	1
46	CIRCAEA QUADRISULCATA	2	100.00	2	2	1	0	0	0	0	0	0	0	2.000	1
111	MOSS	2	100.00	2	2	1	0	0	0	0	0	0	0	2.000	2
119	PARTHENOCISSUS SPP.	2	100.00	2	2	2	2	2	0	0	0	0	0	4.500	1
76	FRAXINUS AMERICANA	2	100.00	1	1	1	1	1	0	0	0	0	0	2.500	1
138	PRUNUS SEROTINA	1	50.00	0	0	1	1	1	0	0	0	0	0	1.500	1
66	CRYPTOTAENIA CANADENSIS	1	50.00	1	1	1	0	0	0	0	0	0	0	1.000	1
128	PLATANUS OCCIDENTALIS	1	50.00	0	0	0	0	0	0	1	0	0	0	2.000	1
62	CORNUS FLORIDA	1	50.00	1	1	2	1	1	0	0	0	0	0	4.500	1
87	DRYOPTERIS SPINULOSA	1	50.00	1	1	0	0	0	0	0	0	0	0	1.500	2
101	LONICERA TATARICA	1	50.00	1	1	2	0	0	0	0	0	0	0	2.000	1
138	PTERIDIUM AQUILINUM	1	50.00	1	1	1	0	0	0	0	0	0	0	1.000	3
47	COLLINSONIA CANADENSIS	1	50.00	1	1	1	0	0	0	0	0	0	0	2.000	1
142	QUERCUS VELUTINA	1	50.00	0	0	0	0	0	0	0	1	0	0	2.000	1
198	VIOLA SPP.	1	50.00	1	1	1	0	0	0	0	0	0	0	2.000	3
197	VIOLA INCOGNITA	1	50.00	1	1	1	0	0	0	0	0	0	0	1.500	3
146	RHAMNUS CATHARTICA	1	50.00	0	0	1	1	1	0	0	0	0	0	2.500	1
146	RHUS GLABRA	1	50.00	1	1	1	1	1	0	0	0	0	0	1.500	1
99	LYRIODENDRON TULIPIFERA	1	50.00	0	0	0	1	1	0	0	0	0	0	2.000	1
98	LINDERA BENZOIN	1	50.00	0	0	1	0	0	0	0	0	0	0	2.000	1
92	IMPATIENS CAPENSIS	1	50.00	1	1	1	0	0	0	0	0	0	0	1.500	1
110	MORUS ALBA	1	50.00	0	0	0	1	1	0	0	0	0	0	1.500	2
220	GERANIUM MACULATUM	1	50.00	1	1	1	0	0	0	0	0	0	0	1.000	1
113	ONOCLEA SENSIBILIS	1	50.00	1	1	1	0	0	0	0	0	0	0	1.000	3
114	OSMORHIZA CLAYTONI	1	50.00	1	1	1	0	0	0	0	0	0	0	1.000	2
81	GLEDITSIA TRIACANTHOS	1	50.00	0	0	0	0	0	0	1	0	0	0	2.000	1
80	GLECOMA HEDERACEA	1	50.00	1	1	0	0	0	0	0	0	0	0	1.000	1
79	GERANIUM BICKNELLII	1	50.00	1	1	0	0	0	0	0	0	0	0	1.000	3
117	OXALIS MONTANA	1	50.00	1	1	0	0	0	0	0	0	0	0	1.000	1
100	LONICERA JAPONICA	1	50.00	0	0	1	0	0	0	0	0	0	0	1.000	3
74	FRAGARIA VIRGIANA	1	50.00	1	1	1	0	0	0	0	0	0	0	1.000	1
122	PHRAGMITES COMMUNIS	1	50.00	1	1	1	0	0	0	0	0	0	0	1.000	1
88	EQUISETUM SPP.	1	50.00	1	1	1	0	0	0	0	0	0	0	2.500	3
26	BOEHMERIA CYLINDRICA	1	50.00	1	1	1	0	0	0	0	0	0	0	1.500	1
10	ALLIUM SPP.	1	50.00	1	1	0	0	0	0	0	0	0	0	1.000	1
11	ALNUS RUGOSA	1	50.00	0	0	1	1	1	0	0	0	0	0	4.000	1

Table E2.

