

THE VASCULAR FLORA AND VEGETATIONAL COMMUNITIES OF HAYES ARBORETUM IN WAYNE COUNTY, INDIANA

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ABSTRACT. An inventory of the naturally occurring or naturalized vascular flora occurring at Hayes Arboretum revealed 525 species representing 316 genera and 97 families. The 12 families containing 57% of the documented species were Asteraceae, Poaceae, Cyperaceae, Rosaceae, Ranunculaceae, Liliaceae, Fabaceae, Brassicaceae, Lamiaceae, Apiaceae, Scrophulariaceae, and Caprifoliaceae. Of the documented flora, 375 were native and 150 were adventives. A detailed physiognomic analysis is presented. Of the 525 species reported, 305 represent Wayne County records. The Floristic Quality Index (FQI) for the native species is 72.0, while for all species the FQI is 60.8. The mean Coefficient of Conservatism (C_{av}) for the native species is 3.7, while for all species the C_{av} is 2.7. The mean Wetland Indicator Status (W) for the native species is 0.7, while for all species, the mean W is 1.3. The FQI, C_{av} , and mean W are discussed; and they suggest that Hayes Arboretum is a site with high natural quality that is being compromised by adventives. The vascular flora of Hayes Arboretum includes one rare species, (*Crataegus succulenta*), one endangered species (*Geranium bicknellii*), two threatened species (*Thalictrum pubescens* and *Veronica anagallis-aquatica*), and one species on the watch list (*Panax quinquefolius*). Based on hydrology, soil types, and topography, the major community types (beech-maple forest, mixed hardwood forest in various stages of succession, steep slope and upland woods, floodplain woodland adjacent to Culmer's Run, wet meadows, cattail marsh, seeps, ponds, and fields) are described.

Keywords: Wayne County, Hayes Arboretum, Floristic Quality Index (FQI), county records—vascular plants, plant communities, beech-maple forest, floodplain woods, upland woods, successional woods, cattail marsh, flora—Indiana

Hayes Arboretum is located in the northeast corner of Richmond, Indiana, nestled between U.S. Route 40 and Interstate 70 in Wayne County. It is owned and maintained by the Stanley W. Hayes Research Foundation, Inc. for the use and benefit of the public on a regulated basis. The 202.4 hectare (~ 500 acres) arboretum is a repository for native wild plants indigenous to Wayne County and the counties of the Whitewater Valley Drainage Basin in Indiana and Ohio. It is both an educational facility and a managed nature preserve. As an educational institution, its goals are to provide the public with the best quality resource information available in the area

about natural history—especially plants, their disease, care, proper placement, and growth. As a nature preserve, it serves as a permanent habitat for the native flora and fauna of this region.

Under the ownership of Stanley W. Hayes and continuing after the inception of the arboretum in April 1963, the aspiration was to reforest the land with native trees as it was when the first pioneers pushed through this area. Hayes wanted to recreate and protect the natural heritage that the land had to offer. With this aim, much attention was and is placed on the woody flora of the arboretum, with less attention to the herbaceous flora.

There have been several studies of the flora of the arboretum. In 1969, Lindsey et al. (1969) analyzed the woody vegetation in what they termed the "most nearly natural part of the property," the section that the staff refers to as the old-growth woods. They found *Fagus grandifolia* to have the highest importance value based on basal area and density. However, they also reported that high importance values for mature (i.e., over 10 cm dbh) *Prunus serotina* and *Liriodendron tulipifera* and a low one for *Acer saccharum* set this community apart from typical natural maple-beech forest of the region. The most notable study of the herbaceous flora, entitled "Phenology of Wildflowers at Hayes Regional Arboretum," was published in 1975 by Elaine Gandolph Hendricks (1975). Hendricks published the flowering dates of 250 herbaceous plants occurring in the arboretum. Other studies include a list of 251 woody plants (trees, shrubs, and vines) occurring in the arboretum (Staff 1982). In 1994, Paul C. McClure published a list of the vascular plant species at the arboretum (McClure 1994). McClure's list contained over 285 species of plants. In 2001, the Indiana Department of Natural Resources (IDNR) surveyed the old-growth forest north of the Nature Center for potential impact by gypsy moth. In the IDNR report, they noted that many of the large trees were in poor condition due to old age, storm damage, and disease. IDNR also noted the high number of exotic invasive shrubs, 1196 per ha, in the old-growth forest (Jayson R. Waterman, IDNR District Forester, pers. commun.).

