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The Past and Present Flora and Vegetation of the Hackensack Meadows ¹

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INTRODUCTION

The Hackensack Meadows is located in the Triassic Lowlands, a subdivision of the Piedmont Province in Northeastern New Jersey. Elevations range from zero to ten feet, with most areas being less than five feet above sea level. Elevations higher than ten feet occur in restricted areas.

The New Jersey Division of State and Regional Planning considers the Hackensack Meadows to consist of 18,000 acres occurring along the Hackensack River in northeastern New Jersey (see fold-out map). The area of this study includes the above 18,000 acres, but extends additionally into Little Ferry, Secaucus, and Communipaw. Located in Bergen and Hudson Counties, the Hackensack Meadows is bounded on the north approximately by State Route 46, on the south by the confluence of the Passaic and the Hackensack Rivers, on the east by State Route 9, and on the west by State Route 17. It is centered at longitude 74° 04' W and latitude 40° 49' N.

The area is predominantly tidal marsh and the soils are comprised mostly of peat or muck. Mineral soils (limited in distribution) occur on the higher sites where stratified drift and glacial clays of the ancient Glacial Lake Hackensack are exposed. These varved clays represent a continuous series of 2,550 varves representing many years of deposition in the Hackensack Valley (Reeds, 1927). The clays lie upon sedimentary rocks of Triassic age classed as the Newark series (Schuberth, 1968). Diabase intrusives of the Newark series (Triassic age) are exposed in two areas in the Meadows — Snake (Laurel) and Little Snake Hills.

The objective of this report is to describe the past and present flora and vegetation of the Hackensack Meadows. Field work was done in the study area during September, 1969. Data from the field work were then correlated with patterns of apparent vegetation types appearing on aerial photographs taken in June, 1969. The vegetation map was then drawn to a scale of 1:24000 on the basis of these data and correlations. Additional field work was done in the spring and summer of 1970 to more accurately describe the vegetation types and check the mapping. Voucher specimens for most of the encountered species have been deposited in the herbarium of the Academy of Natural Sciences of Philadelphia. A list of the species encountered and/or collected is given in Table 1. Nomenclature in most instances follows Fernald (1950).

In reconstructing the past vegetation of the Hackensack Meadows, five main publications were consulted (Torrey, 1819; Britton, 1889; Heusser, 1949 and

¹ Portion of a thesis (Sipple, 1971) submitted in partial fulfillment of the requirements for the degree of Master of Regional Planning in the Department of Landscape Architecture and Regional Planning at the University of Pennsylvania, Philadelphia.

1963; and Harshberger and Burns, 1919). Vermeule's map (1896) was also examined.

One of the problems encountered in working with the older publications was that some of the locality names have changed subsequent to the time of publication and differ from those on current U.S. Geological Survey topographic maps (Weehawken, 1967; Jersey City, 1967) which have been used for place names in this study. In this report, Manhattanville refers to the borough of Manhattan, Weehawk to Weehawken, and Elizabethtown to Elizabeth. Vermeule's map, as modified in Figure 1, shows the approximate location of some of these localities in the Meadows.

Another problem was that of nomenclature. Consequently, the species lists in this report (Torrey, 1819; Britton, 1889; Harshberger and Burns, 1919; and Heusser, 1949) contained currently unfamiliar nomenclature. It was necessary to bring this nomenclature up to date, at least to a standard (Fernald, 1950).

Lists have been included (Tables 3, 4, 5, and 6) to indicate the species collected in the Hackensack Meadows and surrounding areas. The lists from Britton and Torrey were taken from general floras. (*Catalogue of Plants Found in New Jersey* and *A Catalogue of Plants Growing Spontaneously within Thirty Miles of New-York*). Publications of Burns (1919) and Heusser (1949) contain lists specific to the Hackensack Meadows. Heusser's list (1949) and Burns' list (1919) were compiled from their own field work, so the plants they indicated were essentially contemporaneous with the date of publication. However, Britton (1889) cited species from herbarium collections, but did state that many species in his flora were from recent collections. Dates of collection in Torrey's publication were not given; thus, many of the species listed by Torrey (1819) could have been collected at a much earlier date. Furthermore, the extent of many of the species listed by Torrey, Britton, and Burns in 1819, 1889, and 1919, respectively, is not completely known for the Meadows, because there was a lack of notation on collecting areas. Probably only selected locations were botanized. However, Vermeule's map does indicate the extent of the existing cedar swamp (and acreage) in 1896 (Fig. 1). Vermeule also delineated areas as "cedar swamp bottom" that contained the remains of dead cedars which gives an indication of the extent of the cedar swamp prior to 1896. Collection localities for species reported by Torrey (1819), Britton (1889), Harshberger and Burns (1919), and Heusser (1949) have been indicated (Fig. 1). Since some of the species were reported by 19th century botanists, the author examined their collections preserved at the New York Botanical Garden. Specimens of about 25 species were found that were collected from the Meadows during the nineteenth century including some original specimens from the Torrey collection such as *Coptis groenlandica*. All of those examined (Table 2) appeared to be identified correctly except for a doubtful specimen of *Xyris flexuosa* and three doubtful specimens of *Rubus pubescens*.

PRESENT FLORA AND VEGETATION

Nineteen vegetation types are described and grouped into four general categories: marshes, forested areas, meadows, and ruderal plants.

Marshes

1. *Phragmites australis* (Reed-Grass) Type: This vegetation type is ubiquitous in the area. It is the most common vegetation type found and, because of its density and height, travel through it is difficult. Its great abundance is evident on the accompanying vegetation map. These plants usually have seed-less spikelets and reproduce chiefly by vegetative means. Surface runners up to 4.5 meters in length have been seen in the Meadows. In many places *Phragmites australis* occurs in pure stands and in some areas it appears to be encroaching upon other vegetation types such as forested areas and ruderal fields. This encroachment too is evident where the salt marsh species are peripheral to the reed-grass. Higher elevations, such as dikes, also contain vegetation comprised almost entirely of the reed-grass. Some small upland areas, not necessarily marshes, are included within this type.

Other marsh areas scattered throughout the Meadows, although mapped as *Phragmites australis* due to its dominance, also contain salt marsh species and have been indicated on the vegetation map as areas "A", "B" and "C". Likewise a salt marsh species, *Spartina alterniflora*, has a discontinuous distribution along the Hackensack River in the study area. It is found in a strip up to about 7 meters in width and is associated with other halophytes. This is similarly true of many of the River's tributaries, such as Sawmill and Cromakill Creeks.

The salt marsh species observed for the entire Meadows include:

| | |
|------------------------------|------------------------------|
| <i>Amaranthus cannabinus</i> | <i>Spartina alterniflora</i> |
| <i>Aster subulatus</i> | <i>S. patens</i> |
| <i>Distichlis spicata</i> | <i>S. cynosuroides</i> |
| <i>Eleocharis parvula</i> | <i>Scirpus olneyi</i> |
| <i>Pluchea purpurascens</i> | <i>Typha angustifolia</i> |
| <i>Salicornia europaea</i> | |

Although most of these species are found in salt marshes, some do occur under brackish or nearly fresh conditions (Fernald, 1950). Consequently, the areas of tidal influence, although containing some salt marsh species, could actually be brackish marsh. Data from Heusser (1949) and Potera (1970) indicate that brackish conditions exist. Heusser reported maximum salinities of 5.10, 6.95, and 20.75 percent of sea water for spring, summer and fall, respectively, in the Secaucus area, while Potera reported extremes of salinity of from 6.9 0/00 to 15.7 0/00 (parts per thousand) from Sawmill Creek area.

Area "A" is one of the better brackish marsh areas in the Meadows. Sawmill Creek passes through its entire length and supports scattered stands of *Spartina alterniflora* peripheral to the more dominant *Phragmites*.

Area "C" is similar to "A" but has a greater diversity of salt and brackish water species present. It is located above Bellman's Creek between the New Jersey Turnpike and the Hackensack River. Here are found:

| | |
|------------------------------|------------------------------|
| <i>Amaranthus cannabinus</i> | <i>Scirpus olneyi</i> |
| <i>Aster subulatus</i> | <i>Spartina alterniflora</i> |
| <i>Atriplex patula</i> | <i>Spartina cynosuroides</i> |
| <i>Hibiscus</i> sp. | <i>Typha angustifolia</i> |
| <i>Pluchea purpurascens</i> | |

Spartina alterniflora, *S. cynosuroides* and *Typha angustifolia* occur in fairly large stands, but the other species are scattered. In most cases these are over-topped by the ubiquitous *Phragmites australis*. Viewed from the River, only the reed-grass can be seen, but, from the Interstate 95 bridge, stands of salt or brackish marsh plants are evident. Even on the upper reaches of Bellman's Creek, salt or brackish marsh species such as *Amaranthus cannabinus* and *Pluchea purpurascens* are present. *Spartina alterniflora*, however, is not present there.

Area "B" which lies to the south of area "C" is located between and around Cromakill and Mill Creeks near Secaucus. Here salt marsh and brackish marsh species are found, but these are hidden from view by the over-topping reed-grass. Heusser (1949) listed 117 species for this region. Many of the species listed by Heusser are reported to typically occur in salt or brackish marshes (Fernald, 1950), but, based upon Heusser's salinity studies, probably only brackish marsh was present. In field checking for the present study, the following species were found along Mill Ridge Road near the boatyard at Cromakill Creek:

| | |
|-----------------------------|------------------------------|
| <i>Atriplex patula</i> | <i>Spartina patens</i> |
| <i>Distichlis spicata</i> | <i>Scirpus americanus</i> |
| <i>Juncus</i> sp. | <i>S. olneyi</i> |
| <i>Pluchea purpurascens</i> | <i>Solidago sempervirens</i> |
| <i>Polygonum punctatum</i> | |

Near the Secaucus sewer plant (which is adjacent to area "B") clumps of *Typha angustifolia* and scattered specimens of *Amaranthus cannabinus* occur. Even the upper reaches of Cromakill Creek has stands of salt and brackish marsh species such as the following:

| | |
|------------------------------|------------------------------|
| <i>Amaranthus cannabinus</i> | <i>Spartina cynosuroides</i> |
| <i>Hibiscus</i> sp. | <i>Typha angustifolia</i> |
| <i>Pluchea purpurascens</i> | |

On the west side of the River, along Berry Creek Canal, *Spartina alterniflora* is rare while *Phragmites australis* is found either in the water or along its edge. Where State Route 3 crosses Berry Creek, *Juncus* sp. is found as well as one plant of *Baccharis halimifolia*, infrequent plants of *Amaranthus cannabinus*, and *Pluchea purpurascens*. Farther upstream a large stand of *Typha angustifolia* exists. *Scirpus americanus*, *Spartina alterniflora* and *Pluchea purpurascens* are found also

on Kinglands Creek. At the terminus of Plank Road on the west bank of the Hackensack River, a strip approximately seven meters wide with salt and brackish marsh species is present. This strip supports the following species:

| | |
|------------------------------|------------------------------|
| <i>Atriplex patula</i> | <i>Spartina alterniflora</i> |
| <i>Pluchea purpurascens</i> | <i>Typha angustifolia</i> |
| <i>Solidago sempervirens</i> | |

One area, also along Plank Road in Carlstadt (a few hundred feet from State Route 20), is an open mud flat and supports *Typha latifolia*. One specimen of *Alisma subcordatum* was collected here. A salt or brackish marsh species, *Eleocharis parvula*, also occurs here. Another area just south of the junction of the Hackensack River and Interstate 95 contains such species as:

| | |
|------------------------------|-----------------------------|
| <i>Aster subulatus</i> | <i>Hibiscus</i> sp. |
| <i>Amaranthus cannabinus</i> | <i>Pluchea purpurascens</i> |
| <i>Atriplex patula</i> | <i>Typha angustifolia</i> |

Salt or brackish marsh species likewise exist at other access points such as an area near Communipaw along the Hackensack River where the following are found:

| | |
|------------------------------|------------------------------|
| <i>Amaranthus cannabinus</i> | <i>Solidago sempervirens</i> |
| <i>Distichlis spicata</i> | <i>Spartina alterniflora</i> |
| <i>Juncus</i> sp. | |

2. *Spartina alterniflora*-*Amaranthus cannabinus* Type: The larger of the two areas mapped under this category is a narrow strip occurring between Interstate 95 land-fill and a road dike to the west. This area was continuous with "A" (see fold-out map) before the construction of the highway, which now separates it from area "A". It is comprised almost entirely of *Spartina alterniflora* and *Amaranthus cannabinus* with the latter growing mostly along the watercourses. To the west of the dike and to the east of the road-fill, large open areas exist which are inundated at high tide but are exposed mud flats at low tide. *Phragmites australis* grows east of the inundated area. Many dead tree stumps are evident during low tide.

3. *Spartina patens*-*Atriplex patula*-*Salicornia europaea* Type: This is a small area, comprised mostly of these three species, that is located west of Little Snake Hill near the junction of the Penn Central and Erie-Lackawanna Railroads. This vegetation type, slowly being destroyed by sanitary land-fill operations, was probably of a larger extent prior to the filling.

4. *Typha angustifolia* Type: These areas are in many cases too small to be mapped and, therefore, are discussed above. However, there are some larger areas as indicated by the vegetation map. One such area is located along the Berry Creek Canal.

5. *Pluchea purpurascens* Type: Although this species is found frequently along the tributaries, it usually is too scattered to warrant mapping. However, in

some areas it is locally abundant or dominant and in at least one case was mapped. This area is found on the eastern edge of the Meadows near North Bergen. In most places it is usually associated with *Amaranthus cannabinus* or *Aster subulatus*.

Forested Areas

6. *Quercus palustris-Quercus bicolor-Acer rubrum* Type: Of the forested areas in the Hackensack Meadows, this type is the most frequent. However, the forested areas are small in number as well as in area and occur at Little Ferry, Moonachie, and in the vicinity of the Teterboro Airport. The forests in these localities are dominated by *Quercus palustris*. *Quercus bicolor* and *Acer rubrum* are also abundant. One such area west of the Losen Slofe Branch of the Hackensack River supports the following species of trees:

| | |
|--------------------------------|--------------------------|
| <i>Acer rubrum</i> | <i>Quercus alba</i> |
| <i>Betula populifolia</i> | <i>Q. palustris</i> |
| <i>Liquidambar styraciflua</i> | <i>Q. rubra</i> |
| <i>Populus grandidentata</i> | <i>Nyssa sylvatica</i> |
| <i>Populus tremuloides</i> | <i>Sassafras albidum</i> |
| <i>Prunus serotina</i> | |

The shrub layer is comprised of:

| | |
|----------------------------------|-----------------------------|
| <i>Cephalanthus occidentalis</i> | <i>Rhus copallina</i> |
| <i>Ilex verticillata</i> | <i>Spiraea tomentosa</i> |
| <i>Pyrus melanocarpa</i> | <i>Vaccinium corymbosum</i> |
| <i>Rhododendron viscosum</i> | <i>Viburnum dentatum</i> |

Of these shrubs *Pyrus melanocarpa* and *Vaccinium corymbosum* are the most abundant. They form a thicket type growth. Beneath this thick underbrush are found such plants as *Osmunda regalis* var. *spectabilis* and *Osmunda cinnamomea* as well as sphagnum moss. In 1919, cedar bogs existed in the northern part of the Meadows (Harshberger, 1919) and an 1896 map verifies their existence (Vermeule, 1897). This forested area could very well have been peripheral to such cedar bogs, much as deciduous swamps skirt around cedar bogs in the Pine Barrens of southern New Jersey today (McCormick, 1967). Species found common to both the Moonachie area and deciduous swamps in the Pine Barrens include:

| | |
|------------------------------|---|
| <i>Acer rubrum</i> | <i>Osmunda cinnamomea</i> |
| <i>Ilex verticillata</i> | <i>O. regalis</i> var. <i>spectabilis</i> |
| <i>Iris prismatica</i> | <i>Pyrus melanocarpa</i> |
| <i>Hypericum canadense</i> | <i>Rhexia virginica</i> |
| <i>Lilium superbum</i> | <i>Rhododendron viscosum</i> |
| <i>Ludwigia alternifolia</i> | <i>Vaccinium corymbosum</i> |
| <i>Nyssa sylvatica</i> | |

On the periphery of the forested area are also found *Andropogon virginicus* var. *abbreviatus*, *Onoclea sensibilis*, *Solidago graminifolia*, *Hypericum mutilum*, *Polygala sanguinea*, and *Thalictrum polygamum*.

Another forested area examined is off Moonachie Road about one mile from State Route 17. The following trees occur:

| | |
|--------------------------------|--------------------------|
| <i>Acer rubrum</i> | <i>Quercus palustris</i> |
| <i>Liquidambar styraciflua</i> | <i>Q. rubra</i> |
| <i>Nyssa sylvatica</i> | |

The shrub layer is comprised of:

| | |
|--------------------------|-----------------------------|
| <i>Clethra alnifolia</i> | <i>Vaccinium corymbosum</i> |
| <i>Pyrus melanocarpa</i> | <i>Viburnum dentatum</i> |

Osmunda cinnamomea, *Woodwardia areolata*, *Maianthemum canadense*, and *Uvularia sessilifolia* represent the herb layer in the spring and early summer.

In Little Ferry there is a large forested area between Eckeland and Mehrhof Roads that is dominated by *Quercus palustris* and *Q. bicolor*. It has an understory shrub layer comprised mainly of *Clethra alnifolia* and *Pyrus melanocarpa*. The following herbaceous plants are present:

| | |
|----------------------------------|------------------------------------|
| <i>Bartonia virginica</i> | <i>Polygala sanguinea</i> |
| <i>Dennstaedtia punctilobula</i> | <i>Pteridium aquilinum</i> |
| <i>Hypericum canadense</i> | <i>Rhynchospora chalarocephala</i> |
| <i>Juncus marginatus</i> | <i>Scirpus cyperinus</i> |
| <i>Lilium superbum</i> | <i>Woodwardia areolata</i> |
| <i>Lysimachia terrestris</i> | |

Another native forested area dominated by *Quercus palustris* is found at Secaucus off Mill Ridge Road. It contains other tree species such as *Acer rubrum*, *Carya* sp., *Liquidambar styraciflua*, *Prunus serotina*, *Quercus bicolor*, and *Ulmus americana*. The most abundant shrub is *Viburnum dentatum*, but *Sambucus canadensis* is frequent on the periphery. Other species found include *Dryopteris noveboracensis*, *Impatiens capensis*, *Juncus tenuis*, *Maianthemum canadense*, *Polygonum cespitosum*, and *Uvularia sessilifolia*.