28 CARDAMINE ROTUNDIFOLIA	1	50.00	1	1	0	0	0	0	0	0	1.000	1
29 CAREX SPP.	1	50.00	1	1	1	0	0	0	0	0	1.000	3
155 SALIX SPP.	1	50.00	0	0	0	1	1	1	0	0	3.000	1
166 SOLIDAGO SPP.	1	50.00	1	1	1	0	0	0	0	0	1.000	1
165 SOLANUM DULCAMARA	1	50.00	1	1	1	0	0	0	0	0	1.000	1
17 ARALIA RACEMOSA	1	50.00	1	1	1	0	0	0	0	0	1.500	1
1 ACER SACCHARUM	1	50.00	1	1	0	1	1	0	0	0	1.500	1
147 RHUS RADICANS	1	50.00	1	1	1	0	0	0	0	0	1.500	3
22 ASTER SPP.	1	50.00	1	1	1	0	0	0	0	0	1.500	1
151 RUBUS OCCIDENTALIS	1	50.00	0	0	1	0	0	0	0	0	1.000	1
152 RUBUS SPP.	1	50.00	1	1	0	0	0	0	0	0	1.500	1
32 CARYA GLABRA	1	50.00	0	0	1	1	1	1	0	0	6.500	1

Table E2. Continued.

Appendix F

Results from RELEVE on marsh and other hardwoods types.

REF. NO.: G03 MAP-UNIT-NO.: 98 DATE(DA.MO.YR)--23-07-84
 LOCATION: COACH HOUSE TRACT
 SURVEYOR--J. RUDNICKY AREA COVERED--0.01 HA

REMARKS-----

THIS IS A FLAT PHRAGMITES STAND IN A MOIST AREA EAST OF CRUM ELBOW CREEK. THE TALL (10+ FEET), DENSE PHRAGMITES HAVE REDUCED THE SUNLIGHT SO LOW THAT THERE IS NOT MUCH OF AN UNDERSTORY. SOIL IS A MUCK. CANNOT TELL WHERE THE WATER IN THE PLOT IS COMING FROM OR GOING TO -- STAND IS TO DENSE.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
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G1-4C

5.5	122	PHRAGMITES	COMMUNIS
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H1-3P

3.2	92	IMPATIENS	CAPENSIS
2.3	126	PILEA	PUMILA
2.2	112	MYOSOTIS	SCORPIOIDES
1.2	111	MOSS	
+ .1	173	SYMPLOCARPUS	FOETIDUS
+ .1	191	VERONICA	SERPYPILLIFOLIA

TOTAL SPECIES = 7

Table F1. Continued.

REF. NO.: G04 MAP-UNIT-NO.: 98 DATE(DA.MO.YR)--23-07-84
 LOCATION: COACH HOUSE TRACT
 SURVEYOR--J. RUDNICKY AREA COVERED--0.01 HA

REMARKS-----

5% SLOPE FACING 310'. THIS IS A SHRUB/HERB PATCH ON A RIDGE OVERLOOKING CRUM ELBOW CREEK FROM THE EAST. THE DENSED PURPLE LOOSESTRIPE IS 7-8 FEET TALL. SOIL IS WET, WATER MOVES DOWN THE SLOPE TOWARDS THE CREEK. SOIL 6-8" DEEP, COARSE TO FINE SANDY LOAM, GREYISH -- POOR DRAINAGE. NO CHARCOAL.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
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H1-4C

5.5	105	LYTHRUM	SALICARIA
2.2	147	RHUS	RADICANS
2.1	119	PARTHENOCISSUS	SPP.
+ .1	54	CRUCIFERAE	
+ .1	92	IMPATIENS	CAPENSIS
+ .1	219	UNKNOWN	GOLDENROD
R.1	2	ACHILLEA	MILLEFOLIUM
R.1	29	CAREX	SPP.
R.1	113	ONOCLEA	SENSIBILIS
R.1	122	PHRAGMITES	COMMUNIS
R.1	173	SYMPLOCARPUS	FOETIDUS

