

Bazzania, *Odontoschisma*, *Jamesoniella*, *Nowellia* and *Scapania* and others. Lichens, a variety of *Cladonia* species, small tufts of *Usnea*, *Cetraria*, *Parmelia*, *Physcia*, *Umbilicaria*, *Peltigera*, and many crustose lichens.

We are impressed with the zeal shown by everyone in locating and bringing to our attention the wide variety of these plants. There were many fungi located by Eleanor Yarrow and her cohort of Mushroom Cookers and we still have our reservations about how "delicious" some of the more horrible looking ones may be! Actually, we have been delighted over the past years by the beauty of form and color we see in much of our fungi and with such expert finders we have been deluged with masses of pink, green and liver-colored mushrooms and told how delectable these morsels can be—but as of now we still think we will eat steak and potatoes with the more exotic foods going to our helpful friends. Attendance 35. Leader, Ed Whelen.

Floristic Study of the William L. Hutcheson Memorial Forest (New Jersey)¹

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Introduction—HISTORICAL ACCOUNT. The William L. Hutcheson Memorial Forest, located one mile east of East Millstone, New Jersey, represents 63 acres of mature oak forest. Actually, the Forest consists of 65 acres; however 63 are older with the remaining two acres near the east end having been cut in 1872 and cultivated until 1890 (Monk, 1957).

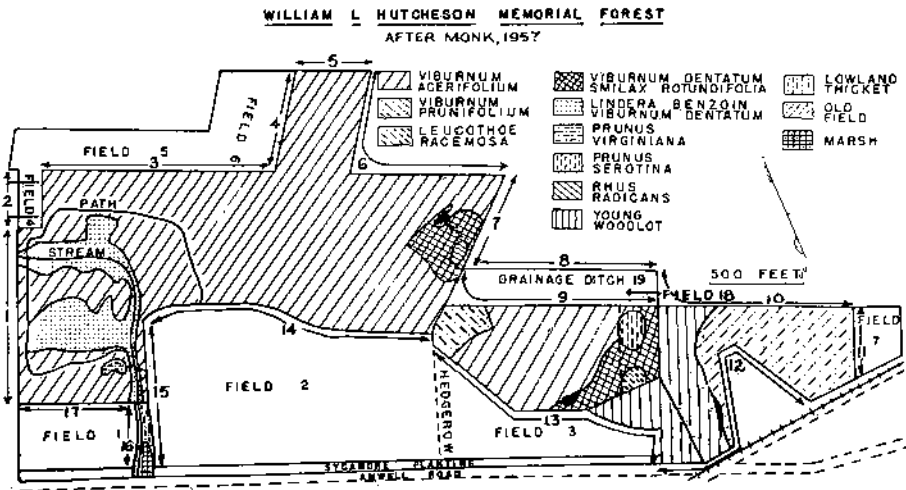


FIGURE 1. NUMBERED EDGE STATIONS

Myneer Cornelius Van Liew, a Dutch colonist, first purchased the land which was originally a 1,500-acre tract in 1701 (Cunningham, 1954). Of the original 1,500 acres, 65 became known as Mettler's Woods and remained in the Mettler family essentially undisturbed by man until 1950.

A tropical storm on November 25, 1950, caused destruction to 299 trees in the Woods. Mr. Thomas Mettler, the family owner at that time, had this large number of trees removed in 1951. Previous to this time, fallen trees were allowed to undergo natural decay processes in the woods.

Rutgers—The State University was presented the Woods by the United Brotherhood of Carpenters and Joiners of America which purchased it in the memory of a former presi-

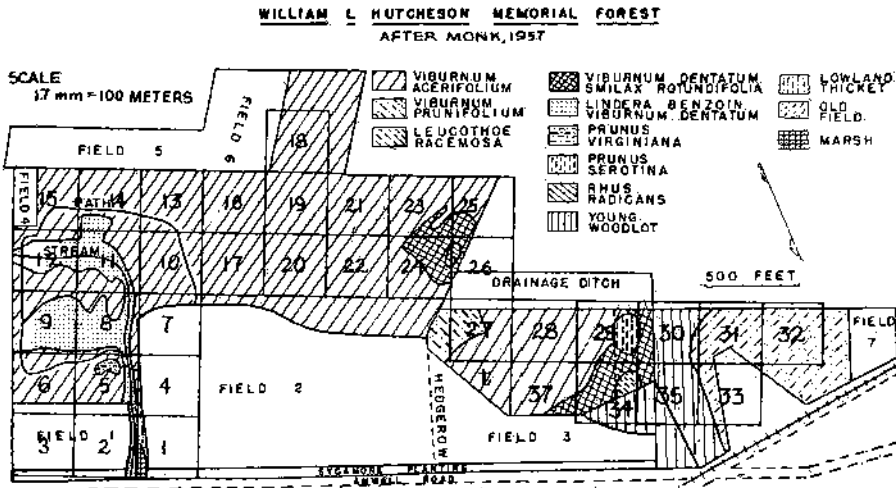
¹ This work and its publication supported in part from the Hutcheson Forest Research Fund.

dent. The Woods was formally dedicated on October 15, 1955, as the William L. Hutcheson Memorial Forest to be preserved in its natural state, being utilized only for scientific research and teaching.

PHYSIOGRAPHY. The Forest lies on the Piedmont Plain which is a lowland of gently rolling hills (Kümmel, 1940). Underlying the Piedmont is the Brunswick Formation which is composed of red shale consisting of siltstone, clay, and sandstone (Ugolini, 1960). The sandy beds located at the southwest end of the Forest are the result of fluvial deposits by the Millstone River which occurred sometime after the Wisconsin Ice Age (Balloni, 1959).

NATURAL CALAMITIES. As a result of the 1950 hurricane, a 324-year old tree with a basal diameter of 40 inches was among those that fell. A study of its annual rings revealed six periods of fire in the Forest beginning in 1641 and ending about the time of colonization in the area in 1711. Most of the fires were presumed to be set at about ten-year intervals by the Lenape Indians (Buell *et al.*, 1954).

Other wind storms in 1954 and 1955 caused trees to be blown down. The result was that more light reached the Forest floor allowing species to flourish which had been unable to before the wind damage (Monk, 1961). In the spring of 1960, during an electric storm, two large trees were felled by lightning which resulted in new openings in the Forest canopy.



Methods—Floristic Study—Edge Study. In this research a strip of land approximately 4 feet wide extending from the last visible furrow of cultivated land where it could be seen adjoining the Forest was used for obtaining data for the Forest edge studies.