A very small area, lying next to Interstate 95 and adjacent to the road dike running from Plank Road to the Hackensack River, contains fourteen standing red maples (*Acer rubrum*) twelve of which appear to be dead. Beneath the maples *Pluchea purpurascens* and *Cyperus strigosus* are found on the wetter sites while ruderal plants are found in drier areas.

7. *Quercus-Carya* Type: In the southern part of the Meadows two areas of this upland forest type are found. These forests occur on Snake (Laurel) and Little Snake Hills. Another occurs at Secaucus. Prior to quarrying, Snake Hill supported many trees, but now only a narrow strip of trees along the New Jersey Turnpike remains. Even though Little Snake Hill is being encroached upon by sanitary land-fill, it is still covered with a mixture of trees and herbs. Most of the woody plants are scattered and are small relative to the other forested

areas (trees up to six meters). The trees and shrubs consist of:

| | |
|-----------------------------|--------------------------|
| <i>Betula populifolia</i> | <i>Quercus rubra</i> |
| <i>B. lenta</i> | <i>Q. stellata</i> |
| <i>Carya</i> sp. | <i>Rhus copallina</i> |
| <i>Celtis occidentalis</i> | <i>R. glabra</i> |
| <i>Hamamelis virginiana</i> | <i>R. typhina</i> |
| <i>Nyssa sylvatica</i> | <i>Rubus</i> sp. |
| <i>Prunus serotina</i> | <i>Sassafras albidum</i> |
| <i>Quercus prinus</i> | |

Of these species, *Quercus prinus* and *Quercus rubra* are the most abundant. As opposed to other natural forested areas in the Meadows, *Quercus palustris* is not present on either Snake (Laurel) or Little Snake Hills. The dominant herbs are *Andropogon scoparius*, *Sorghastrum nutans* and *Deschampsia caespitosa*. The following also occur:

| | |
|----------------------------------|--------------------------------|
| <i>Apocynum</i> sp. | <i>Panicum virgatum</i> |
| <i>Asclepias tuberosa</i> | <i>Poa</i> sp. |
| <i>Calamagrostis canadensis</i> | <i>Phytolacca americana</i> |
| <i>Dennstaedtia punctilobula</i> | <i>Scrophularia lanceolata</i> |
| <i>Erechtites hieracifolia</i> | |

8. *Ailanthus altissima* Type: Although these forested areas are dominated by *Ailanthus altissima*, they contain in most instances an understory of ruderal plants. A good example of such an area is found along Secaucus Road.

9. Herb-Shrub Thicket: Almost all the areas mapped as Herb-Shrub Thicket occur in the vicinity of Teterboro Airport adjacent to forested areas and appear to be in various stages of succession from old field to forest. Some of these are cut-over areas. One large area also occurs in the southern part of the Meadows adjacent to Snake Hill.

Meadows

10. *Andropogon virginicus* Type: Although species of this genus are found frequently on dry sites throughout the Meadows, there are only two localities where they are abundant enough to be considered a vegetation type. One is a small area near the edge of the Meadows at North Bergen and the other is a larger area near Snake Hill. The dominant grass is *Andropogon virginicus*, but in some instances *Andropogon scoparius* also occurs.

11. *Panicum virgatum* Type: There are only three areas mapped under this vegetation type. One is in the northern part of the Meadows on the west side of the Hackensack River. The second is in the Little Ferry-Moonachie area and the third occurs along the Erie-Lackawanna Railroad near Little Snake and Snake Hills. This plant also occurs elsewhere in the meadows on dry sites but is not dominant.

12. *Panicum virgatum*-Ruderal Species: One locality was mapped under this

category; it occurs at Moonachie. The most common ruderals are *Helianthus annuus*, *Asclepias syriaca*, and *Artemisia vulgaris*.

13. *Panicum virgatum-Solidago* Type: This vegetation type is comprised almost completely of *Panicum virgatum* and species of *Solidago*. It occurs only at one locality near Moonachie.

14. *Panicum virgatum-Calamagrostis canadensis* Type: This vegetation type occurs in only one area (at Moonachie near the terminus of Moonachie Avenue) and contains certain native species not observed elsewhere. Some of these restricted species are *Iris prismatica*, *Lilium superbum*, *Spiraea latifolia*, and *S. tomentosa*.

15. *Solidago* Type: Only one locality was found to support this vegetation type. It is a small area in Moonachie at the terminus of Moonachie Avenue. It is comprised almost entirely of *Solidago* species along with a few ruderal plants, such as *Helianthus annuus*.

Ruderal Plants

This category contains some of the more common species of plants in the Hackensack Meadows. While ruderal plants usually refer to those plants commonly found growing on disturbed areas which were previously occupied by native species, in this report areas so mapped refer to vegetation consisting of only herbaceous ruderal plants such as those occurring in vacant lots, along transportation routes, land-fill areas, utility lines, and other areas where the ground has been disturbed. In fact almost all of these plants occur on old land-fills and along roadsides throughout the Meadows. However, many of these highly disturbed areas are not large enough to warrant mapping.

16. Ruderal Species: This category is the most common of the ruderal plant areas. Its composition varies somewhat in different areas. For example, one such area along Plank Road between Route 20 and the Hackensack River consists, almost entirely, of *Artemisia vulgaris*. Another area at the terminus of Plank Road consists of the following species:

| | |
|---------------------------|--------------------------------|
| <i>Arctium minus</i> | <i>Lepidium virginicum</i> |
| <i>Artemisia vulgaris</i> | <i>Melilotus alba</i> |
| <i>Chenopodium album</i> | <i>Panicum dichotomiflorum</i> |
| <i>Daucus carota</i> | <i>Polygonum cuspidatum</i> |
| <i>Helianthus annuus</i> | <i>Setaria faberi</i> |

Some trees and shrubs occur too, such as:

| | |
|----------------------------|------------------------------|
| <i>Ailanthus altissima</i> | <i>Robinia pseudo-acacia</i> |
| <i>Betula populifolia</i> | <i>Salix nigra</i> |
| <i>Prunus serotina</i> | <i>Viburnum recognitum</i> |

South of Secaucus on County Road the following ruderal species occur:

| | |
|--------------------------------|--------------------------|
| <i>Asclepias syriaca</i> | <i>Helianthus annuus</i> |
| <i>Aster pilosus</i> | <i>Humulus japonicus</i> |
| <i>Daucus carota</i> | <i>Melilotus alba</i> |
| <i>Erechtites hieracifolia</i> | |

At Communipaw on the banks of the Hackensack River nineteen such species are found:

| | |
|--------------------------------|--------------------------------|
| <i>Ambrosia artemisiifolia</i> | <i>Melilotus alba</i> |
| <i>Artemisia vulgaris</i> | <i>Panicum dichotomiflorum</i> |
| <i>Chenopodium album</i> | <i>Petunia violacea</i> |
| <i>Daucus carota</i> | <i>Phytolacca americana</i> |
| <i>Digitaria sanguinalis</i> | <i>Polygonum cuspidatum</i> |
| <i>Eleusine indica</i> | <i>Potentilla canadensis</i> |
| <i>Erigeron canadensis</i> | <i>Setaria faberi</i> |
| <i>Euphorbia supina</i> | <i>Triodia flava</i> |
| <i>Helianthus annuus</i> | <i>Verbascum thapsus</i> |
| <i>Lepidium virginicum</i> | |

Others, not usually considered ruderals, are also found:

| | |
|--------------------------|----------------------------|
| <i>Oenothera biennis</i> | <i>Solidago altissima</i> |
| <i>Panicum virgatum</i> | <i>Verbena urticifolia</i> |
| <i>Rubus</i> sp. | |

These lists are not complete, but they do give an indication of the major species occurring in areas mapped as ruderal species.

17. Ruderal Species-*Phragmites australis*: Ten areas in the Meadows are included in this category. The majority are found in the Little Ferry-Teterboro Airport area. Other such areas are found in the southern part of the Meadows, the largest occurring south of Exchange 16 of the New Jersey Turnpike. These areas contain *Phragmites australis* and many of the ruderals indicated above.

18. Ruderal Species-*Phragmites australis*-Shrub: Only one area under this category exists in the Meadows. It occurs along the Belleview Turnpike near Schuyler's Corner. While it contains *Phragmites australis* and some of the ruderals listed under category 16, in addition it contains scattered shrubs and small trees such as *Prunus serotina*.

19. Ruderal Species-Scattered Trees: Only one area under this category exists in the Meadows. It is located along County Road across from the Croxton Railroad Yards. It contains many ruderals as well as scattered trees such as *Prunus serotina* and *Ailanthus altissima*.

Past Flora and Vegetation

During the Wisconsin glaciation, the area north of the terminal moraine in northern New Jersey, including the present area of the Hackensack Meadows, was covered with ice. However, with the retreat of the glacier, the area now considered the Hackensack Meadows was occupied by a large glacial lake (Glacial Lake Hackensack) that was supplied with melt-water from the retreating glacier. During the existence of this lake much sedimentation took place to form the present thick accumulation of varved clays. Based upon varve counts, this accumulation seems to have taken place over a 2,500 to 3,000 year period (Antevs,

1928). For some reason, possibly due to isostatic adjustment after the glacial retreat, the lake drained. Furthermore, with the melting of the glaciers during this period, there was a concomitant rise in sea level with encroachment of waters into the Meadows culminating in a favorable environment for the post-Wisconsin marsh formation in the lower Hackensack River Valley.

Pollen and Peat Samples

The pollen studies of Heusser (1949, 1963) for the Secaucus area indicated that an angiospermous swamp dominated by *Fraxinus nigra* probably was the first plant association to become established after the lake drained, although other vegetation might have preceded it and not left a record. The swamp peat was overlain by peat composed of a mixture of the above species as well as two typically northern bog species (*Larix laricina* and *Picea mariana*). An absence of ash was reported at about seven feet but the two northern species increased. Heusser's data indicated that a southern bog composed of *Chamaecyparis thuyoides* followed the bog dominated by northern species. This cedar bog peat was in turn encroached upon on its periphery by a layer of marsh peat composed largely of *Scirpus olneyi*, *Juncus gerardi*, and *Typha angustifolia*, all either salt or brackish marsh species. This entire sequence, *Fraxinus nigra* to salt or brackish marsh species, represents great change for the Secaucus area and quite possibly even the entire Hackensack Meadows.

Heusser's 1963 profiles were obtained from Secaucus, East Rutherford and Kearny. *Chamaecyparis thuyoides* pollen as well as wood was found only on the upper part of the Secaucus bog, thus indicating a late migration of this species into the area — perhaps 500 years ago. The presence of this species in southern New Jersey at a much earlier date was demonstrated by the report of trees of 6' dbh and with 1,000 annual rings in bog excavations there (Gifford, 1895). It became established in Cheesequake tidal marsh (northeastern New Jersey) about 1,800 years ago (Rosenwinkel, 1964). Evidently the climate was milder in the more southern coastal areas of New Jersey at this time. Thus the Hackensack Meadows probably had cedar bogs at least 500 years ago, and these were still extensive in 1896 when Vermeule mapped the area.

Hackensack Meadows — 1819

"Perhaps there is no region more interesting to the botanist nor to the geologist than that which surrounds the City of New-York." This statement by John Torrey (1819) expresses how diverse the area must have been in contrast to the way it is today. Torrey went on to say: "Few places have afforded us more plants, than the vicinity of Hoboken and Weehawk, and the neighboring marshes. Many excursions have been made to these places, but much remains to be discovered. The cedar swamp, near New Durham, is particularly deserving of notice. This is a sphagnum morass, of about three quarters of a mile in length, and between two and three hundred yards wide, and is entirely overgrown with the *cupressus thuyoides* or white cedar, and other evergreens. Many of our most

rare and interesting plants were obtained in this place, as our catalogue bears evidence."

Table 3, which contains species listed by Torrey in 1819 for the Hackensack Meadows and vicinity, gives a concept of how diverse the past flora was. For example, at Manhattanville such species as *Tsuga canadensis* and *Viburnum alni-folium* occurred. Across the river at Weehawk, northern species such as *Coptis groenlandica* and *Cypripedium reginae* as well as typically cedar bog species like *Sarracenia purpurea*, *Hypericum denticulatum*, *Carex collinsii* and *Arethusa bulbosa* were reported. South of Weehawk at Hoboken many species were found as indicated under the list for Hoboken and/or Greenwich in which contains 88 species. Also included in Table 3 are species collected from Elizabethtown and the Newark Meadows.

Torrey listed collection sites (Table 3) within the Hackensack Meadows such as the New Durham cedar swamp where the following northern bog species were reported:

| | |
|----------------------------|--------------------------------|
| <i>Calla palustris</i> | <i>Listera convallarioides</i> |
| <i>Eriophorum tenellum</i> | <i>Picea mariana</i> |
| <i>Larix laricina</i> | <i>Vaccinium oxycoccos</i> |

He also reported *Drosera rotundifolia* and *Sarracenia purpurea* as well as two species typically found in northern forests, *Trientalis borealis* and *Cornus canadensis*. *Drosera rotundifolia* and *Sarracenia purpurea* are also found in southern bogs, but Transeau (1903) considered them typical northern bog species. Another species found at New Durham, *Aster nemoralis*, is similarly a typical northern bog species, although this plant presently occurs in the New Jersey Pine Barrens and has been reported from Delaware by Fernald (1950).

Today, citations such as the above (except *A. nemoralis*, *D. rotundifolia*, *S. purpurea*, and *T. borealis*) are not reported from the coastal plain in New Jersey, and in 1919 Burns reported Meadows collections for only two of those mentioned by Torrey. Stone (1911) considered the Hackensack Meadows as being a part of his Middle District which included southwestern New Jersey as well as an extension southeast of the fall-line into the northeastern part of the state including Staten Island and the Hackensack Meadows. Stone's data indicated that northern plants were probably few in numbers in the Hackensack Meadows area, or else he would have placed the area in a different district.

Southern bog species listed as being collected in the New Durham cedar swamp included:

| | |
|-------------------------------|---------------------|
| <i>Chamaecyparis thyoides</i> | <i>Ilex ambigua</i> |
| <i>Drosera intermedia</i> | <i>I. glabra</i> |
| <i>Habenaria cristata</i> | |

Some of these also occur in northern bogs, but two (*Ilex ambigua* and *Habenaria cristata*) are strictly southern species. If *Ilex ambigua* was identified correctly, it would be quite an exception since it is not even mentioned as occurring in New

Jersey by Fernald (1950), Robinson and Fernald (1908) or even Gray (1856). However, *Ilex verticillata* and *I. laevigata* are very similar to *Ilex ambigua* and could have been misidentified for it.

In addition, other southern bog species were reported from the Hackensack Meadows such as *Orontium aquaticum* from Bergen and *Xyris caroliniana* from the area in general. Furthermore, many species were reported from the New Jersey area in general (but within 30 miles of New York) and these could have been collected in the Meadows.

No salt or brackish marsh species were reported other than *Sabatia dodecandra*. Likewise, the presently ubiquitous *Phragmites australis* was not yet reported from the Meadows although it could have been present at the time because it was reported from Elizabethtown. *Zizania aquatica* was reported although it is absent from the Meadows today.

The conclusion is that a large cedar swamp was present prior to and in 1819. Since Torrey stated that the cedar swamp was near New Durham, it could have been the same area delineated by Vermeule for the Secaucus area in 1896: the descriptions match, even though Vermeule's map lists Secaucus and New Durham as separate places. Heusser (1949) suggests the area at Secaucus was known to botanists as the New Durham cedar swamp. If this is true then the cedar swamp probably did not change greatly between these two periods.

Undoubtedly, other freshwater areas were in existence within the Meadows at this time because representative species were reported. However, it is doubtful that much, if any, salt or brackish marsh was present because only *Sabatia dodecandra* was collected and this species is found also in freshwater marshes. The possibility exists that such marshes were present, but were not botanized.

Hackensack Meadows — 1889

When Britton compiled his flora in 1889, the extent of the cedar swamp probably had not changed appreciably from the time Torrey studied the flora in 1819 since Torrey's description of the area is very similar to that of Vermeule in 1896. However, the precise extent of the cedar bogs in the Meadows could have been different and the composition could have changed. Furthermore, it is difficult to compare Torrey's data with Vermeule's map since Torrey spoke little of areas other than New Durham. For example, Torrey listed only four collection localities in the Meadows while Britton listed ten. This dearth of localities probably reflects localized collection (or a lack of it) rather than a lack of good collecting areas. Torrey (1819) listed eight northern bog species for New Durham and two southern bog species while Britton (1889) lists seven northern bog species and three southern bog species (Tables 3 and 4).