D1-3P

2.1	152	RUBUS	SPP.
2.1	225	ROSA	SPP.
1.1	100	LONICERA	JAPONICA
+ .1	46	CLEMATIS	VIRGINIANA
+ .1	75	FRAXINUS	AMERICANA
+ .1	98	LINDERA	BENZOIN
+ .1	165	SOLANUM	DULCAMARA
+ .1	199	VITIS	SPP.

TOTAL SPECIES = 19

REF. NO.: M52 MAP-UNIT-NO.: 98 DATE(DA.MO.YR)--27-06-84
 LOCATION: SOUTH FIELD
 SURVEYOR--J. RUDNICKY AREA COVERED--0.01 HA

REMARKS----

5% SLOPE FACING 300'. THIS RELEVÉ IS LOCATED BETWEEN THE BASES OF TWO SMALL KNOLLS IN A WET MARSHY SPOT. THERE IS STANDING WATER IN SOME AREAS. ABUNDANT GRASS/HERB LAYER GIVING 100% COVER. RUNOFF FROM BOTH KNOLLS DRAINS INTO THIS AREA. CLAYEY SOIL WITH CHARCOAL. SOIL LAYER 12-18" DEEP OVER A COARSER LAYER. THE OVERLYING LAYER MAYBE FROM EROSION OFF OF THE SLOPE AND KNOLLS. DRAINAGE IS POOR IN THE SOIL, MOTTILING IS PRESENT. THE CHARCOAL CAME FROM THE PARK BURNING A SLASH PILE IN THE 1970S.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
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H1-3C

4.4	159	SCIRPUS SPP.	
3.2	7	AGROSTIS SPP.	
3.2	105	LYTHRUM SALICARIA	
2.1	2	ACHILLEA MILLEFOLIUM	
1.1	54	CRUCIFERAE	
1.1	63	DESCHAMPSIA SPP.	
1.1	69	ERIGERON PHILADELPHICUS	
1.1	218	GRASS 19	
+.1	116	OXALIS EUROPEA	
+.1	153	RUDBECKIA SEROTINA	
+.1	164	SOLANUM CAROLINENSE	
+.1	173	SYMPLOCARPUS FOETIDUS	
+.1	177	THELYPTERIS PALUSTRIS	
+.1	198	VIOLA SPP.	
+.1	208	GRASS 9	
+.1	209	GRASS 10	

TOTAL SPECIES = 16

REF. NO.: A01 MAP-UNIT-NO.: 01 DATE(DA.MO.YR)--06-06-84
 LOCATION: BARD ROCK - SITE A
 SURVEYOR--J. RUDNICKY AREA COVERED--0.04 HA

REMARKS-----

FLAT AREA. THIS AREA WAS CHOSEN FOR A PLOT TO REPRESENT A HICKORY TYPE, THE THE ELM AND OAK MAY MAKE THIS AN 'OTHER HARDWOOD'. SOME OPEN SPOTS IN CANOPY LET LIGHT IN. DENSE HERB LAYER, BUT NOT MUCH UNDER SHRUBS. GRAPE VINES HAVE CAUSED SOME BRANCHES TO BE KNOCKED DOWNED. SITE IS BORDERED ON ONE SIDE BY RED SPRUCE. LOOKS LIKE A MOIST SITE, BUT THIS MAYBE DUE TO LAST WEEK'S HEAVY RAIN. PLOT IS SITUATED ON SMALL RIDGETOP. SOME ROCK OUTCROPS. A COUPLE OF DOWNED TREES. IN THE SMALL GULLY WEST OF THE RIDGE IS A 3' X 3' SQUARE HOLE LINED WITH STONES. MOSS COVERED BRICKS ARE STREWNED ABOUT THE EDGES. THIS MAY HAVE BEEN EITHER PART OF THE BOAT HOUSE OR A RAIL ROAD STRUCTURE. ONE ELM IS 36 YEARS OLD AND A PIGNUT HICKORY IS 36 YEARS OLD. SOIL IS 3-6" DEEP. GREYISH GRAVELLY SANDY LOAM WITH LITTLE ORGANIC LITTER ON TOP. NO CHARCOAL.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
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D 7R