Using Monk's map (1957), the edges of the Forest were divided into regions which were designated by numbers for reference purposes (fig. 1). Observations were made concerning: (1) the species present; and (2) whether they bore spores or seeds; fruited, flowered or both, and if so, the earliest date of the appearance of flowers and fruits was recorded. The above stated observations were made during the months of June and August, 1960. Voucher specimens collected from the Forest edge were deposited in the Chrysler Herbarium at Rutgers—The State University.

Section Study. The entire Forest was sampled through a section study in June, July, and August, 1960. Previous to this study the Forest had been divided into six 100-meter lines running east to west. Each line was divided into 100-meter sections running north to

south. The 100-meter points in all directions were permanently marked with red metal stakes 2 to 3 feet high. These stakes were lettered to indicate the E-W line and numbered to indicate the N-S line. Every stake in the forest was placed in its position based on compass readings with the 100-meter distances between these stakes measured with tapes. The immediate area surrounding each stake was described and recorded to facilitate re-locating the stakes (Small, personal communication).

For the current study, the Forest was divided into thirty-two 100-meter square sections (fig. 2). There was no number 36 section but rather a lettered section t. Using the stakes as markers, each section was temporarily enclosed by string. To keep the strings between stakes as straight as possible, direction between stakes was maintained by compass reading.

Each section was studied by traversing its length back and forth with 20 to 30 trips per section. The outer edges of each section were also studied. Observations were made for each section concerning: (1) the species present; (2) whether they were rare, common or abundant in their presence; (3) whether they bore spores or seeds; flowered, fruited, or both, and if so, whether they were light or heavy fruited; and (4) data were recorded on the species earliest flowering and fruiting dates and on the quantity of flowers and fruits. Voucher specimens collected from the studies of the sections were deposited in the Chrysler Herbarium.

A species list for the Forest was compiled. Since the section studies were begun in June, the early spring blooming flowers could not be sampled in this manner. It must also be noted that some of the early summer blooming flowers at the eastern end of the Forest were missed when the study was being concentrated at the western end of the Forest. Reconnaissance trips were taken through this area in June to collect the earlier blooming flowers in the eastern area.

Discussion. There was a total of 312 species of vascular plants found in the Hutcheson Memorial Forest as a result of the edge and section studies (table 1). Of the total, 135 (43%) were found only within the Forest, 69 (22%) only along the edge and 108 (34%) species occurred in both areas. Including those species which overlapped, there was a total of 242 (77%) species found within the Forest and 177 (57%) found along the edge. Of the total species found, 79 (25%) were woody of which 40 (13%) were trees and 39 (13%) were shrubs. The herbaceous species numbered 232 (75%). One species, *Crataegus*, was identified only to genus and was not included with either the shrubs or trees. These 312 species comprise a total of 83 families which were arranged taxonomically in this paper following Fernald (1950) for the non-flowering plants, Benson (1957) for the monocots, and Cronquist (1957) for the dicots. The family represented by the largest number of species was the Compositae, which included 34 species (10% of the total species). This family was followed by the Rosaceae and Leguminosae, both with 19 species (6%). Thirty-four (40%) of the families found were represented by one species. Nomenclature followed Gray's Manual, eighth edition (Fernald, 1950) unless otherwise noted.

EDGE STUDY. Nineteen stations along the edge were designated for the study (see fig. 1). The time of heaviest flowering of the most species occurred during the first two weeks in June, 1960. The species first observed in flower along the edge was *Fiburnum prunifolium* on April 16, 1960. There appeared to be a second but less heavy flowering in late summer when the fall composites bloomed. The first fall composite to flower was *Solidago juncea* on August 21, 1960.

DISTRIBUTION. It was interesting to note that of the 177 species found along the edge only 29 (17%) were woody of which 13 (7%) were trees. The species with the widest distribution, which was represented by the greatest number of stations in which it was observed, was *Solanum carolinense* which occurred along 13 stations or throughout 68% of the entire edge studied (table 1). *Lonicera japonica* was the second most frequent species observed in 60% of the stations while *Asparagus officinale* was third in 53% of the stations. Over one-half of the species were found to occur only at one or two stations for 5-11% distribution (here presence along one station is synonymous with a 5% distribution along the edge regardless of the quantity of the species observed) over the entire edge.

ABUNDANCE. While *Rhus radicans* had a distribution of only 37%, it was the most abundant species in those edge stations in which it occurred (abundance was calculated by averaging the abundance of each species for each station) (see table 1). *Fragaria virginiana*, while found in only 21% of the stations, was very highly concentrated along station 7 where it flowered and fruited heavily. *Onoclea sensibilis* was found only along station 12 where it was abundant.

SECTION STUDY. The time of greatest flowering of species was early to mid-spring with a second but less heavy flowering in late summer when the composites bloomed. The species first observed flowering in the station study was *Symplocarpus foetidus* on February 8, 1960. The first fall composite to flower was *Solidago juncea* on August 21, 1960.

DISTRIBUTION. Thirty-two of the 37 sections were designated for the section study. Those five not sampled were located in the adjoining fields to the Forest (fig. 2). Of the 242 species within the Forest, 73 (30%) were woody including 39 (16%) tree species. The most widely distributed species as far as the number of sections in which they were observed were *Fiburnum prunifolium*, *Polygonatum biflorum*, and *Smitacina racemosa* which were observed throughout 94% of the sections. The distributions of the latter two were identical being absent from section 33 and 35. Through reconnaissance trips in early spring, *Podophyllum peltatum* and *Claytonia virginica* appeared to have a very wide-spread distribution and abundance in the Forest. Later study showed *Podophyllum* to have a 63% distribution. This was a typical distribution for *Podophyllum* but was not a normal distribution for the rest of the species. Over half of all the species observed occurred in only one or three sections. This represents a 3-9% distribution (here presence in one section is synonymous with a distribution of 3% throughout the Forest regardless of the quantity of the species observed).

ABUNDANCE. *Cornus florida*, which was distributed throughout 84% of the sections, was the most abundant of the species found in quantity in those sections. However, *Fiburnum acerifolium*, *Lonicera japonica*, and *Rhus radicans* were also abundant in their sections.

Other species which appeared to have a wide distribution (over 30%) but which were few in abundance in their respective sections were: *Botrychium virginianum*, *Athyrium filix-femina*, *Dennstaedtia punctilobula*, *Juniperus virginiana*, *Geum canadense*, *Berberis thunbergii*, *Oxalis stricta*, and *Viola sagittata* (table 1).