Southern species in this paper refer to those species found usually on the coastal plain and reaching their northern-most distribution in many instances in southern New Jersey or extending up the coastal plain to Staten Island, Massachusetts, or Rhode Island. Northern species on the other hand are typically

found in northeastern U.S. and adjacent Canada and south only to northern New Jersey and Pennsylvania or only in mountainous areas further south of their northern range (Fernald, 1950). The entire area contained three southern citations (3 species) and ten northern citations (10 species) in Torrey's data (Table 3). Britton's data, however, contained seven southern citations (7 species) and 37 northern citations (24 species) (Table 4). Britton's northern species include the following (those found typically in northern bogs are indicated with an asterisk):

| | |
|--------------------------------|------------------------------|
| <i>Anemone canadensis</i> | * <i>Parnassia glauca</i> |
| <i>Carex lacustris</i> | * <i>Picea mariana</i> |
| * <i>C. trisperma</i> | <i>Potentilla fruticosa</i> |
| <i>Coptis groenlandica</i> | * <i>Rhamnus alnifolia</i> |
| <i>Cornus canadensis</i> | * <i>Rubus pubescens</i> |
| * <i>Cypripedium reginae</i> | * <i>Salix candida</i> |
| * <i>Gaultheria hispidula</i> | <i>S. gracilis</i> |
| <i>Hierochloë odorata</i> | <i>Sambucus pubens</i> |
| * <i>Larix laricina</i> | <i>Smilacina stellata</i> |
| <i>Lathyrus palustris</i> | <i>Trillium undulatum</i> |
| * <i>Linnaea borealis</i> | <i>Trollius laxus</i> |
| * <i>Menyanthes trifoliata</i> | * <i>Vaccinium oxycoccos</i> |
| <i>Nemopanthus mucronata</i> | |

Rhododendron maximum was reported, but this species has also been reported from coastal plain and piedmont areas. Those species listed by Britton that are typically considered southern plants include:

| | |
|-----------------------------|---------------------------|
| <i>Ascyrum hypericoides</i> | <i>Scirpus rubricosus</i> |
| <i>Habenaria cristata</i> | <i>Tipularia discolor</i> |
| <i>Magnolia virginiana</i> | <i>Xyris flexuosa</i> |
| <i>Polygala brevifolia</i> | |

Tipularia discolor and *Scirpus rubricosus* were collected at Bergen Point (which is out of the Meadows) at the junction of Newark Bay and Kill Van Kull. Three of these species (*Habenaria cristata*, *Polygala brevifolia*, and *Xyris flexuosa*) have their northern-most distribution in the New Jersey Pine Barrens (McCormick, 1967) and are typically found in southern bogs. Another species (*Hypericum denticulatum*) likewise having its northern-most distribution in the New Jersey Pine Barrens was collected at Weehawk in or prior to 1819 (Torrey, 1819). *Ascyrum hypericoides*, *Magnolia virginiana* and *Xyris flexuosa* were also reported by Britton from Staten Island in 1880. In 1910, Stone, in listing plants found in the New Jersey Pine Barrens, included *Xyris flexuosa* while Fernald (1950) considered it as being found in "sandy and peaty pine-barrens or bogs, Fl. to Ark. and e. Tex., n. on the Coastal plain to N.J." Other southern species listed (not necessarily restricted to the south) included:

| | |
|----------------------------------|--|
| <i>Calopogon pulchellus</i> | <i>Osmunda regalis</i> var. <i>spectabilis</i> |
| <i>Chamaecyparis thyoides</i> | <i>Pogonia ophioglossoides</i> |
| <i>Chamaedaphne calyculata</i> | <i>Vaccinium atrococcum</i> |
| <i>Clethra alnifolia</i> | <i>V. corymbosum</i> |
| <i>Habenaria blephariglottis</i> | <i>V. macrocarpon</i> |
| <i>Ilex glabra</i> | <i>Woodwardia areolata</i> |
| <i>I. laevigata</i> | <i>W. virginica</i> |
| <i>Leucothoë racemosa</i> | <i>Rhododendron viscosum</i> |
| <i>Orontium aquaticum</i> | |

Some species listed are typically plants with northern distribution, but have also been reported as far south as New Jersey, Delaware or Maryland. *Arethusa bulbosa*, *Aster nemoralis*, *Cyperus dentatus*, and *Utricularia intermedia* represent this group. These four species, as well as those that occur in but are not necessarily restricted to the south and those listed as occurring only in the south today (28 in total), are found in the New Jersey Pine Barrens. This is a satisfactory reason for listing them as southern species, since the New Jersey Pine Barrens is considered mostly southern in floristic nature. Other species found in the Pine Barrens listed by Britton included:

| | |
|--|------------------------------|
| <i>Aletris farinosa</i> | <i>Eupatorium pilosum</i> |
| <i>Asclepias amplexicaulis</i> | <i>Gentiana saponaria</i> |
| <i>Aster patens</i> var. <i>phlogifolius</i> | <i>Gerardia purpurea</i> |
| <i>Bidens coronata</i> | <i>Iris prismatica</i> |
| <i>Calamagrostis cinnoides</i> | <i>Lilium superbum</i> |
| <i>Chamaedaphne calyculata</i> | <i>Ophioglossum vulgatum</i> |
| <i>Clitoria mariana</i> | <i>Polygala cruciata</i> |
| <i>Cuscuta compacta</i> | <i>Quercus stellata</i> |
| <i>Eleocharis olivacea</i> | <i>Scleria triglomerata</i> |
| <i>Eragrostis spectabilis</i> | <i>Viburnum nudum</i> |

However, some of them do occur elsewhere in South Jersey and are not restricted to the Pine Barrens. Britton reported 34 characteristic Pine Barren plants from Staten Island, and *Chamaecyparis thyoides* was reported from the northern tip of Staten Island by Taylor in 1915. Except for possible rare occurrences, such species do not occur in the Meadows or Staten Island area today.

Apparently, during this period (1889) much freshwater marsh existed because Britton, in making reference to *Zizania aquatica*, stated that it was "very abundant on Newark and Hackensack Marshes." *Lophocarpus spongiosus* was reported for the Meadows region in general as well as *Sagittaria subulata*, while at New Durham *Lemna minor* was collected. *Lysimachia thyrsiflora* was reported from Little Ferry. Two species (*Bidens cernua* and *Equisetum fluviatile* forma *linnaeanum*) were reported from Rutherford and three species (*Carex versicaria* var. *monile*, *Fraxinus nigra* and *Glyceria acutiflora*) were reported from Lyndhurst.

Only seven citations were recorded at this time (1889) which included salt or brackish marsh species. Those recorded included *Kosteletzkya virginica*, *Sabatia dodecandra*, *Scirpus olneyi*, and *Typha angustifolia*. The first one and the latter two were stated to have occurred in general in the area while the latter was also found in the Newark Marshes. *Sabatia* was found at both Carlstadt and Bergen. No species restricted to salt marshes was reported, so it is assumed that this type of marsh was little or non-existent in the Hackensack Meadows, except perhaps in the southern part.

Hackensack Meadows — 1919

By 1919, when Harshberger and Burns published on the Hackensack Meadows, it had apparently changed considerably. Burns suggested that typical salt marsh flora existed at the mouth of the river near Newark Bay and gradually changed upstream into brackish flora in the center of the valley with freshwater marsh occurring in the northern area. It was further suggested that acid swamps still existed in the northern areas, but were absent from the southern. Harshberger stated that "a bog formation (not studied) probably exists in the northern part of the region." He also presented a photograph of a location where cedar stumps had been extracted in 1916. Burns, who collected and identified the species, reported *Calopogon pulchellus*, *Habenaria ciliaris*, *Pogonia ophioglossoides*, and *Lycopodium alopecuroides* near Moonachie, which gives an indication that this northern area still had extant cedar. He reported acidophiles such as *Osmunda regalis* var. *spectabilis* and *Utricularia intermedia* along the Bellevue Turnpike and *Clethra alnifolia*, *Rhododendron viscosum* and *Vaccinium corymbosum* at Secaucus. Other species for which specific localities were not given included *Bidens coronata*, *Lilium superbum*, *Solidago uliginosa*, and *Vaccinium corymbosum*.

These species, typical of acid lowlands, can also be found in such areas in the New Jersey Pine Barrens as can the following species reported from Snake Hill:

Lespedeza hirta
L. intermedia
Solidago bicolor

Solidago nemoralis
Vaccinium vacillans

From Little Snake Hill, *Andropogon scoparius*, *Solidago bicolor* and *Solidago nemoralis* were reported. *Spiraea tomentosa* was found along the Bellevue Turnpike.

The salt marsh extent in 1919 was described as ". . . fairly uniform in character. It is found at the mouths of the creeks and rivers which intersect the region, and around the margins of the lagoons and estuaries, forming extensions landward of Newark Bay. The influence of salt water is felt some distance above Newark Bay, and the tidal channels permit the entrance of sea water, so that daily the surface of the salt marsh is partly or wholly flooded with salt or brackish water." *Spartina alterniflora* var. *pilosa*, characteristic of salt marshes,

was reported only from Sawmill Creek southward. Thus it is assumed that the salt marsh did not extend farther upstream from the junction of Sawmill Creek and the Hackensack River. Harshberger (1919) in writing of the Meadows also stated that "The outer margin of the salt marsh, where it touches the open lagoon, or the tidal thoroughfare, is fringed with a broader, or a narrower, strip of the tall salt grass, *Spartina glabra* var. *pilosa* [*S. alterniflora* var. *pilosa*]. Back of this strip, whose width depends on the slope and the height to which the tide rises, we find the rush salt grass, *Spartina patens*, which grows at a slightly higher tidal level. Then came the extensive areas of the black grass, *Juncus gerardi*, upon which, in part, the economic value of the marsh depends. Sometimes there are extensive areas covered with the lesser salt grass, *Distichlis spicata*. The sea lavender, *Limonium carolinianum*, is also found with the samphires [*Salicornia* sp.], as also *Suaeda maritima* and *Atriplex patula*." Burns additionally listed *Iva frutescens* var. *oraria* as occurring in the Meadows as well as *Echinochloa walteri*, *Cyperus filicinus*, *Sabatia stellaris* and *Spartina cynosuroides*. All of these can be found in salt or brackish marshes, but some species that he listed occur in either salt, brackish, or fresh water marshes such as *Amaranthus cannabinus*, *Scirpus americanus* and *Solidago sempervirens*. Others, usually considered as brackish marsh species (*Chenopodium ambrosioides*, *Rumex orbiculatus*, and *Spartina patens* var. *monogyna*), were also included. Some species typically found in either fresh or brackish marshes near the coast were listed such as:

| | |
|-------------------------------|----------------------------------|
| <i>Bidens laevis</i> | <i>Pluchea camphorata</i> |
| <i>Dryopteris thelypteris</i> | <i>Polygonum hydropiperoides</i> |
| <i>Hibiscus moscheutos</i> | <i>Ptilimnium capillaceum</i> |
| <i>Juncus canadensis</i> | <i>Typha angustifolia</i> |
| <i>Onoclea sensibilis</i> | |

Hibiscus moscheutos apparently was quite abundant since Burns stated that "in August the marsh looks like a vast flower garden, for many areas are colored white and pink by the profusion of the large flowers." In 1909 the area was described as being "gay in the fall with acres of mallow" (Anonymous, 1910). Most of the plants in Burns' list were considered quite common with *Typha angustifolia* being especially so!

By 1919 *Phragmites australis* was probably very abundant since it was reported to cover extensive areas and to be impressive at all seasons (this is how it would be described today). Harshberger stated that *Phragmites australis* competed with such species as *Typha angustifolia* and *Typha latifolia* for occupation of the marshland.

Even though many salt and brackish marsh species were reported, it is thought by this author that much freshwater marsh existed also in 1919 because plants typical of such a marsh were reported by Harshberger and Burns. Several species of *Potamogeton* were reported as well as drainage ditches covered with *Lemna minor*. *Sagittaria latifolia* was reported to be found in standing water everywhere while *Bidens laevis* in early September brightened the area with patches

of gold. Other species listed as occurring commonly at Moonachie were:

| | |
|------------------------------|----------------------------|
| <i>Alisma subcordatum</i> | <i>Peltandra virginica</i> |
| <i>Cicuta maculata</i> | <i>Sium suave</i> |
| <i>Menyanthes trifoliata</i> | <i>Samolus parviflorus</i> |

Zizania aquatica was reported from usually deeper water in certain areas where it formed associations of considerable size.

Many lowland plants, not necessarily hydrophytes, were reported (Table 5). Many of the following species probably occurred on the marsh periphery or in the fresh water marsh itself:

| | |
|--|----------------------------|
| <i>Asclepias incarnata</i> var. <i>pulchra</i> | <i>Quercus bicolor</i> |
| <i>Bidens frondosa</i> | <i>Rudbeckia laciniata</i> |
| <i>Eupatorium perfoliatum</i> | <i>Sambucus canadensis</i> |
| <i>E. purpureum</i> | <i>Scirpus cyperinus</i> |
| <i>Helianthus giganteus</i> | <i>Verbena hastata</i> |
| <i>Polygonum sagittatum</i> | |

Other species of an upland character were listed as well as the flora of Snake and Little Snake Hills (Table 5). Furthermore, this was the first report on large numbers of ruderal plant species for the area with 63 being mentioned. Most of these are from dry habitats and probably were found on the periphery of the Meadows or along access routes across it. However, it is not doubted by this author that such plants did occur there at earlier dates. As far back as 1881 Addison Brown (in Britton, 1881) collected 99 ballast plants, mostly of European origin, at Communipaw. Even Torrey (1819) listed some from the Hoboken and Greenwich areas (Table 3).

Hackensack Meadows — 1949

After Harshberger and Burns, the next person who published on the Hackensack Meadows was Heusser (1949). His study was restricted to the Secaucus area.

Although most traces of a northern element in the Meadows had disappeared by 1919, some cedar swamp did exist. However, in Heusser's study, no northern element was found, only a few species typical of southern areas were encountered, and even those species occur elsewhere. Heusser reported on six cedar trees at Moonachie in April of 1949 but stated that the last of the cedar at Secaucus died in 1935. In Heusser's list (Table 6) the following acidophiles (not necessarily southern or northern species) were reported:

| | |
|--|--|
| <i>Hypericum virginicum</i> | <i>Rhododendron viscosum</i> |
| <i>Leucothoë racemosa</i> | <i>Vaccinium corymbosum</i> var. <i>albiflorum</i> |
| <i>Osmunda regalis</i> var. <i>spectabilis</i> | <i>V. corymbosum</i> var. <i>corymbosum</i> |
| <i>O. cinnamomea</i> | <i>Viburnum nudum</i> |

All of these occur in cedar swamps in South Jersey. Other species also found in the Pine Barrens, but from upland sites include:

| | |
|---|------------------------------------|
| <i>Gaylussacia frondosa</i> | <i>Parthenocissus quinquefolia</i> |
| <i>Gnaphalium obtusifolium</i> var. <i>praecox</i> | <i>Solidago rugosa</i> |

The area Heusser studied was actually a dying cedar swamp between the Cromack and Mill Creeks. He also examined the surrounding marshland where he described four zones — *Spartina*, *Typha angustifolia-Scirpus olneyi*, *Scirpus olneyi*, and *Phragmites australis*. The bog itself was composed mostly of shrubs, scattered trees, and invading herbaceous plants. His data suggest that mostly brackish conditions prevailed. The following salt marsh species were reported:

| | |
|------------------------------|---|
| <i>Aster subulatus</i> | <i>Distichlis spicata</i> |
| <i>Baccharis halimifolia</i> | <i>Spartina alterniflora</i> var. <i>pilosa</i> |
| <i>Juncus gerardi</i> | <i>S. patens</i> |

Others typical of salt or brackish conditions included:

| | |
|----------------------------|-----------------------|
| <i>Cyperus filicinus</i> | <i>Scirpus olneyi</i> |
| <i>Echinochloa walteri</i> | <i>S. robustus</i> |

Some of those listed have broad tolerances of salinity and can be found in either fresh, brackish, or salt marsh environments such as:

| | |
|------------------------------|------------------------------|
| <i>Amaranthus cannabinus</i> | <i>Scirpus americanus</i> |
| <i>Atriplex patula</i> | <i>Solidago sempervirens</i> |
| <i>Aster novi-belgii</i> | |

Others listed by Heusser typically occur in either fresh or brackish waters:

| | |
|----------------------------------|---|
| <i>Bidens laevis</i> | <i>Ranunculus sceleratus</i> |
| <i>Hibiscus moscheutos</i> | <i>Scirpus validus</i> var. <i>creber</i> |
| <i>Polygonum hydropiperoides</i> | <i>Spartina cynosuroides</i> |
| <i>Ptilimnium capillaceum</i> | |

Species collected that are usually restricted to fresh to slightly brackish environments included:

| | |
|-----------------------------|--|
| <i>Alisma subcordatum</i> | <i>Rorippa islandica</i> var. <i>hispida</i> |
| <i>Caltha palustris</i> | <i>Peltandra virginica</i> |
| <i>Cicuta maculata</i> | <i>Sagittaria latifolia</i> |
| <i>Eleocharis palustris</i> | <i>Sium suave</i> |
| <i>Lemna minor</i> | <i>Typha latifolia</i> |

Many other species were listed by Heusser, most of which grow typically in moist habitats (Table 6). Some of those found were:

| | |
|--|-------------------------------|
| <i>Asclepias incarnata</i> var. <i>pulchra</i> | <i>E. purpureum</i> |
| <i>Bidens connata</i> | <i>Iris versicolor</i> |
| <i>B. coronata</i> | <i>Lysimachia thyrsiflora</i> |
| <i>Cyperus strigosus</i> | <i>Quercus bicolor</i> |
| <i>Eupatorium perfoliatum</i> | <i>Q. palustris</i> |

Because the area is wet, few ruderal species were found. Only six were listed.

Subsequent to Heusser's study, it is assumed that *Phragmites australis* became more prevalent at the expense of the freshwater marsh vegetation, although some fresh water species listed by Heusser probably still exist there today. However, it is suggested (based upon reported salinities by Heusser, 1949; Potera, 1970; and personal examination) that presently the area is composed mostly of brackish marsh. The present rarity of freshwater marsh species also suggests, at least floristically, the absence of freshwater environments (except for possible localized occurrences and wetlands impounded by dikes).

FACTORS CAUSING VEGETATION CHANGE

After 1896 the cedar swamps in the Hackensack Meadows must have declined sharply, because Harshberger suggests that in 1919 they only occurred in the northern part of the Meadows, while at Newark only a few plants were reported. Diking and ditching probably aided the decline of many cedar areas. For example, in 1867 the Iron Dike Land Reconstruction Company constructed a dike following the lower part of the Passaic River south and then up the Hackensack River to Sawmill Creek and finally up Sawmill Creek itself. This completely isolated a section that was shown by Vermeule (1896) to be a large area where cedar trees once existed. Because diking prevents the influx of tidal water and at the same time tends to drain the diked area, this factor probably was effective in destroying the cedar marsh in the Sawmill Creek area. Between 1869 and 1887 a subsidence of three to three and a half feet was reported from peat areas in the Hackensack Meadows due to the lowering of the water table (Waksman, 1942). This drainage also subjected the cedar to fire hazard as suggested by Heusser (1949). Both ditching and diking undoubtedly were conducive to the spread of *Phragmites australis*. A further decline of the cedar may have resulted from the cutting of cedars for planking in road use (Heusser, 1949).