An inventory of resources is the necessary first step in developing a long-term resource management plan. Homoya et al. (1985) used floral species composition and distribution as an important component for delineating various natural regions. An inventory is the simplest means to document species diversity and is a fundamental step in monitoring changes that may occur in species composition. Additionally, measures of diversity are frequently seen as indicators of the well-being of ecological systems (Magurran 1988). Given the history of severe anthropogenic disturbance followed by nearly 100 years of aspiring to return the site to its presettlement condition, Hayes Arboretum provides an opportunity for numerous ecological studies, including the long-term monitoring of species composition,

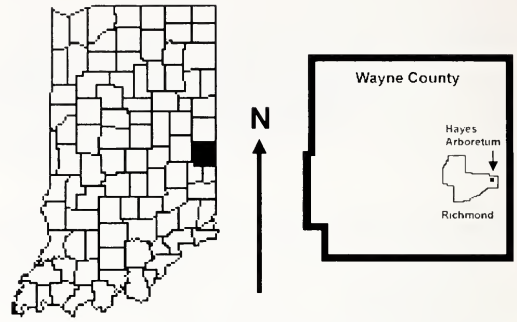


Figure 1.—Location of Hayes Arboretum. Map of Indiana (left) showing the location of Wayne County and Richmond, and the location of Hayes Arboretum in the northeast section of Richmond (right).

size class structure, ecological succession, and the problem of invasive exotics. In this study, our goals were (1) to inventory the natural vascular flora of Hayes Arboretum; (2) to visually estimate the relative distribution of each species; and (3) to describe the seasonal changes in the vegetation for the different habitats. It should be noted that this study concentrated on the natural vascular flora. Species that were planted for educational purposes, such as *Aesculus flava* Aiton and *Rhus aromatica* Aiton, were noted but not included in this inventory even if they may be native to the greater Richmond area.

THE STUDY AREA

Hayes Arboretum, consisting of approximately 202.4 ha, is located in the northeast corner of Richmond, Indiana in Wayne County (New Paris Quadrangle, north part of the NW one-quarter of Section 35, Township 14 North, Range 1 West; or UTM Zone 16 S, 0684106E by 4412094N [parking lot west of Nature Center], NAD83) (Fig. 1). The property is bordered on the west by Elks Road and some residential sites, on the north by a line of the Pennsylvania Railroad, on the east by Gravel Pit Road, some residential sites and property owned by the Indiana American Water Company Water Company (which is leased to the arboretum), on the southwest by U.S. Route 40, and on the south-central and south-east by Woodside Road. The arboretum is divided into the West Side and the East Side by Hayes Arboretum Road. The East Side, the smaller of the two sections, is currently closed

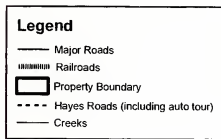
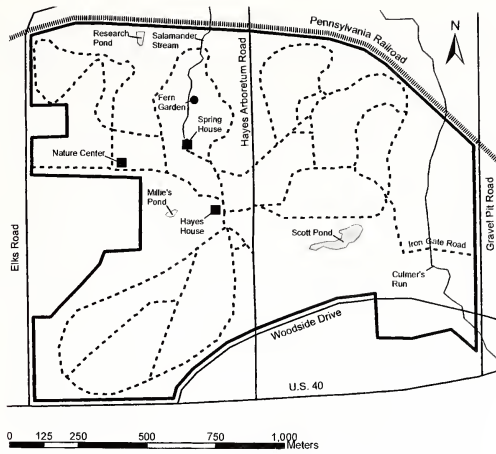


Figure 2.—Map showing the boundary, prominent features, and reference points of Hayes Arboretum. The dash lines indicate the roads within the arboretum, but the auto tour is only in the western section (west of Hayes Arboretum Road).

to the public. An auto tour route runs through the west side (Fig. 2).

Hayes Arboretum contains a variety of natural habitats. The primary types include an older beech-maple woodland, many younger woodlands in various stages of succession, several fields (most manicured but a few with the edges undisturbed), several woodland creeks, one small seasonal pond, one large woodland pond, and one large pond partially shaded by woods, a large cattail marsh, several woodland seeps, three prairie plantings, a railroad embankment, and a variety of roadside habitats (Fig. 3). The wooded areas include hilltop, slope (often steep), and floodplain forests.