The following species may be designated as being rarely found in the Forest (those with a limited distribution which were also few in number in their respective sections). Such species were: *Osmunda cinnamomea*, *O. claytoniana*, *Sagittaria latifolia*,* *Sparganium americanum*,* several graminoids, *Lemna minor*, *Hemerocallis fulva*, *Cypripedium acaule*,** *Habenaria lacera*,** *Salix nigra*,** *Betula populifolia*, *Polygonum convolvulus*, *P. persicaria*. Also, *Silene stellata*,* *Cardamine parviflora*, *Lepidium campestre*, *Saxifraga virginiana*, *Amelanchier canadensis*, *Potentilla norvegica*,* *Pyrus arbutifolia*,* *Rubus phoenicolasius*,** *Apios americana*, *Liriodendron tulipifera*,** *Cassia fosciculata*,* *Melilotus officinalis*,* *Ilex opaca*,** *I. verticillata*, *Celastrus scandens*, *Euonymus alatus*,** *Epilobium glandulosum*, *Aralia nudicaulis*, *Cicuta maculata*,* *Cryptotaenia canadensis*, *Rhododendron viscosum*, *Lysimachia terrestris*, *Diospyros virginiana*,* *Asclepias amplexicaulis*, *Lycopus amplexens*, *Solanum dulcamara*,* *S. nigrum*,* *Paulownia tomentosa*,** *Hackelia virginiana*, *Triosteum aurantiacum*, and *Anaphales margaritacea*.*

HABITAT: The following species were distributed in the Forest in certain habitat types such as along the path along the stream (see Monk's map, fig. 1). Of those species found along the path, the following appeared to be characteristic for that area: *Juncus tenuis*, *Veronica officinalis*, *Commelina communis*, *Heuchera americana*, *Sedum telephium*, *Oxalis stricta*, and *Prunella vulgaris*.

The stream often dries in the summer and a flora then develops on the former stream bottom. In the current study the stream did not dry to any extent during the summer of 1960. Of those species found along the banks or in the stream, the following appeared to

* Those species represented by less than seven in number.

** Those species represented by only one specimen.

be characteristic of the area: *Symplocarpus foetidus*, *Cuscuta gronovii*, *Lemna minor*, *Sagittaria latifolia*, *Polygonum* sp., and *Gratiola virginiana*. Where the stream flows outside the Forest in the lowland thicket, *Alnus rugosa*, *Sparganium americanum*, *Amphicarpa bractea*, and *Phragmites communis* were found in addition to those species already mentioned.

Areas in the Forest which were open and exposed to the most light contained the following species: *Fraxinus americana*, *Ailanthus altissima*, *Impatiens capensis*, *Juniperus virginiana*, *Galium* sp., *Parthenocissus quinquefolia*, *Rosa multiflora*, *Smilax rotundifolia*, *Rubus allegheniensis*, *R. occidentalis*, *Botrychium virginianum*, *Acer saccharum*, *A. platanoides*, *A. rubrum* (wetter areas), *Geum canadense*, and *Berberis thunbergii*.

ESTABLISHED VS. DISTURBED: The area represented on Monk's map as young woodlot as well as that represented on the map as old fields supported a distinct flora in contrast, most evident in the herbaceous layer, to the older, more established, part of the Forest which lies to the east. The sandy beds described by Ballou underlie the most western part of the disturbed area. Some of the species composing this flora in addition to various graminoids are: *Cypripedium acaule*, *Habenaria lacera*, *Populus grandidentata*, *Myrica pensylvanica*, *Betula nigra*, *Polygonum sagittatum*, *Cassia fasciculata*, *Desmodium marilandicum*, *D. perplezum*, *D. rigidum*, *Hex opaca*, *I. verticillata*, *Celastrus scandens*, *Aralia nudicaulis*, *Cicuta maculata*, *Chimaphila maculata*, *Rhododendron viscosum*, *Lysimachia terrestris*, *Asclepias amplexicaulis*, *Lycopus amplexens*, *L. virginicus*, *Scutellaria integrifolia*, *Linaria vulgaris*, *Verbascum thapsus*, *Cephalanthus occidentalis*, *Diodea teres*, *Anthemis cotula*, *Aster divaricatus*, *Chrysanthemum leucanthemum* var. *pinnatifidum*, *Eudectia hirta*, *Solidago graminifolia*, and *Vernonia noveboracensis*.

COMMON TAXA REPRESENTATIVE OF THE FOREST AND THE EDGE: Of the nine ferns found in the Forest, *Athyrium filix-femina* and *Botrychium virginianum* were the most widespread in distribution found in 44% and 34% of the sections, respectively. Along the edge five species of ferns were recorded.

The grasses of the Forest were nearly equally distributed in the sections. Along the edge, *Phleum pratense* was widely distributed in 47% of the stations. *Smilax herbacea* was the most widely distributed greenbrier, found in 59% of the sections, while *S. rotundifolia* was the most abundant in quantity per section. *S. rotundifolia* was the most abundant and most widely distributed greenbrier found along the edge.

Rubus allegheniensis, with a 78% distribution in the Forest, was encountered much more frequently than *R. phoenicolasius* with a 3% distribution. *Rubus radicans* was not only the most abundant species of the genus but also had the widest distribution being in 84% of the sections. *R. radicans* was also the most abundant species and of widest distribution along the edge in 37% of the stations.

Solanum carolinense occurred in 19% of the sections and 68% of the stations. *Galium circaeasans* was the most widely distributed bedstraw, found in 36% of the sections. Although *Viburnum prunifolium* appeared in 94% of the sections and *V. acerifolium* in 87%, the latter was much more abundant per station than the former. Monk in 1957 divided the Forest into plant communities based on the pattern of shrub distribution, and determined dominant shrubs by the size and per cent occupied by each shrub type. His studies of the shrubs did not extend into the young woodlot (fig. 2). In the current study, in the young woodlot, *V. prunifolium* was found in all sections while *V. acerifolium* was found in only half the sections. It must be noted that the distribution of shrubs in the current study does not attempt to indicate dominance but rather the spreading of the species throughout the Forest. Another species with both a wide distribution and abundance was *Parthenocissus quinquefolia*.

Bard (1952) referred to Hutcheson Memorial Forest as an oak-hickory forest approximating climax, while Buell (1957) called it a mature oak forest. Monk (1957) considered it an oak forest while Adjemovitch (1958) called it an oak forest in which white oak is predominant followed by red oak, black oak, and red hickory in that order. Monk (1961) stated that there is little doubt that the Hutcheson Forest represents a variant of the oak-hickory forest of the Piedmont.