A rising sea level also played an important role in the vegetation changes in the Meadows. This sea level change, which was substantiated by Heusser's finding of marsh peat on top of cedar bog peat, was also accompanied by an influx of salt water, attested to by the fact that most species reported from the marsh peat were brackish marsh plants. Thus, the salt encroachment could definitely have helped implement the cedar's decline. The highest salinities reported by Heusser for the Secaucus cedar bog (the trees were dead) for spring, summer, and fall, respectively, were 5.10, 6.95, and 20.75 percent sea water and Potera (1970) reported extremes of salinity of from 6.0 0/00 to 15.7 0/00 (parts per thousand) from the Sawmill Creek area. Furthermore, Harshberger, in 1919, reported that the salt marsh species *Spartina alterniflora* occurred no farther than Sawmill Creek on the Hackensack River; however brackish marsh species could have extended upstream much farther. Heusser (1949), on the other hand, reported extant salt marsh plants about a mile north at Secaucus, and the present study showed their existence upstream from Little Ferry. Hence, there was a

great change in salt water encroachment subsequent to Harshberger's study which would have further affected the cedar adversely. Probably this salt water penetration has been in effect at least since the construction of the Ordell Reservoir (completed in 1922) which cuts off almost all of the river-flow. Below the Reservoir at New Milford, for instance, a discharge as low as 8 cfs (cubic feet per second) has been reported with 180 cfs being discharged 90 percent of the time (Hackensack Water Company, 1970). As a consequence, almost all the water-flow downstream comes from base flow below the reservoir or from runoff.

Diking could prevent salt water encroachment and has in the past (Vermeule, 1897). The current efficiency of the dikes is in doubt, however, because they are not maintained. In addition, the Meadows have long been under tidal influence except for an area that is presently the site of the Teterboro Airport. Many areas behind the dikes, such as areas "A", "B" and "C" have salt and brackish marsh species. These, along with the freshwater marsh species, were also reported by Heusser in 1949 for the Secaucus region which is area "B". In the present survey no strictly freshwater marsh plants could be found within the area of tidal influence with the exception of the local occurrence of duckweed (*Lemna minor*), the water-plantain (*Alisma subcordatum*) and the common cat-tail (*Typha latifolia*). The duckweed was seen in a small pond at Rutherford, in a drainage ditch near Little Snake Hill, and in other small drainage areas in the Meadows. However, the water-plantain was seen in only one locality (one specimen) along Plank Road in Carlstadt. The common cat-tail was seen only in a few areas such as along Plank Road at Carlstadt. Not a single specimen of *Zizania aquatica* was observed, whereas in 1919 *Zizania* was reported in great abundance (Harshberger, 1919). No representatives of the genus *Bidens* were found. These too were abundant in 1919.

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TABLE 1. — List of Species Encountered and/or Collected in the Present Study.

| | |
|---|--------------------------------|
| Osmundaceae | Salicaceae |
| <i>Osmunda cinnamomea</i> | <i>Populus grandidentata</i> |
| <i>O. regalis</i> var. <i>spectabilis</i> | <i>P. tremuloides</i> |
| Polypodiaceae | <i>Salix nigra</i> |
| <i>Dennstaedtia punctilobula</i> | Corylaceae |
| <i>Dryopteris noveboracensis</i> | <i>Betula lenta</i> |
| <i>Onoclea sensibilis</i> | <i>B. populifolia</i> |
| <i>Pteridium aquilinum</i> | <i>Carpinus caroliniana</i> |
| <i>Woodwardia virginica</i> | Fagaceae |
| Typhaceae | <i>Quercus alba</i> |
| <i>Typha angustifolia</i> | <i>Q. bicolor</i> |
| <i>T. latifolia</i> | <i>Q. palustris</i> |
| Alismataceae | <i>Q. prinus</i> |
| <i>Alisma subcordatum</i> | <i>Q. rubra</i> |
| Gramineae | <i>Q. stellata</i> |
| <i>Agropyron repens</i> | Ulmaceae |
| <i>Andropogon scoparius</i> | <i>Celtis occidentalis</i> |
| <i>A. virginicus</i> | <i>Ulmus americana</i> |
| <i>A. virginicus abbreviatus</i> | Urticaceae |
| <i>Bromus japonicus</i> | <i>Humulus japonicus</i> |
| <i>Calamagrostis canadensis</i> | Polygonaceae |
| <i>Deschampsia caespitosa</i> | <i>Polygonum cuspidatum</i> |
| <i>Digitaria sanguinalis</i> | <i>P. cespitosum</i> |
| <i>Distichlis spicata</i> | <i>P. punctatum</i> |
| <i>Echinochloa walteri</i> | <i>Rumex acetosella</i> |
| <i>Eleusine indica</i> | <i>R. crispus</i> |
| <i>Holcus lanatus</i> | Amaranthaceae |
| <i>Panicum clandestinum</i> | <i>Amaranthus cannabinus</i> |
| <i>P. dichotomiflorum</i> | Phytolaccaceae |
| <i>P. virgatum</i> | <i>Phytolacca americana</i> |
| <i>Phragmites australis</i> | Caryophyllaceae |
| <i>Setaria faberi</i> | <i>Lychnis alba</i> |
| <i>Sorghastrum nutans</i> | <i>Saponaria officinalis</i> |
| <i>Spartina alterniflora</i> | Ranunculaceae |
| <i>S. cynosuroides</i> | <i>Thalictrum polygamum</i> |
| <i>S. patens</i> | Lauraceae |
| <i>Triodia flava</i> | <i>Lindera benzoin</i> |
| Cyperaceae | <i>Sassafras albidum</i> |
| <i>Cyperus strigosus</i> | Cruciferae |
| <i>Eleocharis parvula</i> | <i>Lepidium virginicum</i> |
| <i>Rhynchospora chalarocephala</i> | Hamamelidaceae |
| <i>Scirpus americanus</i> | <i>Hamamelis virginiana</i> |
| <i>S. cyperinus</i> | <i>Liquidambar styraciflua</i> |
| <i>S. olneyi</i> | Rosaceae |
| Lemnaceae | <i>Potentilla canadensis</i> |
| <i>Lemna minor</i> | <i>P. recta</i> |
| Juncaceae | <i>Prunus serotina</i> |
| <i>Juncus marginatus</i> | <i>Pyrus melanocarpus</i> |
| <i>Juncus tenuis</i> | <i>Rubus</i> sp. |
| Liliaceae | <i>Spiraea latifolia</i> |
| <i>Lilium superbum</i> | <i>S. tomentosa</i> |
| <i>Maianthemum canadense</i> | Leguminosae |
| <i>Smilax glauca</i> | <i>Melilotus alba</i> |
| <i>S. rotundifolia</i> | <i>M. officinalis</i> |
| <i>Uvularia sessilifolia</i> | <i>Robinia pseudo-acacia</i> |
| Iridaceae | |
| <i>Iris prismatica</i> | |

TABLE 1. (Continued) — List of Species Encountered and/or Collected in the Present Study.

| | |
|------------------------------|-----------------------------------|
| <i>Trifolium pratense</i> | Gentianaceae |
| <i>Vicia cracca</i> | <i>Bartonia virginica</i> |
| Simaroubaceae | Apocynaceae |
| <i>Ailanthus altissima</i> | <i>Apocynum cannabinum</i> |
| Polygalaceae | Asclepiadaceae |
| <i>Polygala sanguinea</i> | <i>Asclepias tuberosa</i> |
| Euphorbiaceae | Convolvulaceae |
| <i>Euphorbia supina</i> | <i>Convolvulus sepium</i> |
| Anacardiaceae | Verbenaceae |
| <i>Rhus copallina</i> | <i>Verbena hastata</i> |
| <i>R. glabra</i> | <i>V. urticifolia</i> |
| <i>R. typhina</i> | Solanaceae |
| Aquifoliaceae | <i>Petunia violacea</i> |
| <i>Ilex verticillata</i> | <i>Solanum dulcamara</i> |
| Aceraceae | <i>Solanum sp.</i> |
| <i>Acer rubrum</i> | Scrophulariaceae |
| Balsaminaceae | <i>Scrophularia lanceolata</i> |
| <i>Impatiens capensis</i> | <i>Verbascum blattaria</i> |
| Malvaceae | <i>V. thapsus</i> |
| <i>Hibiscus sp.</i> | Plantaginaceae |
| Guttiferae | <i>Plantago lanceolata</i> |
| <i>Hypericum canadense</i> | Rubiaceae |
| <i>H. mutilum</i> | <i>Cephalanthus occidentalis</i> |
| <i>H. perforatum</i> | Caprifoliaceae |
| Lythraceae | <i>Sambucus canadensis</i> |
| <i>Lythrum salicaria</i> | <i>Viburnum dentatum</i> |
| Nyssaceae | Compositae |
| <i>Nyssa sylvatica</i> | <i>Achillea millefolium</i> |
| Melastomataceae | <i>Ambrosia artemisiifolia</i> |
| <i>Rhexia virginica</i> | <i>Arctium minus</i> |
| Onagraceae | <i>Artemisia vulgaris</i> |
| <i>Epilobium hirsutum</i> | <i>Aster pilosus</i> |
| <i>Ludwigia alternifolia</i> | <i>Aster subulatus</i> |
| <i>Oenothera biennis</i> | <i>Baccharis halimifolia</i> |
| Umbelliferae | <i>Centaurea scabiosa</i> |
| <i>Daucus carota</i> | <i>Chrysanthemum leucanthemum</i> |
| <i>Pastinaca sativa</i> | <i>Cirsium arvense</i> |
| Clethraceae | <i>Erechtites hieracifolia</i> |
| <i>Clethra alnifolia</i> | <i>Erigeron annuus</i> |
| Ericaceae | <i>Eupatorium dubium</i> |
| <i>Rhododendron viscosum</i> | <i>Helianthus annuus</i> |
| <i>Vaccinium corymbosum</i> | <i>Pluchea purpurascens</i> |
| Primulaceae | <i>Solidago altissima</i> |
| <i>Lysimachia × producta</i> | <i>S. graminifolia</i> |
| <i>L. quadrifolia</i> | <i>S. sempervirens</i> |
| <i>L. terrestris</i> | <i>Tragopogon porrifolius</i> |

TABLE 2. — List of species examined in the New York Botanical Garden herbarium to ascertain the validity of identifications and citations from the Hackensack Meadows.

| SPECIES EXAMINED | COLLECTION LOCALITY | DATE(S) OF COLLECTION |
|----------------------------------|---|-------------------------------|
| <i>Arethusa bulbosa</i> | New Durham | 1819 |
| <i>Calla palustris</i> | Woodridge | 1874 |
| <i>Calopogon pulchellus</i> | Carlstadt | 1883 |
| <i>Carex lacustris</i> | Bergen | None |
| <i>Chamaecyparis thyoides</i> | Secaucus | 1862 |
| <i>Coptis groenlandica</i> | New Durham | None |
| <i>Distichlis spicata</i> | Bergen Point | 1868 |
| <i>Drosera rotundifolia</i> | New Durham, Staten Island | 1890, 1878 |
| <i>Habenaria blephariglottis</i> | Arlington, Staten Island, Secaucus, Hackensack Swamp | 1896, 1896, 1865, 1865 |
| <i>Ilex glabra</i> | New Durham | 1853 |
| <i>Linnaea borealis</i> | New Durham | 1865 |
| <i>Lophotocarpus spongiosus</i> | Lyndhurst | 1915 |
| <i>Menyanthes trifoliata</i> | New Durham | 1865 |
| <i>Nemopanthus mucronata</i> | Secaucus | 1865 |
| <i>Orontium aquaticum</i> | Little Ferry | 1887 |
| <i>Parnassia glauca</i> | Moonachie | 1901 |
| <i>Phragmites australis</i> | Hackensack Meadows, near Rutherford | 1868 & 1903, 1889 |
| <i>Pogonia ophioglossoides</i> | Carlstadt | 1885 |
| <i>Polygala cruciata</i> | Moonachie | 1915 |
| <i>Rubus pubescens</i> | Weehawken, New Durham, Bergen | 1871, 1871, 1870 |
| <i>Sarracenia purpurea</i> | New Durham | 1827 |
| <i>Spartina alterniflora</i> | Rutherford, Weehawken | 1889 & 1892, 1895 |
| <i>S. cynosuroides</i> | Hackensack Meadows, Hack- ensack Swamp, Rutherford, Moonachie | 1903 & 1876, 1865, 1889, 1901 |
| <i>Tipularia discolor</i> | Bergen Point | 1867 |
| <i>Tientalis borealis</i> | Secaucus | 1864 |
| <i>Trollius laxus</i> | Rutherford | 1887 |
| <i>Typha angustifolia</i> | New Durham | 1868 & 1875 |
| <i>Utricularia intermedia</i> | Hackensack Swamp | 1868 |
| <i>Xyris flexuosa</i> | Staten Island | None |
| <i>Zizania aquatica</i> | Moonachie, Bergen, Woodridge | 1901, 1895, 1889 |

TABLE 3.—Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Torrey, et al, 1819) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (TORREY, 1819) ² | | | | | | | | | | | |
|--|--|---|---|---|---|---|---|---|---|----|----|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| <i>Andropogon virginicus</i> L. var. <i>abbreviatus</i> (Hack.) Fern. & Grise. | | | | | | | | | | | | x |
| <i>Angelica atropurpurea</i> L. | | | | | | | | | | | | x |
| <i>Apocynum androsaemifolium</i> L. | | | | | | | | | | | | x |
| <i>Arabis thaliana</i> (L.) Heynh. | | | | | | | | | | | | x |
| <i>Arabis canadensis</i> L. | | | | | | | | | | | | x |
| <i>Arenaria lateriflora</i> L. | | | | | | | | | | | | x |
| <i>Arethusa bulbosa</i> L. | | | | | | | | | | | | x |
| <i>Aristolochia serpentaria</i> L. | | | | | | | | | | | | x |
| <i>Asarum canadense</i> L. | | | | | | | | | | | | x |
| <i>Asclepias exaltata</i> L. | | | | | | | | | | | | x |
| <i>Aster nemoralis</i> Ait. | | | | | | | | | | | | x |
| <i>A. puniceus</i> L. | | | | | | | | | | | | x |
| <i>A. undulatus</i> L. var. <i>diversifolius</i> (Michx.) Gray | | | | | | | | | | | | x |
| <i>Bartonia paniculata</i> (Michx.) Muhl. | | | | | | | | | | | | x |
| <i>Bidens coronata</i> (L.) Britt. | | | | | | | | | | | | x |
| <i>Boehmeria cylindrica</i> (L.) Sw. | | | | | | | | | | | | x |
| <i>Botrychium dissectum</i> Spreng. | | | | | | | | | | | | x |
| <i>B. virginianum</i> (L.) Sw. | | | | | | | | | | | | x |
| <i>Bulbostylis capillaris</i> (L.) C. B. Clarke | | | | | | | | | | | | x |
| <i>Cakile edentula</i> (Bigel.) Hook. | | | | | | | | | | | | x |
| <i>Calla palustris</i> L. | | | | | | | | | | | | x |
| <i>Caltha palustris</i> L. | | | | | | | | | | | | x |
| <i>Campanula aparinoides</i> Pursh | | | | | | | | | | | | x |
| <i>Carex collinsii</i> Nutt. | | | | | | | | | | | | x |
| <i>C. comosa</i> Boott | | | | | | | | | | | | x |
| <i>C. lupulina</i> Muhl. | | | | | | | | | | | | x |
| <i>C. squarrosa</i> L. | | | | | | | | | | | | x |
| <i>Cassia fasciculata</i> Michx. | | | | | | | | | | | | x |
| <i>A. macrouros</i> Mx. | | | | | | | | | | | | x |
| <i>Apocynum androsaemifolium</i> (L.) Br. | | | | | | | | | | | | x |
| <i>Arabis Thaliana</i> Willd. | | | | | | | | | | | | x |
| <i>A. falcata</i> Mx. | | | | | | | | | | | | x |
| <i>Arethusa bulbosa</i> Sw. | | | | | | | | | | | | x |
| <i>Asclepias phytolaccoides</i> (Lyon) Ph. | | | | | | | | | | | | x |
| <i>Aster ledifolius</i> Ph. | | | | | | | | | | | | x |
| <i>A. diversifolius</i> Mx. | | | | | | | | | | | | x |
| <i>B. paniculata</i> Mx. | | | | | | | | | | | | x |
| <i>Coreopsis trichosperma</i> Mx. | | | | | | | | | | | | x |
| <i>B. cylindrica</i> Willd. | | | | | | | | | | | | x |
| <i>Botrychium fumaroides</i> Willd. | | | | | | | | | | | | x |
| <i>B. gracile</i> Ph. | | | | | | | | | | | | x |
| <i>Scirpus capillaris</i> Muhl. | | | | | | | | | | | | x |
| <i>Cakile edentula</i> L. | | | | | | | | | | | | x |
| <i>C. subulata</i> Mx. | | | | | | | | | | | | x |
| <i>C. pseudo-cyperus</i> Willd. | | | | | | | | | | | | x |
| <i>C. lupulina</i> Willd. | | | | | | | | | | | | x |
| <i>Cassia chamaecrista</i> L. | | | | | | | | | | | | x |