Hayes Arboretum lies within the Whitewater River Basin or Watershed. The Whitewater River Basin encompasses 3445 km² in southeastern Indiana and 376 km² in southwest Ohio and includes all of Wayne and Union counties, most of Fayette and Franklin counties, and parts of Randolph, Henry, Decatur, and Dearborn counties in Indiana and parts of Butler, Darke, Hamilton, and Preble Counties in Ohio. The Whitewater River Ba-

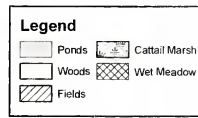


Figure 3.—Map showing the prominent physical features and the major habitat types at Hayes Arboretum.

sin, which lies within the Miami River Basin of the Ohio River drainage system, extends approximately 120 km along the Indiana-Ohio state line and eventually flows into the Great Miami River, which empties into the Ohio River at the intersection of the Indiana, Ohio, and Kentucky state lines (Indiana Department of Natural Resources 1988; U.S. Environmental Protection Agency 2004; Woodfield 2001).

The Whitewater River has its origin at two sites. The headwaters of the East Fork of the Whitewater River are located in southwestern Darke County, Ohio. The East Fork drains the northeastern part of the Whitewater basin, including Richmond, Indiana (and Hayes Arboretum), as it flows south-southwest. The headwaters of the West Fork of the Whitewater River are located in extreme southern Randolph County, Indiana. The West Fork drains the northwestern and western part of the Whitewater basin, that is, the area west of Richmond. In Franklin County, the West Fork bends southeast to join the East Fork to form the Whitewater River near Brookville, Indiana (Indiana Department of Natural Resources 1988; Thorp 1983; U.S. Environmental Protection Agency 2004; Woodfield 2001).

The Whitewater River Basin includes two physiographic units. The Tipton Till Plain,

comprising the northern one-third of the basin, is characterized by flat to gently-rolling terrain, the result of continental glaciation during which glacial till and outwash were deposited as the ice advanced and retreated from Indiana during the Wisconsin glacial stage (Hedge 1997; Homoya et al. 1985; Melhorn 1997; Woodfield 2001). The headwaters of both the East Fork and West Fork of the Whitewater River occur in the Tipton Till Plain. In contrast, the southern two-thirds of the basin is in the Dearborn-Upland natural area. This part of the basin is a highly dissected bedrock plateau of rugged relief with valley bottoms as much as 150 m (450 feet) lower than the plateau surface (Homoya et al. 1985; Indiana Historical Bureau 2004; Schneider 1966; Thorp 1983; Woodfield 2001).

Hayes Arboretum lies on the border between the Tipton Till Plain and the Dearborn Upland natural areas. The arboretum sets on the top of the plateau just south of the East Fork of the Whitewater River at the easternmost section of the Whitewater Gorge (Thorp 1983). Geologically, the plateau consists of Wisconsin till (e.g., unconsolidated sediments) that is 15–60 m deep (Indiana Geological Survey 1998). This unconsolidated material sets on the surface of the bedrock, which in the Richmond area is Ordovician shale and limestone (Woodfield 2001) and is part of the Cincinnati Arch (Indiana Department of Natural Resources 1988; Woodfield 2001).

The soil at the arboretum, the Miami-Crosby-Strawn association, is characterized as deep, nearly level to very steep, well-drained to somewhat poorly-drained soil formed dominantly in glacial till, generally occurring on uplands (Blank 1987; Wayne County Resource Inventory Council 2005). Specifically, the major soil type at the arboretum is Miami silt loam, a deep, well-drained soil with slopes (Blank 1987). The majority of the forested sites occur on the Miami silt loam. There is a small section of Eldean loam adjacent to the railroad track. Eldean loam, which supports forests, is a strongly sloping, well-drained soil (Blank 1987). On the west side of the arboretum, the fields and moist to wet woods south of the Hayes House contain Sleeth silt loam and Westland silty clay loam soils. These soils are deep, nearly level, poorly-drained soils (Blank 1987). On the east side of the arboretum, there are pockets of Eldean loam and

Sleeth silt loam within the Miami silt loam. These soils are primarily covered by successional woodlands. In the northern section of the East Side along the railroad, a pocket of Rodman gravelly loam occurs. This type, which is covered with successional woodlands, is characterized as steep to very steep, excessively drained soil on side slopes of outwash plains and moraines (Blank 1987). The final soil type on the East Side is Stonelick loam, a nearly level, deep, well-drained soil on which the floodplain along Culmer's Run occurs.

The Richmond area lies on the Wayne-Henry aquifer system (Indiana Department of Natural Resources 1988; Woodfield 2001). The local system in the Richmond area and Hayes Arboretum flows east. At the arboretum, part of the water from this system flows into Culmer's Run, a creek that flows north and eventually empties into the East Fork of the Whitewater River. On the west side, water flows into Salamander Creek, which flows north and empties into the East Fork of the Whitewater River.