In this study the oak with the widest distribution was *Q. alba* (84%) followed by *Q. rubra* (72%), *Q. velutina* (66%), *Q. coccinea* (28%), *Q. palustris* (25%), and *Q. bicolor* (19%). In abundance, *Q. alba* and *Q. rubra* were about equally the most common oaks. *Fraxinus americana* had an 87% distribution followed by *Cornus florida* (84%), *Acer rubrum* (81%), *Carya ovalis* (78%), *Sassafras albidum* (59%), *Acer platanoides* (47%), *A. saccharum* (44%), *Fagus grandifolia* (34%), and *Acer saccharinum* (25%).

OBSERVATIONS. During the summer of 1960 the following species were not observed flowering or fruiting: *Sedum telephium*, *Fagus grandifolia*, *Diospyros virginiana*, *Prunus virginiana*, *Uvularia perfoliata*, *Hepatica americana*, *Heuchera americana*, *Berberis thunbergii*, *Rubus phoenicolasius*, *Rhus copallina*, *Euonymus alatus*, *Menispermum canadense*, *Arabis nudicaulis*, *Viburnum rafinesquianum*, *Ilex opaca*, and *I. verticillata*.

Those taxa which were greatest quantitatively in the number of flowers produced in the Forest and along the edge were: *Podophyllum*, *Imatiens*, *Claytonia*, *Arisaema*, *Anemone*, *Solidago*, *Cornus florida*, *Prunus avium*, *Viburnum prunifolium*, *Scutellaria integrifolia*, and *Smilacina racemosa*. Those taxa which were heavy fruiters were: *Viburnum acerifolium*, *Podophyllum*, *Arisaema*, *Phytolacca*, and *Galium*.

SECTION AND EDGE OVERLAP. Many of the herbaceous species which occurred along the edge and neighboring stations were restricted to that part of the station which adjoined the edge. It is possible that the edge species may penetrate the Forest by seeds disseminated by wind or fauna. It was observed that where *Rhus radicans* overlapped the edge and Forest very few species of other flowering plants were found.

NATURAL GEOGRAPHICAL AFFINITIES. The term affinity is used in this study to indicate relationship rather than origin. These affinities included northern, southern, both (northern and southern together), Coastal, and Piedmont. There was no attempt to study the ridge province, or other geographical affinities.

In this study species with either a northern or southern affinity were considered as those whose recorded distribution extended the furthest distance north or south of the Forest. Those species which were equally distributed in either direction were considered as having both northern and southern affinities, as were those which were recorded as weedy or ubiquitous in their distribution. Alien species were interpreted as those which had been introduced or naturalized into this country. Fernald was used as the source for data on northern, southern, both (northern and southern), and alien distributions. Twenty-three of the alien species recorded in the Forest were listed by Adjemovitch (1958) in her study of alien species.

The Forest which lies on the Piedmont is but a few miles to the west of the Coastal Plain. It was thought that the Forest could have both Coastal and Piedmont affinities. The sources used to collect these data were Bard (1952), Fernald (1950), Shreve et al. (1910), and Stone (1911). These sources were used as an indication of the recorded presence of the species on the Coastal Plain or Piedmont Plain or both. Also, Stone's work lists only species reported on the Coastal Plain while Shreve lists both Coastal Plain and Piedmont species. Fernald lists a limited number of Coastal and Piedmont species. It must be realized that certain species may be characteristic of another province, even though listed as being found on the Coastal Plain. For example, *Asplenium platyneuron* is characteristically a limestone fern in New Jersey but was listed as found on the Coastal Plain by Stone. Therefore, in this study it was considered to have a Coastal affinity.

The alien species found numbered 71 (22%), those species with northern affinities numbered 27 (8%), southern affinities numbered 41 (13%) (table 2). Those with both northern and southern affinities numbered 170 (55%). When taken together (northern, southern, and both northern and southern, and alien), the percentage of data available on affinities represents 98% of the total species. The Coastal affinities numbered 135 (43%) and Piedmont affinities numbered 115 (37%). It must be pointed out that the data available for the Coastal and Piedmont geographical affinities when taken together represent only 80% of the number of species present. Also, there were more data avail-

able for species with a Coastal affinity than for those with Piedmont affinities. No data were available for the affinity of *Cortaderia selloana* (Hitchcock, 1951), nor for the northern or southern affinity consideration of *Polygonum virginianum* (Gleason, 1952). As *Crataegus* was identified only to genus, it was not considered in calculating affinities.

A further consideration was given to the affinities of the trees, shrubs, and herbaceous vegetation (table 2). The results showed six (15%) tree species were alien, one (3%) had a northern affinity, six (15%) had southern affinities, 27 (68%) had affinities both northern and southern, 21 (53%) had Coastal while 27 (63%) had Piedmont affinities. Six of the shrubs were alien, four (10%) had a northern affinity, eight (21%) had southern affinities, 23 (59%) had Coastal while 18 (46%) had Piedmont affinities. There were 59 (26%) herbs which were alien, 22 (10%) were northern, 27 (12%) were southern, 122 (53%) had both northern and southern affinities, while 91 (39%) had Coastal and 70 (30%) had Piedmont affinities.

The data available indicated that the Forest has a Coastal Plain and Piedmont element and plants with northern affinities, southern affinities, and plants that range both north and south. Even though the data indicated that the Forest contained a larger percentage of Coastal species than Piedmont species, it is important to remember that the data available for the Coastal and Piedmont geographical affinities when combined represented 80% of the number of species present. In addition, the source of Piedmont records was obtained from studies which represented only a portion of that province; one of which was located approximately 150 miles southwest of the Forest. The Coastal Plain data were obtained from a more comprehensive survey which was conducted within approximately 10 to 100 miles of the Forest. Considering the available information and the proximity of the studies, it is highly probable that the remaining 20% would be mostly Piedmont species.

Summary. A floristic study was made of Hutcheson Memorial Forest, located one mile east of East Millstone, New Jersey.

The methods used to make the floristic study were observations on vascular plants in stations along the edge of the Forest and observations of vascular plants in stations within the Forest. The results of both these studies show there was a total of 312 species of vascular plants present. Seventy-seven per cent of these were found within the Forest, 57% were found along the edge, and there was an overlap of 34% (108 species).

These species comprise a total of 83 families in which the Compositae is represented by the largest number of species. Thirty-four of the families were represented by only one species. Of the total number of species, 13% (40) were trees, 13% (39) were shrubs, and the remaining 75% (232) was composed of herbaceous plants. *Quercus*, the best represented genus of trees, consisted of six species, of which *Q. alba* (84%), *Q. rubra* (72%) and *Q. velutina* (66%) had the widest distribution in the Forest and were the most abundant of the oaks.