TABLE 3. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Torrey, et al, 1819) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (TORREY, 1819) | | | | | | | | | | | |
|--|-----------------------------|---|---|---|---|---|---|---|---|----|----|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| <i>Epifagus virginiana</i> (L.) Bart. | | | | | | | | | | | | |
| <i>Equisetum hyemale</i> L. | | | | | | | | | | | | x |
| <i>Equisetum palustre</i> L. | | | | | | | | | | | | x |
| <i>Epilobium coloratum</i> Biehler | | | | | | | | | | | | |
| <i>Eriophorum tenellum</i> Nutt. | | | | | | | | | | | | x |
| <i>Eryngium aquaticum</i> L. | | | | | | | | | | | | x |
| <i>Eupatorium pilosum</i> Walt. | | | | | | | | | | | | x |
| <i>E. purpureum</i> L. | | | | | | | | | | | | x |
| <i>E. rugosum</i> Houtt. | | | | | | | | | | | | x |
| <i>E. sessilifolium</i> L. | | | | | | | | | | | | x |
| <i>Fimbristylis castanea</i> (Michx.) Vahl | | | | | | | | | | | | x |
| <i>Gallium asprellum</i> Michx. | | | | | | | | | | | | x |
| <i>G. triflorum</i> Michx. | | | | | | | | | | | | x |
| <i>Gautheria procumbens</i> L. | | | | | | | | | | | | x |
| <i>Gentiana saponaria</i> L. | | | | | | | | | | | | x |
| <i>Geum rivale</i> L. | | | | | | | | | | | | x |
| <i>Glyceria fluitans</i> (L.) R. Br. | | | | | | | | | | | | x |
| <i>Glyceria obtusa</i> (Muhl.) Trin. | | | | | | | | | | | | x |
| <i>Habenaria ciliaris</i> (L.) R.Br. | | | | | | | | | | | | x |
| <i>H. clavellata</i> (Michx.) Spreng. | | | | | | | | | | | | x |
| <i>H. cristata</i> (Michx.) R.Br. | | | | | | | | | | | | x |
| <i>H. fimbriata</i> (Ait.) R.Br. | | | | | | | | | | | | x |
| <i>Helenium autumnale</i> L. | | | | | | | | | | | | x |
| <i>Heracleum maximum</i> Bartr. | | | | | | | | | | | | x |
| <i>Hibiscus moscheutos</i> L. | | | | | | | | | | | | x |
| <i>Holcus lanatus</i> L. | | | | | | | | | | | | x |
| <i>Hypericum canadense</i> L. | | | | | | | | | | | | x |
| <i>H. deniculatum</i> Walt. | | | | | | | | | | | | x |
| <i>Epifagus americanus</i> Nutt. | | | | | | | | | | | | |
| <i>Epilobium coloratum</i> Muhl. | | | | | | | | | | | | |
| <i>Eriophorum angustifolium</i> L. | | | | | | | | | | | | |
| <i>Eryngium virginianum</i> Lmk. | | | | | | | | | | | | |
| <i>Eupatorium teucrifolium</i> Willd. | | | | | | | | | | | | |
| <i>E. laevigatum</i> (sp. nov.) | | | | | | | | | | | | |
| <i>E. ageratoides</i> Willd. | | | | | | | | | | | | |
| <i>Scirpus spadicus</i> (L.) Muhl. | | | | | | | | | | | | |
| <i>Gentiana Saponaria</i> L.-Ph. | | | | | | | | | | | | |
| <i>Poa fluitans</i> Sm. | | | | | | | | | | | | |
| <i>Glyceria obtusa</i> Muhl. | | | | | | | | | | | | |
| <i>Orchis ciliaris</i> L. | | | | | | | | | | | | |
| <i>Orchis tridentata</i> Willd. | | | | | | | | | | | | |
| <i>Orchis cristata</i> Mx. | | | | | | | | | | | | |
| <i>Orchis fimbriata</i> Willd. | | | | | | | | | | | | |
| <i>H. lanatum</i> Mx. | | | | | | | | | | | | |
| <i>Hibiscus moscheutos</i> Willd. | | | | | | | | | | | | |
| <i>Hypericum angulosum</i> Mx. | | | | | | | | | | | | |

TABLE 3. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Torrey, et al, 1819) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (TORREY, 1819) ² | | | | | | | | | | |
|---|--|---|---|---|---|---|---|---|---|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| <i>H. virginicum</i> L. | | | | | | | | | | | X |
| <i>Ilex ambigua</i> Michx. (Small, 1933) | X | | | | | | | | | | |
| <i>I. glabra</i> (L.) Gray | X | | | | | | | | | | |
| <i>Iris versicolor</i> L. | | | X | | | | | | | | |
| <i>Juncus biflorus</i> Ell. | | | | | | | | | | X | |
| <i>Juncus dichotomus</i> Ell. | | | | | | | | | | X | |
| <i>Kalmia latifolia</i> L. | | | | | | X | | | | | |
| <i>Lactuca canadensis</i> L. | | | | | | | X | | | | |
| <i>Laportea canadensis</i> (L.) Wedd. | | | | | | | | X | | | |
| <i>Larix laricina</i> (DuRoi) K. Koch | | | | | | | | | X | | |
| <i>Lathyrus palustris</i> L. var. <i>myrtifolius</i> (Muhl.) Gray | X | | | | | | | | | X | |
| <i>Leucothoë racemosa</i> (L.) Gray | | | | | | | | | | X | |
| <i>Liatris scariosa</i> (L.) Willd. | | | | | | | | | | | X |
| <i>Lilium canadense</i> L. | | | | | | | | | | | X |
| <i>Liparis liliifolia</i> (L.) Richard | | | | | | | | X | | | |
| <i>Listera convallarioides</i> (Sw.) Nutt. | X | | | | | | | | | | |
| <i>Lobelia spicata</i> Lam. | | | | | | | | | | | |
| <i>Lonicera americana</i> K. Koch | X | | | | | | | X | | | |
| <i>Lysimachia hybrida</i> Michx. | X | | | | | | | | | | |
| <i>L. thyrsiflora</i> L. | X | | | | | | | | | | X |
| <i>Malaxis unifolia</i> Michx. | X | | | | | | | | | | |
| <i>Melanthium virginicum</i> L. | | | | | | | | | X | | |
| <i>Mimulus ringens</i> L. | | | | | | | | | | | X |
| <i>Muhlenbergia frondosa</i> (Poir.) Fern. | | | | | | | | | | | X |
| <i>M. glomerata</i> (Willd.) Trin. | | | | | | | | | X | | |
| <i>M. schreberi</i> J. F. Gmel. | | | | | | | | | | X | |
| <i>M. sylvatica</i> Torr. | | | | | | | | | | | X |
| <i>H. virginianum</i> L. | | | | | | | | | | | X |
| <i>I. glaber</i> L. | | | | | | | | | | | X |
| <i>Juncus aristatus</i> Mx. | | | | | | | | | | X | |
| <i>J. bulbosus</i> Muhl. | | | | | | | | | | X | |
| <i>Sonchus palidus</i> Willd. | | | | | | | | | | | X |
| <i>Urtica canadensis</i> L. | | | | | | | | | X | | |
| <i>Pinus pendula</i> Ait. | | | | | | | | | | X | |
| <i>Lathyrus myrtifolius</i> Willd. | | | | | | | | | | | X |
| <i>Andromeda racemosa</i> (no author given) | | | | | | | | | | | X |
| <i>Liatris scariosa</i> L. | | | | | | | | | | | X |
| <i>L. liliifolia</i> Sw. | | | | | | | | X | | | |
| <i>Epipactis convallarioides</i> Sw. | | | | | | | | | | | X |
| <i>L. claytoniana</i> Mx. | | | | | | | | | X | | |
| <i>Lonicera grata</i> Ait. | | | | | | | | | | | X |
| <i>Lysimachia capitata</i> Ph. | | | | | | | | | | | X |
| <i>M. virginicum</i> Willd. | | | | | | | | | X | | |
| <i>Agrostis Mexicana</i> Muhl. | | | | | | | | | | | X |
| <i>M. glomeratus</i> Willd. R & S. | | | | | | | | | X | | |
| <i>M. diffusa</i> Schreb. | | | | | | | | | | X | |
| <i>Agrostis truncata</i> Muhl. | | | | | | | | | | | X |

TABLE 3. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Torrey, et al, 1819) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (TORREY, 1819) ² | | | | | | | | | | |
|---|--|---|---|---|---|---|---|---|---|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| <i>Myosotis verna</i> Nutt. | | | | | | | | | | x | |
| <i>Nelumbo lutea</i> (Willd.) Pers.? | | | | | | | | | | | x |
| <i>Orchis spectabilis</i> L. | | | | x | | | | | | x | |
| <i>Oronitum aquaticum</i> L. | | | | | | | | | | x | |
| <i>Osmunda regalis</i> L. var. <i>spectabilis</i> (Willd.) Gray | | | | | | | | | | x | |
| <i>Panicum commutatum</i> Schultes | | | | | | | | | | x | |
| <i>P. dichotomiflorum</i> Michx. | | | | | | | | | | x | |
| <i>Phragmites australis</i> (Cav.) Trin. ex Steudel (Clayton, 1968) | | | | | | | | x | | | |
| <i>Phryma leptostachya</i> L. | | | | | | | | | | x | |
| <i>Physalis subglabrata</i> Mackenz. & Bush | | | | | | | | | | x | |
| <i>Picea mariana</i> (Mill.) BSP. | | | | | | x | | | | | |
| <i>Pogonia ophioglossoides</i> (L.) Ker. | | | | | | x | | | | | |
| <i>Polygala cruciata</i> L. | | | | | | | | | | x | |
| <i>P. paucifolia</i> Willd. | | | | | | x | | | | | |
| <i>P. sanguinea</i> L. | | | | | | | | | | x | |
| <i>Polygonum hydropteroides</i> Michx. | | | | | | | | | | | |
| <i>Pontederia cordata</i> L. | | | | | | | | | | | |
| X <i>Populus gileadensis</i> Rouleau | | | | | | | | | | | |
| <i>Populus nigra</i> L. | | | | | | | | | | x | |
| <i>Potamogeton natans</i> L. | | | | | | | | | | | |
| <i>Potentilla fruticosa</i> L. | | | | | | | | | | | |
| <i>P. palustris</i> (L.) Scop. | | | | | | | | | | | |
| <i>Pycnanthemum incanum</i> (L.) Michx. | | | | | | | | | | | |
| <i>P. muticum</i> (Michx.) Pers. | | | | | | | | | | | |
| <i>Ranunculus repens</i> L. | | | | | | | | | | | |
| <i>Rhododendron maximum</i> L. | | | | | | | | | | | |
| <i>M. virginiana</i> L. | | | | | | | | | | | |
| <i>Nuphar lutea</i> Ait. | | | | | | | | | | | |
| <i>O. spectabilis</i> Willd. | | | | | | | | | | | |
| <i>P. nervosum</i> Muhl. | | | | | | | | | | | |
| <i>P. geniculatum</i> Muhl. | | | | | | | | | | | |
| <i>Arundo phragmites</i> L. | | | | | | | | | | | |
| <i>Physalis pennsylvanica</i> L. | | | | | | | | | | | |
| <i>Pinus nigra</i> Ait. | | | | | | | | | | | |
| <i>Arethusa ophioglossoides</i> L. | | | | | | | | | | | |
| <i>P. cruciata</i> Willd. | | | | | | | | | | | |
| <i>Populus canadensis</i> Ait. | | | | | | | | | | | |
| <i>P. betulifolia</i> Ph. | | | | | | | | | | | |
| <i>Comarum palustre</i> L. | | | | | | | | | | | |
| <i>P. incanum</i> Mx. | | | | | | | | | | | |
| <i>P. muticum</i> Pers. | | | | | | | | | | | |

TABLE 3. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Torrey, et al, 1819)¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (TORREY, 1819) | | | | | | | | | | | |
|---|-----------------------------|---|---|---|---|---|---|---|---|----|----|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| <i>Rotala ramosior</i> (L.) Koehne | | | | | | | | | | | | |
| <i>Rubus hispidus</i> L. var. <i>obovatis</i> (Michx.) Fern. | | | | X | | | | | | | | |
| <i>Rubus odoratus</i> L. | | | | | | | X | X | | | | |
| <i>Rudbeckia laciniata</i> L. | | | | | | | | | | | | |
| <i>Sabbatia dodecandra</i> (L.) BSP. | | | | | | | | | | | | |
| <i>Sagittaria latifolia</i> Willd. or <i>S. engelmanniana</i> J. G. Smith | | | | X | | | | | | | | |
| <i>Sagittaria latifolia</i> Willd. forma <i>hastata</i> (Pursh) Robins. | | | | | | | X | | | | | |
| <i>Salix lucida</i> Muhl. | | | | | | | | | | | | |
| <i>Sanguinaria canadensis</i> L. | | | | | | | X | | | | | |
| <i>Sarrisorba canadensis</i> L. | | | | | | | | | | | | X |
| <i>Sarracenia purpurea</i> L. | | | | | | | | | | | | |
| <i>Saururus cernuus</i> L. | | | | | | | | | | | | |
| <i>Saxifraga pennsylvanica</i> L. | | | | | | | | | | | | |
| <i>Scleria triglomerata</i> Michx. | | | | | | | | | | | | |
| <i>Scrophularia marilandica</i> L. | | | | | | | | | | | | |
| <i>Senecio pauperculus</i> Michx. var. <i>balsamitae</i> (Muhl.) Fern. | | | | | | | | | | | | X |
| <i>Sium suave</i> Walt. | | | | | | | | | | | | |
| <i>Smilax herbacea</i> L. | | | | | | | | | | | | |
| <i>Solidago graminifolia</i> (L.) Salisb. <i>S. odora</i> Ait. | | | | | | | | | | | | |
| <i>Sonchus arvensis</i> L. | | | | | | | | | | | | |
| <i>Spartina cynosuroides</i> (L.) Roth. | | | | | | | | | | | | |
| <i>Spargula arvensis</i> L. | | | | | | | | | | | | |
| <i>Sphenopholis obtusata</i> (Michx.) Scribn. | | | | | | | | | | | | |
| <i>Spiraea alba</i> DuRoi | | | | | | | | | | | | |
| <i>Ammania ramosior</i> Mx.? | | | | | | | | | | | | |
| <i>Rubus obovatis</i> Mx. | | | | | | | | | | | | |
| <i>R. laciniata</i> Willd. | | | | | | | | | | | | |
| <i>Sabbatia chlorides</i> Ph. | | | | | | | | | | | | |
| <i>Sagittaria sagittifolia</i> L. | | | | | | | | | | | | X |
| <i>Sagittaria hastata</i> Ph. (var. of <i>sagittifolia</i> L.?) | | | | | | | | | | | | |
| <i>S. lucida</i> Willd. | | | | | | | | | | | | |
| <i>Saxifraga pennsylvanica</i> L. | | | | | | | | | | | | |
| <i>Senecio Balsamitae</i> Willd. | | | | | | | | | | | | X |
| <i>Sium lineare</i> L. | | | | | | | | | | | | |
| <i>Solidago graminifolia</i> Nutt. | | | | | | | | | | | | |
| <i>Spartina polystachya</i> Muhl. | | | | | | | | | | | | |
| <i>Aira truncata</i> Muhl. | | | | | | | | | | | | |
| <i>S. salicifolia</i> Ait. | | | | | | | | | | | | X |

TABLE 3. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Torrey, et al, 1819) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (TORREY, 1819) | | | | | | | | | | |
|--|-----------------------------|---|---|---|---|---|---|---|---|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| <i>S. tomentosa</i> L. | | | | | X | | | | | | |
| <i>Spirodela polyrhiza</i> (L.) Schleid. | | | | | | | | | | X | |
| <i>Sporobolus vaginiflorus</i> (Torr.) Wood | | | | | | | | | | X | |
| <i>Sirophostyles helvola</i> (L.) Ell. | | | | | | | | | | X | |
| <i>S. umbellata</i> (Muhl.) Britt. | | | | | | | | | | X | |
| <i>Teucrium canadense</i> L. | | | | | | | | | | X | |
| <i>Tilia americana</i> L. | | | | | | | | | | X | |
| <i>T. neglecta</i> Spach | | | | | | | | | | X | |
| <i>Trientalis borealis</i> Raf. | | | | | | | | | | X | |
| <i>Triglochin maritima</i> L. | | | | | | | | | | X | |
| <i>Trillium undulatum</i> Willd. | | | | | | | | | | X | |
| <i>Triosteum perfoliatum</i> L. | | | | | | | | | | X | |
| <i>Tripsacum dactyloides</i> L. | | | | | | | | | | X | |
| <i>Isuga canadensis</i> (L.) Carr. | | | | | | | | | | X | |
| <i>Ulmus rubra</i> Muhl. | | | | | | | | | | X | |
| <i>Vaccinium oxycoccos</i> L. var. <i>ovalifolium</i> Michx. | | | | | | | | | | X | |
| <i>Verbena officinalis</i> L. | | | | | | | | | | X | |
| <i>V. simplex</i> Lehm. | | | | | | | | | | X | |
| <i>Viburnum alnifolium</i> Marsh. | | | | | | | | | | X | |
| <i>Vicia sativa</i> L. | | | | | | | | | | X | |
| <i>Viola rafinesgii</i> Greene | | | | | | | | | | X | |
| <i>Woodсия obtusa</i> (Spreng.) Torr.? | | | | | | | | | | X | |
| <i>Woodwardia virginica</i> (L.) Sm. | | | | | | | | | | X | |
| <i>Xyris caroliniana</i> Walt. | | | | | | | | | | X | |
| <i>X. caroliniana</i> Walt.? | | | | | | | | | | X | |
| <i>Zizania aquatica</i> L. | | | | | | | | | | X | |
| <i>Lemna polyrhiza</i> L. | | | | | | | | | | | X |
| <i>Agrostis virginica</i> Muhl. | | | | | | | | | | | X |
| <i>Phasaeolus trilobus</i> Mx. | | | | | | | | | | | X |
| <i>Phasaeolus helveticus</i> L. | | | | | | | | | | | X |
| <i>T. glabra</i> Vent. et Ph. | | | | | | | | | | | X |
| <i>T. pubescens</i> Vent. | | | | | | | | | | | X |
| <i>Trientalis Europaea</i> L. | | | | | | | | | | | X |
| <i>Trillium erythrocarpum</i> Mx. | | | | | | | | | | | X |
| <i>Tripsacum dactyloides</i> Willd. | | | | | | | | | | | X |
| <i>Pinus canadensis</i> L. | | | | | | | | | | | X |
| <i>U. fulva</i> Mx. | | | | | | | | | | | X |
| <i>Oxycoccus vulgaris</i> Ph. | | | | | | | | | | | X |
| <i>V. spuria</i> L. | | | | | | | | | | | X |
| <i>V. angustifolia</i> Mx. | | | | | | | | | | | X |
| <i>Viburnum lantanoides</i> Mx. | | | | | | | | | | | X |
| <i>Vicia sativa</i> Walt. L. | | | | | | | | | | | X |
| <i>Viola concolor</i> Ph. | | | | | | | | | | | X |
| <i>Aspidium obtusum</i> Willd. | | | | | | | | | | | X |
| <i>W. virginica</i> Willd. | | | | | | | | | | | X |
| <i>X. Jupicai</i> Mx. | | | | | | | | | | | X |
| <i>Z. aquatica</i> Ph. | | | | | | | | | | | X |

TABLE 3. (*Continued*) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Torrey, et al, 1819)¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (TORREY, 1819) ² | | | | | | | | | | |
|---|--|---|---|---|---|---|---|---|---|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| <i>Zizia aptera</i> (Gray) Fern. or <i>Thaspium trifoliatum</i> (L.) Gray | | | | | | | | | | | X |
| ? | | | | | | | | | | | X |
| ? | | | | | | | | | | | X |
| ? | | | | | | | | | | | X |
| ? | | | | | | | | | | | X |
| ? | | | | | | | | | | | X |

¹ Torrey's nomenclature has not been changed, but more up-to-date nomenclature is given which follows Fernald (1950). Where a binomial is not given under Torrey, the nomenclature is considered identical to that of Fernald. A question mark after Torrey's nomenclature seems to indicate doubt on Torrey's part, while one after Fernald's nomenclature indicates doubt in the mind of the present author about the correct corresponding binomial used by Fernald.