2.1	142	QUERCUS	VELUTINA
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D 6I

3.4	32	CARYA	GLABRA
2.3	184	ULMUS	AMERICANA

D4-5I

2.1	32	CARYA	GLABRA
2.1	184	ULMUS	AMERICANA
1.3	145	RHAMNUS	CATHARTICA
+ .1	.1	ACER	SACCHARUM
+ .1	136	PRUNUS	SEROTINA

C3-5R

2.2	199	VITIS SPP.
+.1	119	PARTHENOCISSUS SPP.

D 3B

2.1	9	ALLIARIA OFFICINALIS
2.1	32	CARYA GLABRA
1.1	145	RHAMNUS CATHARTICA
1.1	184	ULMUS AMERICANA
+.3	100	LONICERA JAPONICA
+.1	75	FRAXINUS AMERICANA
+.1	136	PRUNUS SEROTINA

H1-2C

3.3	119	PARTHENOCISSUS SPP.
2.3	9	ALLIARIA OFFICINALIS
1.3	82	GRAMINEAE
1.2	67	DRYOPTERIS SPINULOSA
1.2	111	MOSS
1.1	45	CIRCAEA QUADRISULCATA
1.1	152	RUBUS SPP.
1.1	163	SMILACINA RACEMOSA
+.3	79	GERANIUM BICKNELLII
+.1	1	ACER SACCHARUM
+.1	10	ALLIUM SPP.
+.1	18	ARISAEMA ATORORUBENS
+.1	28	CARDAMINE ROTUNDIFOLIA
+.1	75	FRAXINUS AMERICANA
+.1	76	GALIUM APARINE
+.1	80	GLECOMA HEDERACEA
+.1	117	OXALIS MONTANA

TOTAL SPECIES = 24

REF. NO.: B04 MAP-UNIT-NO.: 01 DATE(DA.MO.YR)--15-06-84
 LOCATION: DIRT ROAD - SITE B
 SURVEYOR--J. RUDNICKY AREA COVERED--0.04 HA

REMARKS-----

FLAT AREA. RELEVÉ IS ON MOIST AREA NEXT TO A PHRAGMITES STAND. DENSE CLUMP OF SPECKLED ALDER IS ON THE PLOT. THE LARGE NUMBER OF PLANTS ON THE PLOT INDICATE THE FERTILITY OF THE AREA. THIS IS A NARROW BELT BETWEEN THE SERVICE ROAD AND THE RAIL ROAD TRACKS. SOIL IS A SANDY LOAM WITH LITTLE ORGANIC MATTER. WATER TABLE ABOUT 6-12" BELOW THE SURFACE.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
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D 6P

3.1	184	ULMUS	AMERICANA
2.1	81	GLEDITSIA	TRIACANTHOS
2.1	128	PLATANUS	OCCIDENTALIS
1.2	155	SALIX	SPP.

D4-5R

1.2	110	MORUS	ALBA
+.1	146	RHUS	GLABRA

D4-5I

4.4	11	ALNUS	RUGOSA
2.1	52	CORNUS	FLORIDA
2.1	99	LIRIODENDRON	TULIPIFERA
2.1	155	SALIX	SPP.
1.1	75	FRAXINUS	AMERICANA
+.1	119	PARTHENOCISSUS	SPP.
+.1	199	VITIS	SPP.

Table F2. Continued.