Along the edge the species first observed in flower was *Viburnum prunifolium*; the species with the widest distribution was *Solanum carolinense*; and the species of greatest abundance in the stations along which it was found was *Rhus radicans*. In the section study the species first observed flowering was *Symplocarpus foetidus*; the species with the widest distribution were *Viburnum prunifolium*, *Polygonatum bistlorum*, and *Smilacina racemosa*; and the species of greatest abundance in the sections in which they appeared were *Cornus florida*, *Viburnum acerifolium*, *Lonicera japonica*, and *Rhus radicans*.

Those taxa which were the greatest quantitatively in the number of flowers they produced both along the edge and within the Forest were: *Podophyllum*, *Impatiens*, *Claytonia*, *Arisaema*, *Anemonella*, *Solidago*, *Cornus florida*, *Prunus avium*, *Viburnum prunifolium*, *Scutellaria integrifolia*, and *Smilacina racemosa*. Those taxa which were heavy fruiters included *Viburnum acerifolium*, *Podophyllum*, *Arisaema*, *Phytolacca*, and *Galium*.

The forest is located on the Piedmont, however, it has a Coastal Plain and Piedmont element, and more taxa with southern geographical affinities than northern geographical affinities.

Table 1. *Species list of the Hutcheson Memorial Forest indicating location, abundance, observance of spores, seeds, flowers or fruits, and geographical affinities of the species. r = rare, c = common, a = abundant, p = present, sp = spore, se = seed, fl = flower, fr = fruit, 5-37, t = numbered sections, 1-19 = numbered edge stations, A = alien, N = north, S = south, B = both (north and south). C = Coastal, P = Piedmont Affinity sources, x = Fernald, * = Shreve et. al., - = Stone, xa = Adjemovitch, xb = Bard.*

Species	Section			Edge			se	sp	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
	r	c	a	p												
Equisetum sylvaticum				x						x						15
Botrychium dissectum	x						x					x	-		30-32,35	
B. virginianum	x						x					x	* *		5,8-10,13,14 16,19,20,24,t	
Osmunda cinnamomea	x						x					x	* - *		35	
O. claytoniana	x						x					x	*		21	
Asplenium platyneuron	x			x			x					x	* - *		8,31,32	12
Athyrium filiifemina	x			x			x					x			8-14,16,17,19, 20,23-25	19
Dennstaedia punctilobula	x			x			x					x			8,9,12,14,17 19,21,24,30,37	19
Dryopteris noveboracensis	x						x					x	- *		8,11,16	
D. thelypteris	x						x					x	* - *		21,30,33	
Onoclea sensibilis	x			x			x					x	* *		8,9,11,12,26 33-35	12
Pteridium aquilinum				x			x					x	-			12
Juniperus virginiana	x			x			x			x			* *		9,10,13-15,17- 19,23,26,27, 30-33,35	6,9,10, 19
Pinus nigra				x			x		x							12
Sagittaria latifolia	x						x					x	* - *		12	
Allium vineale	x			x			x	x				x			5,20	1,11, 14,15
Asparagus officinalis	x			x			x	x	x						12,30,31,33	1,6,8- 12,14, 15,19
Hemerocallis fulva	x						x	x							6	
Maianthemum canadense	x						x	x				x	-		5,16,17,23,30, 34	
Polygonatum biflorum	x			x			x	x				x	* - *		all except 33, 35	1
Smilacina racemosa	x						x	x				x			all except 33, 35	
Smilax glauca	x			x			x			x		-	xb		9,32	9,10
S. herbacea	x			x			x			x			*		6-12,14,17,19, 20,22,24-26,t, 29,30,32,34	1,19
S. rotundifolia	x			x			x					x	- *		5,6,9,11-13,16, 17,23,25,26,t, 28-32,34	6,11,19
Uvularia perfoliata	x											x	*		5,21,22,23,30	
U. sessilifolia	x						x					x	* - *		10,17,18,20,22, 23,25	

TABLE 1 (continued)

Species	Section r c a	Edge p	fl	fr	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
Sorghastrum nutans	x	x	x					x	-		30-33	12,13
Triodia flava	x			x				x	-		33-37	
Cypripedium acaule	x			x				x	*	*	33	
Habenaria lacera	x			x				x	-	*	35	
Sparganium americanum		x	x					x				15
Liriodendron tulipifera*	x							x			14	
Chimaphila maculata	x			x				x	*	*	31-33	
Monotropa uniflora	x			x				x	*	*	8,10,11,13-25, 29	
Anemonella thalictroides	x			x				x			5,6,10	
Hepatica americana	x							x			18,19	
Ranunculus abortivus	x	x	x					x	*	xb	5	13
R. recurvatus		x	x					x				1,3
Berberis thunbergii	x	x			xa						5,10,13,14,16- 20,22,24,28,31, 33,35,37	9,12
Podophyllum peltatum		x		x	x			x		*	5-14,16,17,20- 24,27,t,28,29	
Menispermum canadense	x							x		*	13,14	
Lindera benzoin	x			x	x			x	-		5-18,20,22,26, t,29,30,34-37	
Sassafras albidum	x	x		x				x	*	*	6-11,13,16,19, 23,25,t,29-37	19
Hamamelis virginiana	x							x	-		11,12,29,34	
Sedum telephium	x	x			xa						12,13,15,17	1
Chrysplenium americanum	x			x				x	*	*	12,13	
Heuchera americana	x	x						x		*	11,13,14,24	1
Saxifraga virginiensis	x			x				x		*	10	
Amelanchier arborea	x			x				x			12,18,20,24,26, 27,28-31,34	
A. canadensis	x			x				x		*	34	
Crataegus sp	x										5-8,14,20,30, 31,33,35	
Fragaria virginiana	x	x	x	x				x	-	xb	14,24,30-33	3,7
Geum canadense	x	x		x				x	*	*	8-10,12,14-17, 19,20,24,26	1,17
Potentilla canadensis	x	x	x		x				*	*	5,12,14,16,21, 29-32	1,2,8,10, 17
P. norvegica	x	x	x		x						35	13,14,15, 17
P. recta		x	x	x								9

* Sapling

TABLE 1 (continued)