² The localities represented by collections include: (1) New Durham cedar swamp; (2) Hackensack Meadows area in general; (3) Bergen; (4) Weehawk cedar swamp; (5) Weehawk meadows, swamps, or wet woods; (6) Weehawk upland habitats; (7) Manhattanville; (8) Elizabethtown; (9) Newark Meadows; (10) Hoboken and/or Greenwich; and (11) New Jersey in general.

TABLE 4.—Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) 1

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (BRITTON, 1889) | | | | | | | | | | | | | | | | | | | | |
|---|---------------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|---|
| | LOCALITY 2 | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | |
| <i>Acer saccharinum</i> Marsh. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Asclepias viridiflora</i> Raf. | | | | | | | | | | | | | | | X | | | | | | X |
| <i>Aegopodium podagraria</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Agastache nepetoides</i> (L.) Ktze. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Agrimonia parviflora</i> Ait. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Aletris farinosa</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Alopecurus aequalis</i> Sobol. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Amanita coccinea</i> Rothb. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Amorpha fruticosa</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Anemone canadensis</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Anemone quinquefolia</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Aralia hispida</i> Vent. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Arethusa bulbosa</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Aristolochia serpentaria</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Asclepias amplexicaulis</i> Sm. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Aster nemoralis</i> Ait. | | | | | | | | | | | | | | | | | | | | | X |
| <i>A. patens</i> Ait. var <i>phlogifolius</i> (Muhl.) Nees | | | | | | | | | | | | | | | | | | | | | X |
| <i>Ascyrum hypericoides</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Berberis vulgaris</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Bidens cernua</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>B. coronata</i> (L.) Britt. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Calamagrostis cinnoides</i> (Muhl.) Bart. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Calla palustris</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>A. viridiflora</i> (Raf.) Ell. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Lophanthus nepetoides</i> (L.) Benth. | | | | | | | | | | | | | | | | | | | | | X |
| <i>A. geniculatus</i> L. var. <i>aristulatus</i> (Michx.) Munro. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Anemone dichotoma</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>A. nemorosa</i> L. forma <i>quinquefolia</i> (L.) Britt. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Asclepias obtusifolia</i> Michx. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Ascyrum crus-andreae</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Coreopsis trichosperma</i> Michx. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Deyeuxia nuttalliana</i> (Steud.) Vasey | | | | | | | | | | | | | | | | | | | | | X |

TABLE 4. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) 1

| NOMENCLATURE (FERNALD, 1950) | LOCALITY 2 | | | | | | | | | | | | | | | | | | | |
|--|------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| <i>Cornus canadensis</i> L. | x | | | | | | | | | | | | | | | | | | | |
| <i>Cuscuta compacta</i> Juss. | x | | | | | | | x | | | | | | | | | x | | | |
| <i>Cynoglossum officinale</i> L. | | | | | | | | | | | | | | | | | | | | x |
| <i>C. virginianum</i> L. | | | | | | | | | | | | | | | | | | | | x |
| <i>Cyperus dentatus</i> Torr. | x | | | | | | | | | | | | | | | | | | | |
| <i>C. odoratus</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Cyripedium reginae</i> Walt. | | | | | | | | | | | | | | | | | | | | |
| <i>Cystopteris fragilis</i> (L.) Bernh. | | | | | | | | | | | | | | | | | | | | |
| <i>Delphinium consolida</i> L. (Gleason, 1963) | | | | | | | | | | | | | | | | | | | | |
| <i>Desmodium glutinosum</i> (Muhl.) Wood | | | | | | | | | | | | | | | | | | | | |
| <i>Diospyros virginiana</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Dryopteris marginalis</i> (L.) Gray | | | | | | | | | x | | | | | | | | | | | |
| <i>Duchesnea indica</i> (Andr.) Focke | | | | | | | | | x | | | | | | | | | | | |
| <i>Eleocharis olivacea</i> Torr. | | | | | | | | | | | | | | | | | | | | |
| <i>Eleocharis rostellata</i> Torr. | | | | | | | | | | | | | | | | | | | | |
| <i>Equisetum fluviatile</i> L. forma <i>linnaeanum</i> (Döll) Broun | | | | | | | | | | | | | | | | | | | | |
| <i>Elymus villosus</i> Muhl.? | | | | | | | | | | | | | | | | | | | | |
| <i>Eragrostis capillaris</i> (L.) Nees | | | | | | | | | | | | | | | | | | | | |
| <i>Ertophorum gracile</i> W. D. J. Koch | | | | | | | | | | | | | | | | | | | | |
| <i>Euonymus atropurpureus</i> Jacq. | | | | | | | | | | | | | | | | | | | | |
| <i>Eupatorium pilosum</i> Walt. | | | | | | | | | | | | | | | | | | | | |
| <i>E. sessilifolium</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Festuca obtusa</i> Biehler | | | | | | | | | | | | | | | | | | | | |
| <i>Floerkea proserpinacoides</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>Fraxinus nigra</i> Marsh. | | | | | | | | | | | | | | | | | | | | |
| <i>Fraxinus sambucifolia</i> Lam. | | | | | | | | | | | | | | | | | | | | |
| <i>Eupatorium teucrifolium</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>F. nutans</i> Spreng. | | | | | | | | | | | | | | | | | | | | |
| <i>Elymus striatus</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>E. limosum</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Fragaria indica</i> Andr. | | | | | | | | | | | | | | | | | | | | |
| <i>Aspidium marginale</i> (L.) Sw. | | | | | | | | | | | | | | | | | | | | |
| <i>Desmodium grandiflorum</i> (Walt.) DC. | | | | | | | | | | | | | | | | | | | | |
| <i>Cuscuta compacta</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Cynoglossum virginicum</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Cyperus speciosus</i> Vahl | | | | | | | | | | | | | | | | | | | | |
| <i>Cyripedium spectabile</i> Sw. | | | | | | | | | | | | | | | | | | | | |
| <i>D. consolida</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Desmodium grandiflorum</i> (Walt.) DC. | | | | | | | | | | | | | | | | | | | | |
| <i>Aspidium marginale</i> (L.) Sw. | | | | | | | | | | | | | | | | | | | | |
| <i>Fragaria indica</i> Andr. | | | | | | | | | | | | | | | | | | | | |
| <i>Eleocharis olivacea</i> Torr. | | | | | | | | | | | | | | | | | | | | |
| <i>Eleocharis rostellata</i> Torr. | | | | | | | | | | | | | | | | | | | | |
| <i>Equisetum fluviatile</i> L. forma <i>linnaeanum</i> (Döll) Broun | | | | | | | | | | | | | | | | | | | | |
| <i>Elymus villosus</i> Muhl.? | | | | | | | | | | | | | | | | | | | | |
| <i>Eragrostis capillaris</i> (L.) Nees | | | | | | | | | | | | | | | | | | | | |
| <i>Ertophorum gracile</i> W. D. J. Koch | | | | | | | | | | | | | | | | | | | | |
| <i>Euonymus atropurpureus</i> Jacq. | | | | | | | | | | | | | | | | | | | | |
| <i>Eupatorium pilosum</i> Walt. | | | | | | | | | | | | | | | | | | | | |
| <i>E. sessilifolium</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Festuca obtusa</i> Biehler | | | | | | | | | | | | | | | | | | | | |
| <i>Floerkea proserpinacoides</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>Fraxinus nigra</i> Marsh. | | | | | | | | | | | | | | | | | | | | |
| <i>Fraxinus sambucifolia</i> Lam. | | | | | | | | | | | | | | | | | | | | |
| <i>Eupatorium teucrifolium</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>F. nutans</i> Spreng. | | | | | | | | | | | | | | | | | | | | |
| <i>Elymus striatus</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>E. limosum</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Fragaria indica</i> Andr. | | | | | | | | | | | | | | | | | | | | |
| <i>Aspidium marginale</i> (L.) Sw. | | | | | | | | | | | | | | | | | | | | |
| <i>Desmodium grandiflorum</i> (Walt.) DC. | | | | | | | | | | | | | | | | | | | | |
| <i>Cuscuta compacta</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Cynoglossum virginicum</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Cyperus speciosus</i> Vahl | | | | | | | | | | | | | | | | | | | | |
| <i>Cyripedium spectabile</i> Sw. | | | | | | | | | | | | | | | | | | | | |
| <i>D. consolida</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Desmodium grandiflorum</i> (Walt.) DC. | | | | | | | | | | | | | | | | | | | | |
| <i>Aspidium marginale</i> (L.) Sw. | | | | | | | | | | | | | | | | | | | | |
| <i>Fragaria indica</i> Andr. | | | | | | | | | | | | | | | | | | | | |
| <i>Eleocharis olivacea</i> Torr. | | | | | | | | | | | | | | | | | | | | |
| <i>Eleocharis rostellata</i> Torr. | | | | | | | | | | | | | | | | | | | | |
| <i>Equisetum fluviatile</i> L. forma <i>linnaeanum</i> (Döll) Broun | | | | | | | | | | | | | | | | | | | | |
| <i>Elymus villosus</i> Muhl.? | | | | | | | | | | | | | | | | | | | | |
| <i>Eragrostis capillaris</i> (L.) Nees | | | | | | | | | | | | | | | | | | | | |
| <i>Ertophorum gracile</i> W. D. J. Koch | | | | | | | | | | | | | | | | | | | | |
| <i>Euonymus atropurpureus</i> Jacq. | | | | | | | | | | | | | | | | | | | | |
| <i>Eupatorium pilosum</i> Walt. | | | | | | | | | | | | | | | | | | | | |
| <i>E. sessilifolium</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Festuca obtusa</i> Biehler | | | | | | | | | | | | | | | | | | | | |
| <i>Floerkea proserpinacoides</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>Fraxinus nigra</i> Marsh. | | | | | | | | | | | | | | | | | | | | |
| <i>Fraxinus sambucifolia</i> Lam. | | | | | | | | | | | | | | | | | | | | |

TABLE 4. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (BRITTON, 1889) | LOCALITY ² | | | | | | | | | | | | | | | | | | | |
|--|---|-----------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| <i>Gaultheria hispida</i> (L.) Bigel. | <i>Chiogenes hispida</i> (L.) T. & G. | x | | | | | | | | | | | | | | | | | | | |
| <i>Gentiana saponaria</i> L. | <i>G. Saponaria</i> L. | | | | x | | | | | | | | | | | | | | | | |
| <i>Geranium robertianum</i> L. | <i>Geranium Robertianum</i> L. | | | | | | | | | | | | | | | | | | x | | x |
| <i>Gerardia purpurea</i> L. forma <i>albiflora</i> Britt. | | | | | | | | | | | | | | | | | | x | x | | |
| <i>Glyceria acutiflora</i> Torr.? | <i>Glyceria brevifolia</i> (Muhl.) Schult. | | | | | | | | | | | | | | | | | | | | x |
| <i>Habenaria blephariglottis</i> (Willd.) Hook. | <i>H. blephariglottis</i> (Willd.) Torr. | | | | | | | | | | | | | | | | | | | | x |
| <i>H. ciliaris</i> (L.) R. BR. | | | | | | | | | | | | | | | | | | | | | |
| <i>H. cristata</i> (Michx.) R. Br. | | | | | | | | | | | | | | | | | | | | | |
| <i>H. flava</i> (L.) R. Br. | <i>H. flava</i> (L.) Gray | | | | | | | | | | | | | | | | | | | | x |
| <i>Helianthus decapetalus</i> L. | | | | | | | | | | | | | | | | | | | | | |
| <i>H. giganteus</i> L. (var. not given) | <i>Helianthus giganteus</i> L. var. <i>ambigans</i> T. & G. | | | | | | | | | | | | | | | | | | | | x |
| <i>Heracleum maximum</i> Bartr. | <i>Heracleum lanatum</i> Michx. | | | | | | | | | | | | | | | | | | | | x |
| <i>Hesperis matronalis</i> L. | | | | | | | | | | | | | | | | | | | | | x |
| <i>Hierochloë odorata</i> (L.) Beauv. | <i>Hierochloë odorata</i> (L.) Wahl. | | | | | | | | | | | | | | | | | | | | x |
| <i>Hydrophyllum virginianum</i> L. | <i>Hydrophyllum virginicum</i> L. | | | | | | | | | | | | | | | | | | | | x |
| <i>Hyssopus officinalis</i> L. | | | | | | | | | | | | | | | | | | | | | x |
| <i>Ilex glabra</i> (L.) Gray | | | | | | | | | | | | | | | | | | | | | x |
| <i>I. laevigata</i> (Pursh) Gray | | | | | | | | | | | | | | | | | | | | | x |
| <i>Impatiens pallida</i> Nutt. | | | | | | | | | | | | | | | | | | | | | x |
| <i>Ipomoea pandurata</i> (L.) Meyer | <i>I. aurea</i> Muhl. | | | | | | | | | | | | | | | | | | | | x |
| <i>Iris prismatica</i> Pursh | | | | | | | | | | | | | | | | | | | | | |
| <i>I. pseudacorus</i> L. | | | | | | | | | | | | | | | | | | | | | |
| <i>Juncus marginatus</i> Rostk. (var. not listed) | <i>J. marginatus</i> Rostk. var. <i>paucicapitus</i> Engelm. | | | | | | | | | | | | | | | | | | | | x |

TABLE 4. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) 1

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (BRITTON, 1889) | | | | | | | | | | | | | | | | | | | |
|--|---------------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| <i>Koeleria virginica</i> (L.) Presl. | | | | | | | | | | | | | | | | | | | | |
| <i>Lactuca hirsuta</i> Muhl. var. | | | | | | | | | | | | | | | | | | | | |
| <i>Lactuca floridana</i> (L.) Gaertn. | | | | | | | | | | | | | | | | | | | | |
| <i>Lactuca villosa</i> (Jacq.) Cronq. | | | | | | | | | | | | | | | | | | | | |
| <i>Larix laricina</i> (DuRoi) K. Koch | | | | | | | | | | | | | | | | | | | | |
| <i>Lathyrus palustris</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>L. palustris</i> L. var. | | | | | | | | | | | | | | | | | | | | |
| <i>myrtifolius</i> (Muhl.) Gray | | | | | | | | | | | | | | | | | | | | |
| <i>Lemna minor</i> L. (var not listed) | | | | | | | | | | | | | | | | | | | | |
| <i>L. minor</i> L. (var. not listed) | | | | | | | | | | | | | | | | | | | | |
| <i>Leucothoe racemosa</i> (L.) Gray | | | | | | | | | | | | | | | | | | | | |
| <i>Liatris spicata</i> (L.) Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>Lilium philadelphicum</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>L. superbum</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Linnaea borealis</i> L. var. | | | | | | | | | | | | | | | | | | | | |
| <i>americana</i> (Forbes) Rehd. | | | | | | | | | | | | | | | | | | | | |
| <i>Liparis loeselii</i> (L.) Richard | | | | | | | | | | | | | | | | | | | | |
| <i>Lobelia siphilitica</i> L. var. | | | | | | | | | | | | | | | | | | | | |
| <i>albiflora</i> Britt. | | | | | | | | | | | | | | | | | | | | |
| <i>Lonicera dioica</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>L. japonica</i> Thunb. | | | | | | | | | | | | | | | | | | | | |
| <i>L. sempervirens</i> Ait. | | | | | | | | | | | | | | | | | | | | |
| <i>Lophotocarpus spongiosus</i> (Engelm.) J. G. Sm. | | | | | | | | | | | | | | | | | | | | |
| <i>Lychnis alba</i> Mill. | | | | | | | | | | | | | | | | | | | | |