D 3R

2.4	52	CORNUS FLORIDA
2.1	98	LINDERA BENZOIN
1.3	101	LONICERA TATARICA
1.1	11	ALNUS RUGOSA
+.1	151	RUBUS OCCIDENTALIS

H1-3P

3.3	68	EQUISETUM SPP.
2.3	198	VIOLA SPP.
2.1	47	COLLINSONIA CANADENSIS
1.3	147	RHUS RADICANS
1.3	197	VIOLA INCOGNITA
1.1	9	ALLIARIA OFFICINALIS
1.1	17	ARALIA RACEMOSA
1.1	18	ARISAEMA ATRORUBENS
1.1	22	ASTER SPP.
1.1	26	BOEHMERIA CYLINDRICA
1.1	52	CORNUS FLORIDA
1.1	92	IMPATIENS CAPENSIS
1.1	119	PARTHENOCISSUS SPP.
+.3	29	CAREX SPP.
+.3	82	GRAMINEAE
+.3	111	MOSS
+.3	113	ONOCLEA SENSIBILIS
+.3	138	PTERIDIUM AQUILINUM
+.2	114	OSMORHIZA CLAYTONI
+.1	45	CIRCAEA QUADRISULCATA
+.1	55	CRYPTOTAENIA CANADENSIS
+.1	74	FRAGARIA VIRGIANA
+.1	76	GALIUM APARINE
+.1	101	LONICERA TATARICA
+.1	122	PHRAGMITES COMMUNIS
+.1	146	RHUS GLABRA
+.1	163	SMILACINA RACEMOSA
+.1	165	SOLANUM DULCAMARA
+.1	166	SOLIDAGO SPP.
+.1	199	VITIS SPP.
+.1	220	GERANIUM MACULATUM

TOTAL SPECIES = 41

LatinName

Acer saccharum

Achillea millefolium

Agropyron A

Agropyron B

Agrostis

Ailanthus altissima

Alliaria officinalis

Allium

Amelanchier

Anemonella thalictroides

Anthoxanthum odoratum

Aralia nudicaulis

Arisaema artorubens

Asclepias syriaca

Asclepias verticillata

Asparagus officinalis

Aster

Aster divaricatus

Betula lenta

Boehmeria cylindrica

Botrychium virginianum

Carex

Carpinus caroliniana

Carya cordiformis

Carya glabra

Carya ovata

Carya tomentosa

Cassia hebecarpa

Catalpa speciosa

Caulophyllum thalictroides

Celastrus scandens

Celtis occidentalis

Cerastium vulgatum

Chimaphila maculata

Circaea quadrisulcata

Collinsonia canadensis

Commelina communis

Conium maculatum (CF)

Cornus alternifolia

The species list for this report is a compilation of plants identified on relevé and quantitative plots. Names preceded by CF indicate a tentative identification.

Names on [p. 152]
reconstructed from other lists in Gex
G. Nelson
28 Nov 1989

<u>Cornus florida</u>	flowering dogwood
<u>Cornus racemosa</u>	panicled dogwood
<u>Cruciferae</u>	mustard family
<u>Cryptotaenia canadensis</u>	honewort
<u>Cypripedium acaule</u>	pink lady's slipper
<u>Cystopteris fragilis</u>	fragile fern
<u>Dactylis glomerata</u>	orchard grass
<u>Daucus carota</u>	wild carrot
<u>Decodon verticillatus</u>	swamp loosestrife
<u>Dennstaedtia punctilobula</u>	hayscented fern
<u>Dentaria diphylla</u>	toothwort
<u>Deschampsia</u> spp.	hairgrass
<u>Dianthus armeria</u>	deptford pink
<u>Dicentra canadensis</u>	squirrel corn
<u>Dryopteris marginalis</u>	marginal woodfern
<u>Dryopteris spinulosa</u>	spinulose woodfern
<u>Equisetum</u> spp.	horse tail
<u>Erigeron philadelphicus</u>	common fleabane
<u>Euonymus alatus</u>	winged euonymous
<u>Eupatorium perfoliatum</u>	boneset
<u>Fagus grandifolia</u>	american beech
<u>Fragaria virginiana</u>	wild strawberry
<u>Fraxinus americana</u>	white ash
<u>Galium aparine</u>	cleavers
<u>Galium circaeazans</u>	wild licorice
<u>Galium mollugo</u>	wild madder
<u>Geranium bicknellii</u>	bicknell's geranium
<u>Geranium maculatum</u>	wild geranium
<u>Geranium robertianum</u>	herb robert
<u>Glechoma hederacea</u>	ground ivy
<u>Gleditsia triacanthos</u>	honey-locust
<u>Gramineae</u>	grass family
<u>Gymnocladus dioica</u>	kentucky coffee-tree
<u>Hackelia virginiana</u>	virginia stickseed
<u>Hamamelis virginiana</u>	witch-hazel
(CF) <u>Hepatica acutiloba</u>	hepatica
<u>Hesperis matronalis</u>	dame's violet
<u>Hieracium canadense</u>	canada hawkweed
<u>Hieracium paniculatum</u>	panicled hawkweed
<u>Hieracium venosum</u>	rattlesnake weed
<u>Hypericum perforatum</u>	common st. johnswort
<u>Impatiens capensis</u>	spotted touch-me-not
<u>Juglans nigra</u>	black walnut
<u>Juniperus virginiana</u>	eastern red-cedar
<u>Lepidium campestre</u>	field peppegrass
<u>Lichens</u> spp.	lichens
<u>Linaria vulgaris</u>	butter-and-eggs
<u>Lindera benzoin</u>	spicebush
<u>Liriodendron tulipifera</u>	tulip poplar
<u>Lonicera japonica</u>	japanese honeysuckle