Species	Section r e a	Edge p	fl	fr	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
<i>Prunus avium</i>	x	x	x	xa						xb	5,8,10-15,20-25,27,t,28-30,34-37	3,12
<i>P. serotina</i>	x	x	x					x	-	*	5-8,19,21,25,28-37	19
<i>P. virginiana</i>	x							x		xb	5-8,12,18,29,37	
<i>Pyrus arbutifolia</i>	x		x	x				x			9,35	
<i>Rosa multiflora</i>	x	x	x	x	xa					xb	5,6,9,10,12,14-16,19,21,23,24,26,28,35	1,3,5-7,9,11,15,17,19
<i>R. virginiana</i>	x	x	x					x	-		21,24,27,t,28,34,35	9,15
<i>Rubus allegheniensis</i>	x		x					x			8-17,19-25,27,t,28-31,33,34,37	
<i>R. flagellaris</i>		x	x	x				x			1,13	3
<i>R. occidentalis</i>	x	x	x					x	-	*	5,8,10,14-17,19-21,24,28,37	19
<i>R. phoenicolasius</i>	x				xa						10	
<i>Spiraea latifolia</i>	x		x		x						29,35	
<i>Amphicarpa bracteata</i>		x	x					x				15
<i>Apios americana</i>	x		x					x	-		17	
<i>Cassia fasciculata</i>	x		x					x			32	
<i>C. nictitans</i>	x	x	x					x	*	*	23,30-32	8-10
<i>Desmodium glutinosum</i>	x		x	x				x			21,22	
<i>D. marilandicum</i>	x	x	x	x				x			37	10
<i>D. perplexum</i>	x	x	x	x			x				32,33,37	8,10
<i>D. rigidum</i>	x	x	x	x				x			27,32,33,37	9,10,13
<i>Lespedeza virginica</i>		x	x					x	*			3-5
<i>Medicago lupulina</i>		x	x	x								9
<i>M. sativa</i>		x	x	x								5,12
<i>Melilotus alba</i>	x		x	x	x						5,17	
<i>M. officinalis</i>	x	x	x	x							20	14,15,17
<i>Trifolium arvense</i>	x		x	x							12	
<i>T. hybridum</i>		x	x	x								14-17
<i>T. pratense</i>		x	x	x								3,5
<i>T. procumbens</i>		x	x	xa								14,15
<i>T. repens</i>		x	x	xa								15
<i>Vicia cracca</i>		x	x	x								16
<i>Cuphea petiolata</i>		x	x					x				9
<i>Circaea quadrisulcata</i>	x	x	x		x					xb	5-10,12-25,t,28,29,32,34,37	9,10,19
<i>Epilobium glandulosum</i>	x		x	x	x						24	
<i>var. adenocaulon</i>												
<i>Oenothera biennis</i>	x	x	x	x				x	-		6,31	1,10,13,16,19
<i>O. perennis</i>		x	x	x	x							1,14
<i>Pilea pumila</i>	x	x	x					x			5,8,10,12-17,19,20,24-27,28,t,37	14,17

TABLE 1 (continued)

Species	Section r c a	Edge p	fl	fr	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
<i>Myrica</i> <i>pennsylvanica</i>	x	x	x					x	x		30-33	10
<i>Morus alba</i>	x	x	x	xa							6,8,14,20,21, 27,28	17
<i>Celtis occidentalis</i>	x	x	x				x		-	*	14,25,26,33	19
<i>Ulmus americana</i>	x	x	x					x		*	24-27,t,29, 32-35	19
<i>Alnus rugosa</i>		x	x		x				*	-	*	15
<i>Betula</i> <i>populifolia</i>	x		x					x		x	31	
<i>B. nigra</i>	x		x					x	*	-	30-33	
<i>Carpinus</i> <i>caroliniana</i>	x		x				x		*	*	11,12,14	
<i>Corylus</i> <i>americana</i>	x		x					x	*		8,11	
<i>Fagus</i> <i>grandifolia</i>	x		x					x	*	-	8-11,13,16-21	
<i>Quercus alba</i>		x	x					x	-	*	5-11,13-27,28- 30,34-37	
<i>Q. bicolor</i>	x		x					x		*	11,12,23,24, 26,34	
<i>Q. coccinea</i>	x		x					x	*	-	8,12,13,16,18, 22,23,25,34	
<i>Q. palustris</i>	x	x	x					x	-	*	12,15,25,30- 32,34,35	19
<i>Q. rubra</i>	x		x					x		*	5-8,10-14,16, 17,19,20,22-25, 27,28-30,34-37	
<i>Q. velutina</i>	x		x					x	*	-	5,6,10,12,14, 17-19,22-25,27,t, 28-31,33,35,37	
<i>Acer negundo</i>	x		x					x		*	14	
<i>A. platanoides</i>	x			xa						xb	5,11,13,14,19, 20,22-24,28-31, 34,37	
<i>A. rubrum</i>	x		x					x	*	*	6-13,15-20,22, 23,25-27,t,28- 30,33-37	
<i>A. saccharinum</i>	x		x					x		*	9,10,20,23,29, 32,33,35	
<i>A. saccharum</i>	x		x					x	*	*	6,8,10,13,16, 19,21,23,27,t, 28,32,34,37	
<i>Rhus copallina</i>	x	x					x		*	-	9,33	10
<i>R. glabra</i>	x	x	x					x	*	-	9,12,16,17,19, 30,32,33,35	10
<i>R. radicans</i>		x	x	x				x	-	*	5-10,12,17,20- 27,t,29-33,35 37	1,2,5,9- 11,19
<i>R. typhina</i>	x	x	x					x			11,20,22	19
<i>Ailanthus</i> <i>altissima</i>	x	x	x	xa							6,9-15,17,19, 20,23,24,27,t, 29-33,37	11,12,19
<i>Oxalis stricta</i>	x	x	x					x	*	-	5-8,10,12,14- 16,19-22,24,25, 27,t,31,32,34	1-3,8,9, 13,14

TABLE 1 (continued)