BRIEF HISTORY OF HAYES ARBORETUM

Inhabitants have shaped the land and its use with evidence reaching back to early woodland Indians, including Adena and Hopewell cultures. From some of the earliest records, we have identified the Robert Comer family as having received a land grant for serving in the War of 1812. The Comer family built a log house and began clearing the land for gardens and pasture. In 1833, a large post and beam barn was constructed (which presently serves as the Nature Center). In June 1915, Stanley Hayes began purchasing property including most of the remaining Comer family lands. Hayes was interested for three noted reasons: (1) its location near U.S. 40 and the railroad; (2) the presence of the Indian mounds; and (3) the 25 ha tract of natural woods that reminded him of his youth in central Ohio during the 1870s. Other than this natural woodland, the rest of the land had been cleared. Over the next 20 years, Hayes acquired additional contiguous acres until his purchases concluded in 1935 with a total area of 115 ha.

Several individuals influenced Hayes, two of whom were Luther Burbank and Charles

Deam. Hayes' personal association with these two led him to pursue collections that were native to the area. Extensive tree-replanting programs began in 1923 and continued for 10 years, with approximately 140,000 trees planted. Additional planting projects continued until most all of the cleared land had been replanted except for the areas that were to be kept as meadows and fields. Initial planting stock was selected hardwoods from Tennessee.

In 1959, Hayes created a foundation to receive his land and a good portion of his assets. The Stanley W. Hayes Research Foundation was created for educational and scientific purposes. After Hayes' death in 1963, the Hayes Arboretum project was launched and opened to the general public with the focus being on nature-related education and the display of Hayes' tree collections.

METHODS

During the 2002 and 2003 growing seasons, one to three forays per week were made into the study area. Forays were random but effort was made to cover all areas. Voucher specimens for each species observed were collected and deposited in the Ball State Herbarium (BSUH). Notes on vegetation consisted of species lists with visual estimates of their abundance (see catalog of vascular plants, Appendices 1–4). Additionally, seasonal changes in the dominant vegetation (based on time of flowering) were noted for the various habitats. Nomenclature followed the U.S.D.A. Plants Database (U.S.D.A. 2004). The species documented at Hayes Arboretum are listed in Appendices 1–4.

The floristic quality index (FQI) for the arboretum, calculated only for the plants listed in Appendix 1, was determined using the program developed the Conservation Research Institute in conjunction with Rothrock (2004).

RESULTS

The catalog of the vascular flora of Hayes Arboretum is listed in Appendices 1 to 4. Appendix 1 is a catalog of the naturally-occurring or naturalized vascular flora occurring at Hayes Arboretum. Summarizing this list, the vascular flora at Hayes Arboretum consists of 525 species representing 316 genera and 97 families. Twenty-eight families are represented by only one species. The 12 families with

Table 1.—Floristic Quality summary. Mean C is the mean Coefficient of Conservatism, FQI is the Floristic Quality Index, and mean W is the means Wetland Indicator Status.

| | Count | Mean C | FQI | Mean W |
|----------------|-------|--------|------|--------|
| Native species | 375 | 3.7 | 72.0 | 0.7 |
| Total species | 525 | 2.7 | 60.8 | 1.3 |

the highest number of species are the Asteraceae (60 species), Poaceae (53 species), Cyperaceae (39 species, including 32 *Carex* spp.), Rosaceae (23 species), Ranunculaceae (20 species), Liliaceae (19 species), Fabaceae (17 species), Brassicaceae (16 species), Lamiaceae (15 species), Apiaceae (14 species), Scrophulariaceae (14 species), and the Caprifoliaceae (12 species). These 12 families account for 302 of the 525 species, or 57.5%, of the species documented at the arboretum. Appendix 2 lists the ferns and their allies documented from the Fern Garden located north of the Spring House. Appendix 3 lists the plant species documented from the three small prairie plantings located south of Hayes House. The plants listed in Appendix 4 are species planted for display and educational purposes. None of the species in Appendix 4 have naturalized, and some are not native to east-central Indiana.

The physiognomic analysis of the flora, both native and exotic (adventive), for the arboretum reveals that of the 525 plants documented, 375, or 71.4 %, are native and 150, or 28.6%, are adventives. Of the 375 native species, 77 species are woody, 225 are herbaceous vines or forbs, 64 are graminoids, and 9 are ferns and their allies. Of the 150 adventives, 25 are woody, 97 are forbs, and 28 are grasses. The Floristic Quality Indices (FQI), the Coefficients of Conservatism (C), and the Wetland Indicator Status (W) are seen in Table 1. The average W for all species is 1.3 or an average rating of Fac (–).