51 <u>Lonicera tatarica</u>	tatarian bush honeysuckle
<u>Lychnis alba</u>	evening lychnis
<u>Lysimachia nummularia</u>	moneywort
<u>Lysimachia quadrifolia</u>	whorled loosestrife
<u>Lythrum salicaria</u>	purple loosestrife
<u>Magnolia tripetala</u>	umbrella tree
<u>Melampyrum lineare</u>	cow wheat
<u>Mitchella repens</u>	partridgeberry
<u>Monotropa uniflora</u>	indian pipe
<u>Morus alba</u>	yellow mulberry
Moss	
<u>Myosotis scorpioides</u>	true forget-me-not
<u>Oenothera biennis</u>	common evening primrose
<u>Onoclea sensibilis</u>	sensitive fern
<u>Osmorhiza claytoni</u>	sweet cicely
<u>Osmunda cinnamomea</u>	cinnamon fern
<u>Ostrya virginiana</u>	hop hornbeam
<u>Oxalis europea</u>	yellow wood sorrel
<u>Oxalis montana</u>	serrel
<u>Panicum</u> spp.	panic grass
<u>Parthenocissus</u> spp.	woodbine
<u>Philadelphus grandiflorus</u>	mock-orange
<u>Phleum patense</u>	timothy
<u>Phragmites communis</u>	common reed
<u>Phytolacca americana</u>	pokeweed
<u>Picea abies</u>	norway spruce
<u>Picea rubens</u>	red spruce
<u>Pilea pumila</u>	cleareweed
<u>Pinus strobus</u>	white pine
<u>Platanus occidentalis</u>	sycamore
<u>Polygonum convolvulus</u>	black bindweed
<u>Polygonatum pubescens</u>	hairy solomon's seal
<u>Polypodium vulgare</u>	common polypody
<u>Polystichum acrostichoides</u>	christmas fern
<u>Potentilla recta</u>	rough cinquefoil
<u>Prunella vulgaris</u>	selfheal
<u>Prunus avium</u>	sweet cherry
<u>Prunus serotina</u>	black cherry
<u>Prunus virginiana</u>	choke cherry
<u>Pteridium aquilinum</u>	bracken fern
<u>Quercus alba</u>	white oak
<u>Quercus prinus</u>	chestnut oak
<u>Quercus rubra</u>	northern red oak
<u>Quercus velutina</u>	black oak
<u>Ranunculus</u> spp.	buttercup
<u>Rhamnus alnifolia</u>	alder-leaved buckthorn
<u>Rhamnus cathartica</u>	common buckthorn
<u>Rhus glabra</u>	smooth sumac
<u>Rhus radicans</u>	poison ivy
<u>Rhus typhina</u>	staghorn sumac