Species	Section r e a	Edge p	f	fr	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
Geranium maculatum	x		x					x	*		9,10,12,16,21, 24,27,28	
Aralia nudicaulis	x					x			-		34	
Cicuta maculata	x	x	x					x	*-		35	19
Cryptotaenia canadensis	x		x					x			8	
Daucus carota	x	x	x		x						34	1,6-9,13, 15,17
Osmorhiza longistylis	x			x				x			13,17,23	
Sanicula trifoliata	x		x			x					5,13,14,20,21, 24,27,t,28	
Carya ovalis (Carya ovata)	x	x		x				x	*		5-8,10-20,22, 24,25,27,t,28, 29,33-37	1,19
Juglans nigra	x	x		x				x	*		11,13,20,t,29, 31	19
Impatiens capensis	x	x	x	x				x	-	xb	5-14,25,26,30, 33,35,37	1,15-17
Polygala mariana		x	x				x		x*	*		1,3,5,12, 13,19 3
Ceanothus americanus		x	x					x	*			
Parthenocissus quinquefolia	x		x					x	*	*	all except 19, 30,33	
Vitis aestivalis	x	x					x		*-	xb	6-23,t,29-30, 32-37	1
Celastrus scandens	x							x	-	*	31	
Euonymus alatus	x				xa						10	
Ilex opaca*	x						x		-		35	
I. verticillata	x						x		*-	*	35	
Acalypha virginica	x	x	x				x		-	*	8,10,13,17,34	13,14,17
Euphorbia maculata		x		x				x	-			7-9
Cornus amomum	x	x	x	x			x		*-	xb	12,27,30,32	14,15
C. florida		x		x	x		x		*-	*	5-24,27,t,28- 31,34,37	
C. racemosa	x			x	x			x		xb	9,10,19,20,30- 33	
Nyssa sylvatica	x			x			x		*-	*	5,8,11,12,14, 15,25,29,34,35	
Phytolacca americana	x	x	x	x				x			5-9,11-18,20- 27,t,28,29,34- 37	5,8,14, 15,17
Claytonia virginica*		x		x				x		*		
Portulaca oleracea		x		x	x							1-3
Cerastium nutans		x		x				x				1
Dianthus armeria	x	x		x	x						6,10,32,33	1,3,9, 12-15,17
Saponaria officinalis		x		x	x							12

* Seedling

* early spring blooming flower not observed during section study.

TABLE 1 (continued)

Species	Section r c a	Edge p	fl	fr	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
<i>Silene cucubalus</i>	x	x	x	x							5,6,20,32	1,2,12, 14-17
<i>S. stellata</i>	x		x	x				x	*	*	5	
<i>Stellaria</i> <i>longifolia</i>		x	x					x				1,14,15, 17
<i>Stellaria media</i>	x		x	x	x						9,12	
<i>Chenopodium</i> <i>album</i>	x		x	xa							5	
<i>Polygonum</i> <i>convolvulus</i>	x	x	x	x	x						27	13,14,16
<i>P. persicaria</i>	x	x	x	x	x						9	4,15,16
<i>P. sagittatum</i>	x	x	x					x	*-	*	34,35	14,15,17
<i>P. scandens</i>		x	x					x	-			13
<i>P. virginiana</i>	x		x						*		9,20,24	
<i>Rumex acetosella</i>	x	x	x	xa							5	2
<i>R. crispus</i>	x	x	x	x	xa						5,6,12,15,20, 24	9-12,14, 15,16,17, 19
<i>Hypericum</i> <i>perforatum</i>	x	x	x	x	x						5,8,10-12,31, 34,35	2,8,13, 14
<i>Tilia americana</i>	x		x		x				*	*	27	
<i>Althaea rosea</i>		x	x	x								12
<i>Barbarea</i> <i>vulgaris</i>	x	x	x	xa							5,12,30	2,16,17
<i>Cardamine</i> <i>parviflora</i>	x		x					x			12	
<i>Lepidium</i> <i>campestre</i>	x	x	x	xa							20	14,15,17
<i>Raphanus</i> <i>raphanistrum</i>		x	x	x								17
<i>Rorippa</i> <i>islandica</i>		x	x		x							7,13
<i>Lechea</i> <i>intermedia</i>		x	x		x							10
<i>Viola sagittata</i>	x		x					x	-	*	6-10,12,14,16, 17,20,21,23,30 33,35	
<i>Populus</i> <i>grandidentata</i>	x		x					x	-			
<i>Salix nigra</i>	x		x					x	-		30	
<i>Leucothoe</i> <i>racemosa</i>	x		x				x		*		8,11,30,34,35	
<i>Rhododendron</i> <i>nudiflorum</i>	x		x				x				24,30,34,37	
<i>R. viscosum</i>	x		x					x			35	
<i>Vaccinium</i> <i>corymbosum</i>	x		x					x	*-		26,29,33-37	
<i>V. vacillans</i>	x		x					x	-		25,30,34	
<i>Diospyros</i> <i>virginiana</i>	x						x		*-	*	12	
<i>Anagallis</i> <i>arvensis</i>		x	x	x								2,4
<i>Lysimachia</i> <i>quadrifolia</i>	x		x					*	-		10,29,30,33-35	
<i>L. terrestris</i>	x		x					x	-		35	
<i>Fraxinus</i> <i>americana</i>		x . x	x	x				x		*	5,8-12,14-27,t, 28,29,31-33,35, 37	14,19

TABLE 1 (continued)

Species	Section r e a p	Edge p	fl fr	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
Ligustrum obtusifolium	x		x	xa						13,20-23,29	
Apocynum medium	x	x	x					x		9,30-32	6,7,9
Asclepias amplexicaulis	x		x			x		-		32	
A. syriaca	x		x					x	-	5,13	
Plantago lanceolata	x	x	x	x	x					5,6	1,5,11, 14,15,17, 19
P. rugelii	x	x	x					x	*	5,6,10,20,24	1,17
Phlox paniculata		x	x			x			*		12
Physalis heterophylla		x	x				x	*	*		1
P. subglabrata		x	x				x		xb		8
Solanum carolinense	x	x	x				x	*	*	5,6,12,14,24, 27	1-4,7-10, 13-17
S. dulcamara	x		x	x						14	
S. nigrum	x		x	x						22	
Ipomoea hederacea	x		x	x						5	
I. pandurata		x	x			x					10
Cuscuta gronovii	x		x				x	*	*	8,11,12,35	
Gratiola virginiana	x		x			x				12,30	
Linaria vulgaris	x	x	x				x			31,32	1,8,9, 12-15
Paulownia tomentosa	x		x	xa						13	
Penstemon hirsutus	x		x				x			9	
Verbascum blattaria	x	x	x	x					*	5	1,7,8,9, 13-17
V. thapsus	x	x	x	x						31,33	10
Veronica arvensis	x		x	x						9	
V. officinalis	x		x				x	-	*	9,33	
Hackelia virginiana	x		x				x			27	
Verbena hastata	x	x	x				x	*	*	11,35	13
V. urticifolia	x	x	x			x		*	*	5,9,17,20	1,3,7, 13,14,17
Collinsonia canadensis	x	x	x			x			*	5,12,16	2
Hedeoma pulegioides	x	x	x				x		*	21,27	4-6,9
Leonurus cardiaca	x		x	x	x					12,14,15	
Lycopus amplectens	x		x			x		x		35	
L. rubellus	x		x			x		*		11,17	
L. uniflorus	x		x	x				x	-	25,27,34	
L. virginicus	x		x					x	*	30,32,35	
Prunella vulgaris	x	x	x	x						10,14,15,17, 20,30	3,6-8, 13,15-17
P. vulgaris forma albiflora		x	x	x							7