TABLE 4. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (BRITTON, 1889) | LOCALITY ² | | | | | | | | | | | | | | | | | | | |
|--|--|-----------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| <i>Lysimachia hybrida</i> Michx. | <i>Steironema lanceolatum</i> (Walt.) Gray var. <i>hybridum</i> (Michx.) Gray | | | | | | | | | | | | | | | | | | | | X |
| <i>L. thysiflora</i> L. | | X | | | X | | | | | | | | | | | | | | | | |
| <i>Lythrum lineare</i> L. | | | X | | | | | | | | | | | | | | | | | | |
| <i>Magnolia virginiana</i> L. | <i>M. glauca</i> L. | X | | | | | | | | | | | | | | | | | | | X |
| <i>Malaxis unifolia</i> Michx. | <i>Microstylis unifolia</i> (Michx.) B.S.P. | X | | | | | | | | | | | | | | | | | | | X |
| <i>Melissa officinalis</i> L. | | | | | | | | X | | | | | | | | | | | | | X |
| <i>Menyanthes trifoliata</i> L. | | | | | | X | | | | | | | | | | | | | | | X |
| var. <i>minor</i> Raf. | | | | | | | X | | | | | | | | | | | | | | X |
| <i>Mimulus alatus</i> Ait. | | | | | | | | X | | | | | | | | | | | | | X |
| <i>Monarda didyma</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Muhlenbergia capillaris</i> (Lam.) Trin. | <i>M. capillaris</i> Kunth. | | | | | | | | | | | | | | | | | | | | X |
| <i>M. racemosa</i> (Michx.) BSP. | | | | | | | | | | | | | | | | | | | | | X |
| <i>M. sobolifera</i> (Muhl.) Trin. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Nemopanthus mucronata</i> (L.) Trel. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Ophioglossum vulgatum</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Origanum vulgare</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Oronitium aquaticum</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Panicum miliaceum</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Parnassia glauca</i> Raf. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Paspalum laeve</i> Michx. | <i>Parnassia caroliniana</i> Michx. | | | | | | | | | | | | | | | | | | | | X |
| <i>Penstemon hirsutus</i> (L.) Willd. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Phaseolus polystachios</i> (L.) BSP. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Physalis pubescens</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Picea mariana</i> (Mill.) BSP. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Plantago aristata</i> Michx. | <i>Plantago patagonia</i> Jacq. var. <i>aristata</i> (Michx.) Gray | | | | | | | | | | | | | | | | | | | | X |

TABLE 4. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) 1

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (BRITTON, 1889) | | | | | | | | | | | | | | | | | | | |
|---|---------------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| <i>Poa palustris</i> L. | | | | | | | | | x | | | | | | | | | | | |
| <i>P. trivialis</i> L. | x | | | | | | | | x | | | | | | | | | | | |
| <i>Pogonia ophioglossoides</i> (L.) Ker. | | | x | | | | | | | | | | | | | | | | | |
| <i>Polygala brevifolia</i> Nutt. | | x | | | | | | | | | | | | | | | | | | |
| <i>P. cruciata</i> L. | | | x | | | | | | | | | | | | | | | | | |
| <i>P. paucifolia</i> Willd. | x | | | | | | | | | | | | | | | | | | | |
| <i>Polygonum lapathifolium</i> L. | | | | | | | | | | | | | | x | | | | | | |
| <i>Polygonum uvedalia</i> L. | | | | | | | | | | | | | | | | | | | | x |
| <i>Populus heterophylla</i> L. | | | | | | | | | | | | | | | | | | | | x |
| <i>Potentilla fruticosa</i> L. | | | | | | | | | | | | | | | | | | | | x |
| <i>Prenanthes racemosa</i> Michx. | | | | | | | | | | | | | | | | | | | | x |
| <i>Prunus pennsylvanica</i> L.f. | x | | | | | | | | | | | | | | | | | | | x |
| <i>P. virginiana</i> L. | | | | | | | | | | | | | | | | | | | | x |
| <i>Pycnanthemum muticum</i> (Michx.) Pers. | x | | | | | | | | | | | | | | | | | | | x |
| <i>Quercus stellata</i> Wang. | | | | | | | | | | | | | | | | | | | | x |
| <i>Ranunculus pennsylvanicus</i> L.f. | | | | | | | | | | | | | | | | | | | | x |
| <i>R. septentrionalis</i> Poir. | x | | | | | | | | | | | | | | | | | | | x |
| <i>Rhamnus alnifolia</i> L'Her. | x | | | | | | | | | | | | | | | | | | | x |
| <i>R. caroliniana</i> Walt. | x | | | | | | | | | | | | | | | | | | | x |
| <i>Rhododendron maximum</i> L. | x | | | | | | | | | | | | | | | | | | | x |
| <i>R. viscosum</i> (L.) Torr. forma <i>glaucum</i> (Lam.) Voss | x | | | | | | | | | | | | | | | | | | | x |
| <i>R. viscosum</i> (L.) Torr. (no variety listed) | | | | | | | | | | | | | | | | | | | | x |
| <i>Rhus typhina</i> L. | | | | | | | | | | | | | | | | | | | | x |
| <i>Ribes americanum</i> Mill. | | | | | | | | | | | | | | | | | | | | x |
| <i>Rorippa islandica</i> (Oeder) Borbas | | | | | | | | | | | | | | | | | | | | x |
| <i>Nasturtium palustre</i> (L.) DC. | | | | | | | | | | | | | | | | | | | | x |

TABLE 4. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) 1

| NOMENCLATURE (FERNALD, 1950) | LOCALITY 2 | | | | | | | | | | | | | | | | | | | |
|--|------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| <i>R. islandica</i> (Oeder) Borbas var. <i>N. palustre</i> (L.) DC. var. <i>hispidula</i> (Desv.) Butt. & Abbe | | | | | | | | | | | | | | | | | | | | x |
| <i>Rotala ramosior</i> (L.) Koehne | | | x | | | | | | | | | | | | | | | | | |
| <i>Rubus odoratus</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>R. pubescens</i> Raf. | | x | | | | | | | | | | | | | | | | | | |
| <i>Rumex orbiculatus</i> Gray | | | x | | | | | | | | | | | | | | | | | |
| <i>R. verticillatus</i> L. | | x | | | | | | | | | | | | | | | | | | |
| <i>Sabatia dodecandra</i> (L.) BSP. | | | | x | | | | | | | | | | | | | | | | |
| <i>Sagina procumbens</i> L. | | x | | | | | | | | | | | | | | | | | | |
| <i>Sagittaria subulata</i> L. | | | | | | | | | | x | | | | | | | | | | |
| <i>Salix candida</i> Flugge | | x | | | | | | | | | | | | | | | | | | |
| <i>S. fragilis</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>S. gracilis</i> Anderss. var. <i>textoris</i> Fern. | | x | | | | | | | | | | | | | | | | | | |
| <i>S. viminalis</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Sambucus pubens</i> Michx. | | | | | | | | | | | | | | | | | | | | |
| <i>Saponaria vaccaria</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Scirpus atrovirens</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>S. lineatus</i> Michx. | | | | | | | | | | | | | | | | | | | | |
| <i>S. olneyi</i> Gray | | | | | | | | | | | | | | | | | | | | |
| <i>S. rubricosus</i> Fern. | | | | | | | | | | | | | | | | | | | | |
| <i>Scleria triglomerata</i> Michx. | | | | | | | | | | | | | | | | | | | | |
| <i>Seteria verticillata</i> (L.) Beauv. | | | | | | | | | | | | | | | | | | | | |
| <i>Silene cucubalus</i> Wibel | | | x | | | | | | | | | | | | | | | | | |
| <i>S. caroliniana</i> Walt. | | | x | | | | | | | | | | | | | | | | | |
| <i>Smilax glauca</i> Walt. | | | | | | | | | | | | | | | | | | | | |
| <i>Smilacina stellata</i> (L.) Desf. | | | | | | | | | | | | | | | | | | | | |
| <i>Unifolium stellatum</i> (L.) Greene | | | | | | | | | | | | | | | | | | | | |
| <i>Sagittaria natans</i> Michx. | | | | | | | | | | | | | | | | | | | | |
| <i>Salix candida</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>S. petiolaris</i> Smith | | | | | | | | | | | | | | | | | | | | |
| <i>S. racemosa</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Scirpus atrovirens</i> Muhl. | | | | | | | | | | | | | | | | | | | | |
| <i>S. olneyi</i> Gray | | | | | | | | | | | | | | | | | | | | |
| <i>Eriophorum cyperinum</i> L. var. <i>laxum</i> (Gray) B.S.P. | | | | | | | | | | | | | | | | | | | | |
| <i>S. inflata</i> Smith | | | | | | | | | | | | | | | | | | | | |
| <i>S. pennsylvanica</i> Michx. | | | | | | | | | | | | | | | | | | | | |
| <i>Unifolium stellatum</i> (L.) Greene | | | | | | | | | | | | | | | | | | | | |

TABLE 4. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (BRITTON, 1889) | | | | | | | | | | | | | | | | | | | |
|--|---------------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| <i>Solanum carolinense</i> L. | | | | | | | | X | | | | | | | | | | | | X |
| <i>Solidago flexicaulis</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>S. elliotii</i> T. & G. var. <i>ascendens</i> Fern. | | | X | X | | | | | | | | | | | | | | | | |
| <i>S. patula</i> Muhl. | | | X | | | | | | | | | | | | X | X | | | | |
| <i>S. rigida</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>S. tenuifolia</i> Pursh | | | X | | | | | | | | | | | | | | | | | |
| <i>S. ulginosa</i> Nutt. | | | | X | | | | | | | | | | | | | | | | |
| <i>S. ulmifolia</i> Muhl. | | | | | | | | X | | | | | | | | | | | | |
| <i>Sonchus arvensis</i> L. | | | | | | | | | X | | | | | | | | | | | |
| <i>S. asper</i> (L.) Hill | | | | | | | | | | X | | | | | | | | | | |
| <i>Sphenopholis obtusata</i> (Michx.) Scribn. | | | X | | | | | | | | | | | | X | | | | | |
| <i>Staphylea trifolia</i> L. | | | | | | | | | | | | | | | | | | X | | X |
| <i>Thalictrum dioicum</i> L. | | | | | | | | | | | | | | | | | | | X | X |
| <i>Tilia neglecta</i> Spach | | | | | | | | | | | | | | X | | | | | | X |
| <i>Tipularia discolor</i> (Pursh.) Nutt. | | | | | | | | | | | | | | | | | | | | |
| <i>Tipularia unifolia</i> (Muhl.) B.S.P. | | | | | | | | X | | | | | | | | | | | | |
| <i>Tragopogon porrifolius</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Trifolium procumbens</i> L. | | | | | | | | | | | | | | | | | | | | X |
| <i>Trillium undulatum</i> Willd. | | | | | | | | | | | | | | | | | | | | |
| <i>Trollius laxus</i> Salisb. | | | | | | | | | | | | | | | | | | | | |
| <i>Typha angustifolia</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Urtica dioica</i> L. | | | | | | | | | | | | | | | | | | | | |
| <i>Utricularia intermedia</i> Hayne | | | | | | | | | | | | | | | | | | | | |
| <i>Vaccinium atrococcum</i> (Gray) Heller | | | | | | | | | | | | | | | | | | | | |
| <i>V. corymbosum</i> L. var. <i>albi-</i> <i>florum</i> (Hook.) Fern. | | | | | | | | | | | | | | | | | | | | |
| <i>V. corymbosum</i> L. var. <i>amoenum</i> (Ait.) Gray | | | | | | | | | | | | | | | | | | | | |
| <i>V. dimorphum</i> Bigel. | | | | | | | | | | | | | | | | | | | | |
| <i>V. erythrocarpum</i> Michx. | | | | | | | | | | | | | | | | | | | | |
| <i>V. dimorphum</i> Bigel. | | | | | | | | | | | | | | | | | | | | |
| <i>V. corymbosum</i> L. var. <i>albi-</i> <i>florum</i> (Hook.) Fern. | | | | | | | | | | | | | | | | | | | | |
| <i>V. corymbosum</i> L. var. <i>amoenum</i> (Ait.) Gray | | | | | | | | | | | | | | | | | | | | |

TABLE 4. (Continued) — Species of Plants Reported from the Hackensack Meadows or Surrounding Areas (Britton, 1889) ¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (BRITTON, 1889) | LOCALITY ² | | | | | | | | | | | | | | | | | | | |
|---------------------------------------|---|-----------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| <i>V. macrocarpon</i> Ait. | | | | | | | | | | | | | | | | | | | | | |
| <i>V. oxycoccus</i> L. | <i>Oxycoccus palustris</i> Pers. | | X | | | | | | | | | | | | | | | | | | |
| <i>Veronica hederaefolia</i> L. | | | | | | | | | | | | | | | | | | | | | X |
| <i>Viburnum nudum</i> L. | | | | | | | | | | | | | | | | | | | | | |
| <i>Viola rafinesquii</i> Greene | <i>V. tenella</i> Muhl. | | | X | | | | | | | | | | | | | | | | | X |
| <i>V. pennsylvanica</i> Michx. | <i>V. pubescens</i> Ait. var. <i>scabrituscula</i> T. & G. | | | | | | | | | | | | | | | | | | | | X |
| <i>Woodsia obtusa</i> (Spreng.) Torr. | | | | | | | | | | | | | | | | | | | | | |
| <i>Woodwardia areolata</i> (L.) Moore | | | | | | | | | | | | | | | | | | | | | X |
| <i>W. virginica</i> (L.) Smith | | | | | | | | | | | | | | | | | | | | | |
| <i>Xyris flexuosa</i> Muhl. | | | | | | | | | | | | | | | | | | | | | |
| <i>Zizania aquatica</i> L. | | | | | | | | | | | | | | | | | | | | | |

¹ Britton's nomenclature has not been changed, but more up-to-date nomenclature is given which follows Fernald (1950). Where a binomial is not given under Britton, the nomenclature is considered identical to that of Fernald. A question mark after Fernald's nomenclature indicates doubt in the mind of the present author as to what is the correct corresponding binomial used by Fernald.

² The localities represented by collections include: (1) New Durham; (2) Secaucus; (3) Hackensack Meadows in general; (4) Bergen Meadows; (5) Bergen in general; (6) Schuyler's Corner; (7) Bergen Hill; (8) Bergen Neck; (9) Bergen Point; (10) Fairview; (11) Woodridge; (12) Arlington; (13) Little Ferry; (14) Lyndhurst; (15) Carlstadt; (16) Rutherford; (17) Little Snake Hill; (18) Snake Hill; (19) Newark Meadows; and (20) Weehawkin.

TABLE 5. — Species of Plants Reported from the Hackensack Meadows by Harshberger and Burns in 1919¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (HARSHBERGER AND BURNS, 1919) | | LOCALITY OR HABITAT ² | | | | | | | | | | | | |
|--|---|---|----------------------------------|---|---|---|---|---|---|----|----|----|----|---|--|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | | |
| <i>Acalypha virginica</i> L. | | | | X | | | | | | | | | | | |
| <i>Acer saccharinum</i> L. | X | | | | | | | | | | | | | | |
| <i>A. saccharum</i> Marsh. | X | | | | | | | | | | | | | | |
| <i>Achillea millefolium</i> L. | | | | | | | X | | | | | | | | |
| <i>Amaranthus retroflexus</i> L. | | | | | | | X | | | | | | | | |
| <i>Ambrosia artemisiifolia</i> L. | | | | | | | X | | | | | | | | |
| <i>A. trifida</i> L. | | | | | | | X | | | | | | | | |
| <i>Amelanchier canadensis</i> (L.) Medic. | | | | | | | X | | | | | | | | |
| <i>Andropogon gerardi</i> Vitman | | X | | | | | | | | | | | | | |
| <i>A. scoparius</i> Michx. | | X | | | | | | | | | | | | | |
| <i>Apocynum cannabinum</i> L. | | | | | | | | | | | | | | X | |
| <i>Arctium minus</i> (Hill) Bernh. | | | | | | | X | | | | | | | | |
| <i>Asclepias incarnata</i> var. <i>pulchra</i> (Ehrh.) Pers. | | | | | | | | | | | | | | | |
| <i>Aster simplex</i> Willd. | | | | | | | | | | | | | | | |
| <i>A. simplex</i> Willd. var. <i>ramosissimus</i> (T. & G.) Cronq. | | | | | | | | | | | | | | X | |
| <i>Aster tradescanti</i> L. | | | | | | | | | | | | | | X | |
| <i>Avena sativa</i> L. | | | | | | | | | | | | | | | |
| <i>Betula lenta</i> L. | | | | | | | | | | | | | | | |
| <i>B. populifolia</i> Marsh. | | | | | | | | | | | | | | | |
| <i>Bidens coronata</i> (L.) Britt. | | | | | | | | | | | | | | | |
| <i>B. frondosa</i> L. | | | | | | | | | | | | | | | |
| <i>Bulbostylis capillaris</i> (L.) C. B. Clarke | | | | | | | | | | | | | | X | |
| <i>Bulbostylis capillaris</i> (L.) Britton | | | | | | | | | | | | | | X | |
| <i>Calamagrostis canadensis</i> (Michx.) Nutt. | | | | | | | | | | | | | | | |
| <i>Calopogon pulchellus</i> (Salisb.) R.Br. | | | | | | | | | | | | | | | |
| <i>Celastrus scandens</i> L. | | | | | | | | | | | | | | | |
| <i>Celtis occidentalis</i> L. | | | | | | | | | | | | | | | |
| <i>Chenopodium album</i> L. | | | | | | | | | | | | | | X | |
| <i>A. oblongifolia</i> (T. & G.) Roem. | | | | | | | | | | | | | | | |
| <i>A. furcatus</i> Muhl. | | | | | | | | | | | | | | | |
| <i>A. minus</i> Bernh. | | | | | | | | | | | | | | | |
| <i>A. paniculatus</i> Lam. | | | | | | | | | | | | | | | |
| <i>A. paniculatus</i> Lam. var. <i>bellidiflorus</i> (Willd.) Burgess | | | | | | | | | | | | | | | |
| <i>A. tradescanti</i> L. | | | | | | | | | | | | | | | |
| <i>B. trichosperma</i> (Michx.) Britton | | | | | | | | | | | | | | | |
| <i>Stenophyllus capillaris</i> (L.) Britton | | | | | | | | | | | | | | | |
| <i>C. canadensis</i> (Michx.) Beauv. | | | | | | | | | | | | | | | |
| <i>C. pulchellus</i> (Sw.) R.Br. | | | | | | | | | | | | | | | |