<u>Ribes cynosbati</u>	prickly gooseberry
<u>Robiia pseudo-acacia</u>	black locust
<u>Rosa</u> spp.	rose
<u>Rubus occidentalis</u>	black raspberry
<u>Rubus</u> spp.	raspberry
<u>Rudbeckia serotina</u>	black-eye susan
<u>Rumex acetosella</u>	wood sorrel
<u>Salix</u> spp.	willow
<u>Sanguinaria canadensis</u>	bloodroot
<u>Sanicula trifoliata</u>	long-fruited snakeroot
<u>Sassafras albidum</u>	sassafras
<u>Satureja vulgaris</u>	wild basil
<u>Scirpus</u> spp.	rushes
<u>Secale cereale</u>	rye
<u>Silene aeneobalbus</u>	bladder campion
<u>Sisyrinchium montanum</u>	common blue-eyed grass
<u>Smilacina racemosa</u>	false solomon's seal
<u>Solanum carolinense</u>	horse nettle
<u>Solanum dulcamara</u>	bitter nightshade
<u>Solidago</u> spp.	goldenrod
<u>Specularia perfoliata</u>	venus's looking-glass
<u>Staphylea trifolia</u>	american bladdernut
<u>Stellaria graminea</u>	lesser stitchwort
<u>Stylophorum diphyllum</u>	celandine poppy
<u>Styrax americana</u>	storax
<u>Symphoricarpos albus</u>	snowberry
<u>Symplocarpus foetidus</u>	skunk cabbage
<u>Taraxacum officinale</u>	dandelion
<u>Taxus canadensis</u>	american yew
<u>Thelypteris noveboracensis</u>	new york fern
<u>Thelypteris palustris</u>	marsh fern
<u>Tilia americana</u>	american basswood
<u>Tilia</u> spp.	basswood
<u>Tovara virginiana</u>	jumpseed
<u>Trifolium agrarium</u>	yellow clover
<u>Trifolium pratense</u>	red clover
<u>Tsuga canadensis</u>	eastern hemlock
<u>Ulmus americana</u>	american elm
<u>Vaccinium corymbosum</u>	highbush blueberry
<u>Vaccinium vacillans</u>	low blueberry
<u>Vaccinium</u> spp.	blueberry
<u>Vaccinium stamineum</u>	deerberry
<u>Valeriana officinalis</u>	common valerian
<u>Veronica officinalis</u>	common speedwell
<u>Veronica serpyllifolia</u>	thyme-leaved speedwell
<u>Viburnum acerifolium</u>	maple-leaved viburnum
<u>Viburnum dentatum</u>	arrow-wood
<u>Viburnum rafinesquianum</u>	downy arrow-wood
<u>Vicia cracca</u>	cow vetch
<u>Vinca minor</u>	myrtle

Viola incognita

Viola spp.

Vitis spp.

large-leaved violet

violet

grape

The following plants located on the Estate are listed as protected in New York state. The numbers in parenthesis are cover types where the plants were found (see Table 5, p. 31).

Botrychium virginianum (27,28)

Celastrus scandens (27,23,21,28,52,01,57,99,29)

Chimaphila maculata (52,23)

Cornus florida (27,23,28,52,01,53)

Cypripedium acaule (23)

Cystopteris fragilis (27)

Dryopteris marginalis (27,52)

Dryopteris spinulosa (27,21,28,52,01,22,33,53,57,32)

Osmunda cinnamomea (27)

Polypodium vulgare (27,52)

Polystichum acrostichoides (27,23,01,57,53)

Sanguinaria canadensis (27,53,29)

Thelypteris noveboracensis (27)

Thelypteris palustris (98)

Appendix H

Conversion factors.

1 centimeter = 0.3937 inches

1 meter = 3.2808 feet

1 chain = 20.1168 meters

1 kilometer = 0.621 miles

1 hectare = 2.4711 acres

1 square meter/hectare = 4.356 square feet/acre