TABLE 1 (continued)

Species	Section r e a	Edge p	fl	fr	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
<i>Pycnanthemum muticum</i>	x	x	x					x			25,26,30-35	13
<i>Scutellaria integrifolia</i>	x		x				x	-			31-33	
<i>S. lateriflora</i>	x		x			x		-			12,15,23-26,30	
<i>Trichostema dichotomum</i>		x	x					x	-	*		10
<i>Lobelia inflata</i>	x	x	x	x				x	*	*	9,10,12,14,15, 17,27,30	1-3,7,8, 13-15,17 14,15,17
<i>Specularia perfoliata</i>		x	x					x	-	*		
<i>Cephalanthus occidentalis</i>	x		x	x				x	*	-	34,35	
<i>Diodia teres</i>	x		x				x		*	-	32,33	
<i>Galium aparine</i>	x	x	x					x	-		8,19,20,22-24	1,14,15
<i>G. circaezans</i>	x		x				x		*	xb	5,8-10,14,16, 17,19,20,22,27	
<i>G. triflorum</i>	x		x					x	*		5,6,10,12-25, 27,29,31,37	
<i>Mitchella repens</i>	x		x					x	*	*	8,10-12,16,18, 21-23,25,26,29, 30,34,35	
<i>Lonicera japonica</i>		x	x	x	x	xa				xb	5,8-24,26,27, 28-37	1,3,6,7, 9-12,14, 15,17,19
<i>L. tatarica</i>	x		x	x							8,20,23	
<i>Sambucus canadensis</i>	x	x	x			x			*	*	8-10,12-15,17, 20-24,27,28, 29,35	15,16
<i>Triosteum aurantiacum</i>	x		x			x					23	
<i>Viburnum acerifolium</i>		x	x						-	*	all except 31, 32,33,35	
<i>V. dentatum</i>	x		x				x		*	*	5-17,20,23-27, 30,34-37	
<i>V. prunifolium</i>	x	x	x				x		*	*	all except 31, 32	19
<i>V. rafinesqui- anum</i>	x							x			8,11,15,24,27, t,29,34	
<i>Achillea millefolium</i>	x	x	x			xa					5,6,12,21,31- 33	14,15,17
<i>Ambrosia artemisiifolia</i>	x	x	x						*	*	6,9,10,12,15, 20,31,32	3,4,9,12, 13,15,16
<i>Anaphalis margaritacea</i>	x	x	x						-		31	10
<i>Anthemis cotula</i>	x	x	x			x					30,31	1
<i>Arcetium minus</i>	x	x	x			x					10,13,14	15
<i>Aster divaricatus</i>	x		x					x		*	35	
<i>A. novae angliae</i>		x	x					x				13
<i>A. spectabilis</i>		x	x					x				13
<i>Bidens bipinnata</i>	x	x	x					x	-	*	8,9,19	8,14,17, 19
<i>B. polylepis</i>		x	x					x				13
<i>Chrysanthemum leucanthemum</i>	x	x	x			xa					5,27	14,15,19

TABLE 1 (continued)

Species	Section r c a	Edge p	f	fr	A	N	S	B	C	P	Section 5-37,t	Edge 1-19
<i>C. leucanthemum</i> var. <i>pinnatifidum</i>		x	x	x								15
<i>Cichorium</i> <i>intybus</i>		x	x	x								3,4
<i>Cirsium arvense</i>		x	x	x								15
<i>C. discolor</i>	x	x	x		x					-	32	
<i>C. pumilum</i>		x	x					x				8,13-15
<i>Erigeron annuus</i>	x	x	x						*	-	* 5,6,15,20,33	1,3,7, 12-17 13,15
<i>E. canadensis</i>		x	x					x		*		13,15
<i>Eupatorium</i> <i>aromaticum</i>	x		x				x		x		30	
<i>E. perfoliatum</i>	x		x					x	*	-	* 9,12,15,30, 34,35	
<i>E. rugosum</i>	x	x	x					x			5,10,12-17,19, 21,24,25,27	8,13
<i>Helianthus</i> <i>giganteus</i>		x	x					x				8
<i>Krigia biflora</i>		x	x					x				7
<i>Lactuca biennis</i>		x	x			x						16
<i>L. canadensis</i>	x		x			x				-	5,6,17,23,26, 35	
<i>L. scariola</i>	x		x		x						9,12	
<i>Rudbeckia hirta</i>	x	x	x				x			*	30,33	1,4,8,10 12,13,15, 17,19
<i>Solidago</i> <i>graminifolia</i>	x	x	x		x						30,35	1,2,7,8 13,14
<i>S. juncea</i>	x	x	x					x		x*	25,27,29-34, 37	1,9,15
<i>S. nemoralis</i>	x	x	x					x	*		8,29-37	13
<i>S. rugosa</i>	x	x	x		x				*	*	29-37	2,6,12, 13
<i>S. ulmifolia</i>		x	x				x					15
<i>Taraxacum</i> <i>officinale</i>		x	x		xa							7,14
<i>Vernonia</i> <i>noveboracensis</i>	x	x	x				x		*	-	* 30,34,35	13

Table 2—Numerical representation of the affinities of the trees, shrubs, and herbaceous vegetation. A = alien, N = north, S = south, B = both north and south, C = coastal, P = Piedmont.

Vegetation	A	N	S	B	C	P	Total C,P	Total veg.
Tree	6	1	6	27	21	27	48	40
Shrub	6	4	8	21	23	18	41	39
Herb	59	22	27	122	91	70	161	232
Totals	71	27	41	170	135	115	250	311
Totals in terms %	22	8	13	55	43	37	80	99

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A *Solidago* hybrid.

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On September 17, 1961, Mr. Louis E. Hand and I explored Iona Island, Rockland County, New York. On the edge of the bog beside the railroad tracks where *Solidago rugosa* Ait. and *S. uliginosa* Nutt. were growing we found several plants that had morphological characteristics which were intermediate between these two species. These putative hybrids are worthy of reporting since they were not mentioned by Fernald in Gray's Manual.

The diagnostic morphological characteristics are listed below:

Solidago rugosa × *S. uliginosa* n. hybr. The probable *S. uliginosa* parentage is indicated by the basal leaves oblanceolate, up to 3.1 cm. wide, much larger than the middle and upper, decreasing rapidly in size up to the inflorescence; bases of the lower and median cauline leaves covering half the circumference of the stem; stem glabrous up to the inflorescence; leaves thickish and glabrous to barely scabridulous; pedicels and branches of the inflorescence hirtellous and achenes glabrous. The probable *S. rugosa*