TABLE 5. (Continued) — Species of Plants Reported from the Hackensack Meadows by Harshberger and Burns in 1919¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (HARSHBERGER AND BURNS, 1919) | | LOCALITY OR HABITAT ² | | | | | | | | | | | | |
|--|---|---|----------------------------------|---|---|---|---|---|---|----|----|----|----|---|--|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | | |
| <i>Linaria vulgaris</i> Hill | | | | | | | | | | | | | | X | |
| <i>Liquidambar styraciflua</i> L. | | X | | | | | | | | | | | | | |
| <i>Lobelia siphilitica</i> L. | | | | | X | | | | | | | | | | |
| <i>Ludwigia alternifolia</i> L. | | | X | | | | | | | | | | | | |
| <i>Lycopodium alopecuroides</i> L. | | | | X | | | | | | | | | | | |
| <i>Medicago sativa</i> L. | | | | | | | | X | | | | | | | |
| <i>Meibotus alba</i> Desr. | | | | | | | | X | | | | | | | |
| <i>M. officinalis</i> (L.) Lam. | | | | | | | | X | | | | | | | |
| <i>Menyanthes trifoliata</i> L. var. <i>minor</i> Raf. | | | | X | | | | | | | | | | | |
| <i>Nepeta cataria</i> L. | | | | | | | | X | | | | | | | |
| <i>Oenothera biennis</i> L. | | | | | | | | X | | | | | | | |
| <i>Osmunda regalis</i> L. var. <i>spectabilis</i> (Willd.) Gray | | | | | X | | | | | | | | | | |
| <i>Panicum capillare</i> L. | | | | | | | | | | X | | | | | |
| <i>P. dichotomiflorum</i> Michx. | | | | | | | | | | | | | | X | |
| <i>P. lanuginosum</i> Ell. var. <i>fasciculatum</i> (Torr.) Fern. | | X | | | | | | | | | | | | | |
| <i>P. virgatum</i> L. | | X | | | | | | | | | | | | X | |
| <i>Parnassia glauca</i> Raf. | | | | | | | | | | | | | | | |
| <i>Parthenocissus quinquefolia</i> (L.) Planch. | | | | | | | | | | X | | | | | |
| <i>Phytolacca americana</i> L. | | | | | | | | | | | | | | X | |
| <i>Phytolacca lanceolata</i> L. | | | | | | | | | | | X | | | | |
| <i>P. major</i> L. | | | | | | | | | | | X | | | | |
| <i>Pogonia ophioglossoides</i> (L.) Ker. | | | | | | | | | | | | | | | |
| <i>Polygonum arifolium</i> L. | | | | | | | | | | | | X | | | |
| <i>P. aviculare</i> L. | | | | | | | | | | | | | | X | |
| <i>P. convolvulus</i> L. | | | | | | | | | | | | | | X | |
| <i>P. hydropiper</i> L. | | | | | | | | | | | | | | X | |
| <i>P. lapathifolium</i> L. | | | | | | | | | | | | | | X | |
| <i>P. Convolvulus</i> L. | | | | | | | | | | | | | | X | |
| <i>P. Hydropiper</i> L. | | | | | | | | | | | | | | X | |
| <i>P. huachucae</i> Ash. | | | | | | | | | | | | | | | |
| <i>P. caroliniana</i> Michx. | | | | | | | | | | | | | | | |
| <i>Psedera quinquefolia</i> (L.) Greene | | | | | | | | | | | | | | | |
| <i>Phytolacca decandra</i> L. | | | | | | | | | | | | | | | |

TABLE 5. (Continued) — Species of Plants Reported from the Hackensack Meadows by Harshberger and Burns in 1919¹

| NOMENCLATURE (FERNALD, 1950) | NOMENCLATURE (HARSHBERGER AND BURNS, 1919) | | LOCALITY OR HABITAT ² | | | | | | | | | | | | |
|---|---|---|----------------------------------|---|---|---|---|---|---|----|----|----|----|---|--|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | | |
| <i>S. nigra</i> Marsh. | | X | | | | | | | | | | | | | |
| <i>Sambucus canadensis</i> L. | | | | | | | | | | | | | | X | |
| <i>Sanguisorba canadensis</i> L. | | | | | | | | | | | | | | | |
| <i>Saponaria officinalis</i> L. | | | | | | | | | | | | | | X | |
| <i>Sassafras albidum</i> (Nutt.) Nees. | | X | | | | | | X | | | | | | | |
| <i>Sassafras variifolium</i> (Salisb.) Ktze. | | | | | | | | | | | | | | X | |
| <i>Scirpus rubricosus</i> Fern. | | | | | | | | | | | | | | | |
| <i>Scrophularia lanceolata</i> Pursh | | X | | | | | | | | | | | | | |
| <i>Scrophularia leporella</i> Bicknell | | | | | | | | | | | | | | X | |
| <i>Setaria glauca</i> (L.) Beauv. | | | | | | | | | | | | | | | |
| <i>Sicyos angulatus</i> L. | | | | | | | | | | | | | | | |
| <i>Silene stellata</i> (L.) Ait. | | X | | | | | | | | | | | | | |
| <i>Sisymbrium altissimum</i> L. | | | | | | | | | | | | | | X | |
| <i>Smilacina racemosa</i> (L.) Desf. | | X | | | | | | | | | | | | | |
| <i>Solanum dulcamara</i> L. | | | | | | | | | | | | | | | |
| <i>Solidago altissima</i> L. | | | | | | | | | | | | | | | |
| <i>S. bicolor</i> L. | | X | | | | | | | | | | | | X | |
| <i>S. canadensis</i> L. | | | | | | | | | | | | | | | |
| <i>S. graminifolia</i> (L.) Salisb. var. | | | | | | | | | | | | | | | |
| <i>nuttallii</i> (Greene) Fern. | | | | | | | | | | | | | | X | |
| <i>S. nemoralis</i> Ait. | | X | | | | | | | | | | | | | |
| <i>S. rigida</i> L. | | X | | | | | | | | | | | | | |
| <i>S. uliginosa</i> Nutt. | | | | | | | | | | | | | | X | |
| <i>S. ulmifolia</i> Muhl. | | | | | | | | | | | | | | | |
| <i>Sonchus asper</i> (L.) Hill | | | | | | | | | | | | | | | |
| <i>Sorghastrum nutans</i> (L.) Nash | | | | | | | | | | | | | | X | |
| <i>Spartina cynosuroides</i> (L.) Roth | | | | | | | | | | | | | | | |
| <i>Spiraea tomentosa</i> L. | | | | | | | | | | | | | | X | |
| <i>Taraxacum officinale</i> Weber | | | | | | | | | | | | | | | |
| <i>Teucrium canadense</i> L. (var. not given) | | | | | | | | | | | | | | X | |
| <i>T. canadense</i> L. var. <i>litorale</i> (Bicknell) Fern. | | | | | | | | | | | | | | X | |

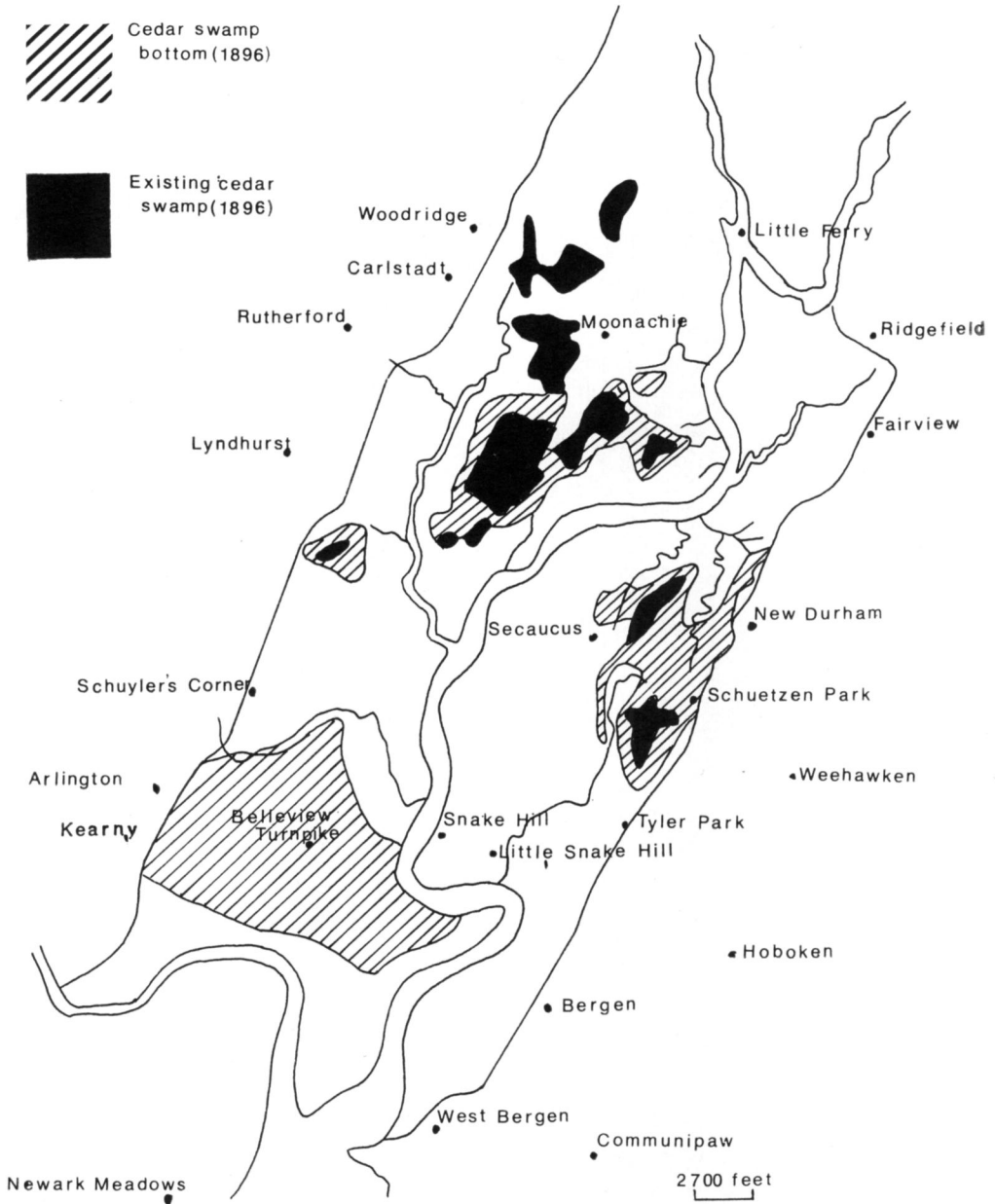
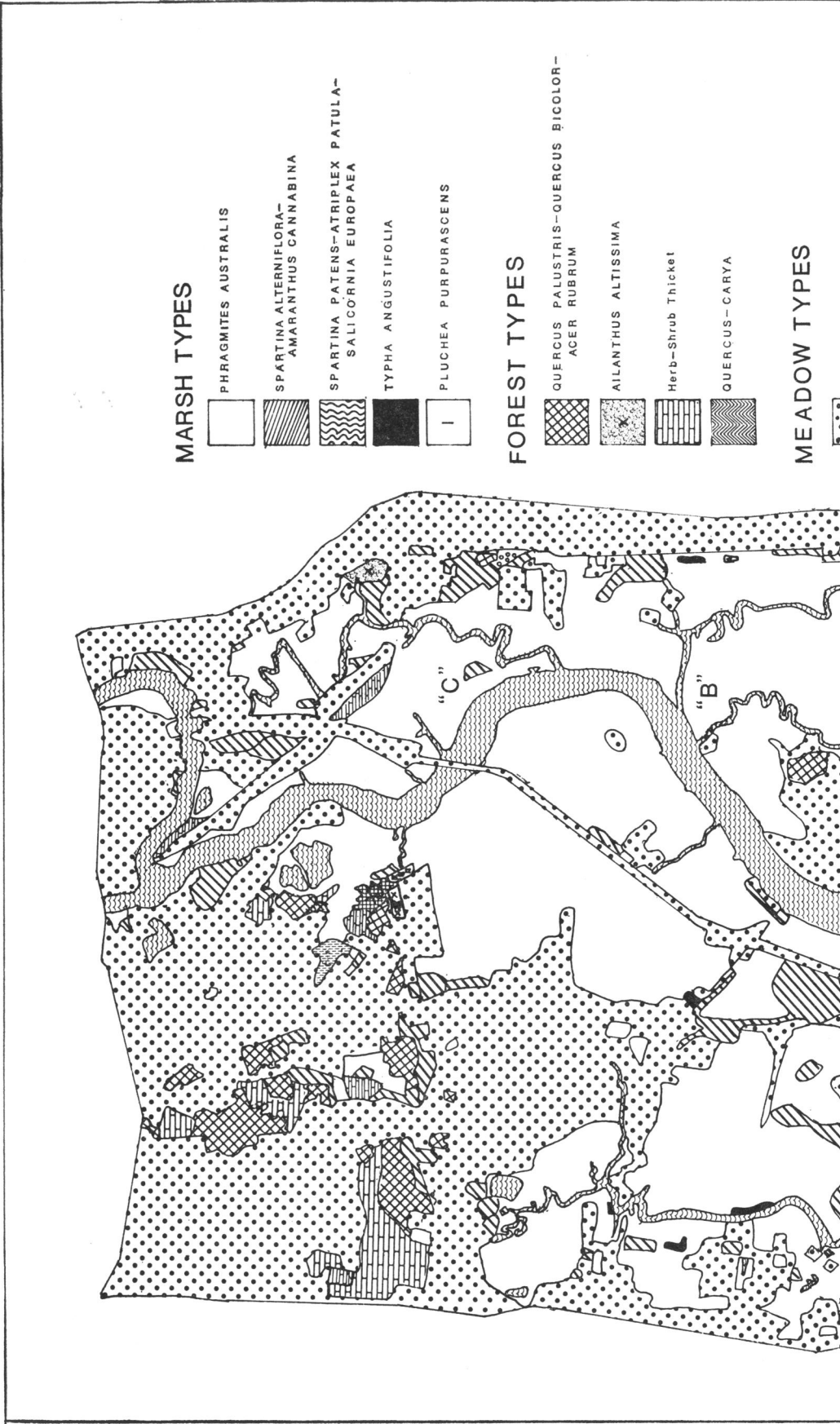
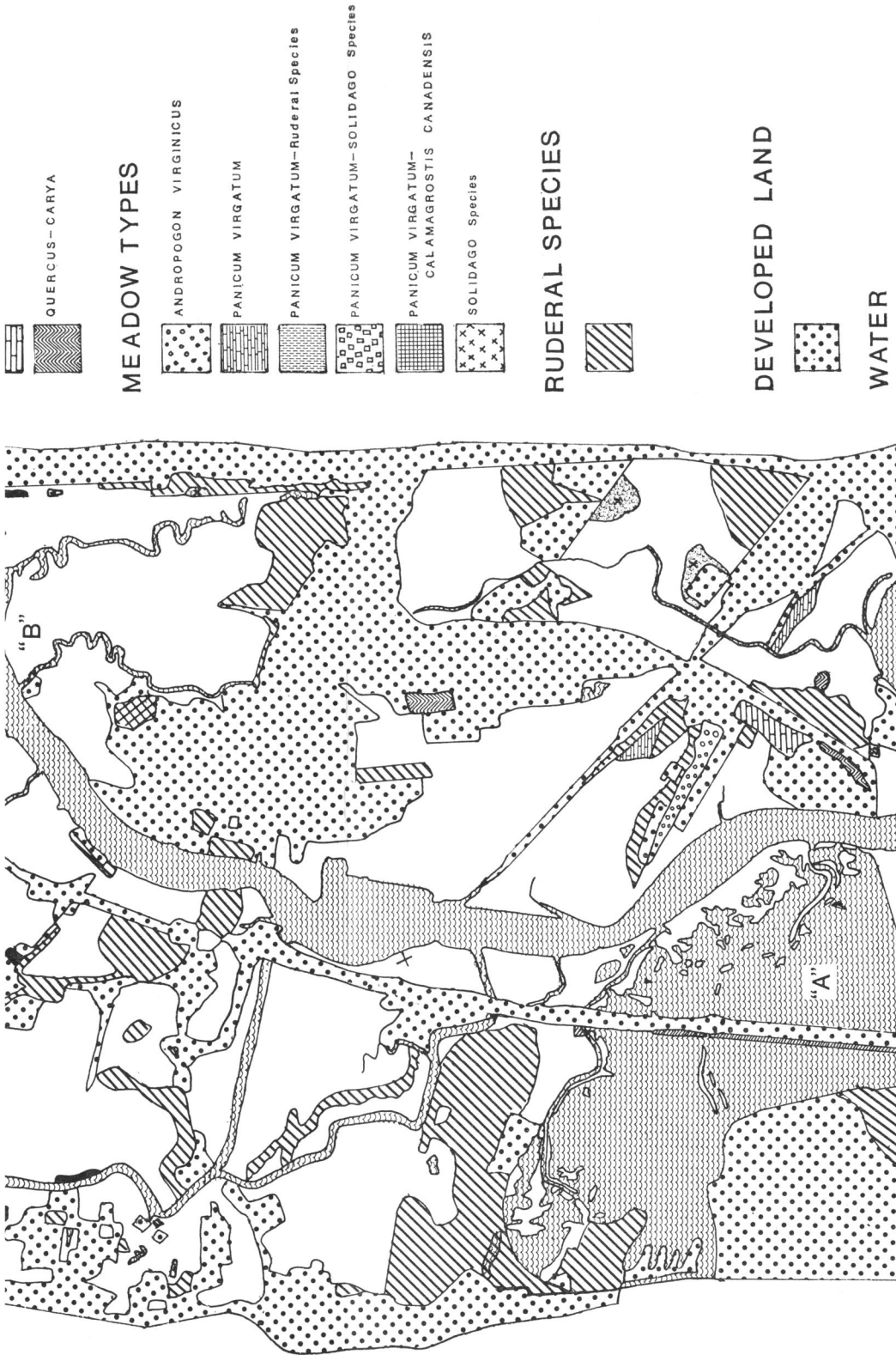


FIGURE 1. Map of Hackensack Meadows (Vermeule, 1896) indicating collection localities of various botanists.





DEVELOPED LAND
WATER



WATER



VEGETATION OF THE HACKENSACK MEADOWS BY WILLIAM SIPPLE

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