Based upon the Indiana Natural Heritage Data Center's records for Wayne County, a total of 305 species documented at the arboretum are reported for the first time and represent county records. Lastly, based on the list compiled by the Indiana Natural Heritage program (3 May 1996 draft), the status of several plants at the arboretum is as follows: Rare: *Crataegus succulenta*; Endangered: *Geranium*

bicknellii; Threatened: *Thalictrum pubescens*, *Veronica anagallis-aquatica*; and on the Watch List: *Panax quinquefolius*.

HABITAT DESCRIPTIONS

The major habitats at Hayes Arboretum include fields (both mowed and non-mowed), roadsides, prairie plantings, woodlands, and wetlands. The woodland types include a beech-maple woods north of the nature center, floodplain woods along Culmer's Run and Salamander Creek, and mixed hardwood forest in various stages of succession. The wetland types include creeks, a woodland seep, three ponds and associated mud flats, a large cattail marsh, and several small wet meadows. Below are descriptions of the vegetation occurring in some of the habitats. See Figs. 2 & 3 for locations of these sites.

Beech-maple forest.—The older woodland lying north of the nature center is the most natural part of the property; and except for the invasive exotics, this woods would be a noteworthy remnant of former beech-maple forest of this region. The most frequent trees of the canopy include *Acer saccharum*, *Carya cordiformis*, *Fagus grandifolia*, *Fraxinus americana*, *Prunus serotina*, and *Quercus rubra*. Trees occurring along the woodland edges or dominating the understory are *Acer platanoides*, *Carpinus caroliniana*, *Cercis canadensis*, *Cornus drummondii*, *Ostrya virginiana*, and *Cercis canadensis*. The most frequent shrubs include *Euonymus alata*, *Ligustrum obtusifolium*, *Lonicera maackii*, *Menispermum canadense*, *Parthenocissus quinquefolia*, *Toxicodendron radicans*, *Viburnum prunifolium*, and *Vitis vulpina*. A large colony of *Aristolochia tomentosa* occurs in the northwest corner along the woods' edge.

The older growth woodland possesses a rich herbaceous layer. There are nearly 20 *Carex* spp., including *C. amphibola*, *C. communis*, and *C. woodii*. Grasses include *Elymus hystrix*, *E. villosus*, *E. virginicus*, *Festuca subverticillata*, and *Poa sylvestris*. Common spring and early summer flowering forbs include *Allium burdickii*, *Arisaema triphyllum*, *Asarum canadense*, *Cardamine concatenata*, *C. douglassii*, *Claytonia virginica*, *Dicentra cucullaria*, *Erigenia bulbosa*, *Galium concinnum*, *Geranium maculatum*, *Geum vernum*, *Hydrophyllum appendiculatum*, *H. macrophyllum*, *Maianthemum racemosum*, *Osmo-*

rhiza longistylis, *Packera obovata*, *Phlox divaricata*, *Podophyllum peltatum*, *Polygonatum biflorum*, *Sanguinaria canadensis*, *Trillium* spp., including *T. grandiflora* (abundant), *Viola pubescens*, and *V. sororia*. Mid-summer to fall flowering forbs include *Ageratina altissima*, *Agrimonia pubescens*, *Campanulastrum americanum*, *Cryptotaenia canadensis*, *Eupatoriadelphus purpureus*, *Helianthus decapetalus*, *Heliopsis helianthoides*, *Polymnia canadensis*, *Sanicula odorata*, *Solidago caesia*, *Symphotrichum cordifolium*, and *S. lateriflorum*. Although rare in distribution, other noteworthy herbs include *Aralia racemosa*, *Asclepias verticillata*, *Solidago riddellii*, and *Stachys nuttallii*. Although not found during the current study, *Geranium bicknellii* was previously collected at Hayes Arboretum. This is the first report of this species outside of the northeast corner of Indiana. Finally, the two most common ferns of the older woods are *Botrychium virginianum* and *Cystopteris protrusa*.

Mixed hardwood forest.—Primarily occurring on the east side of the arboretum, these woods are variable in age and location, e.g., lowland along small creeks, hillside, and hilltop. These forests contain a wide assortment of tree species, including *Acer saccharum*, *A. negundo*, *Aesculus glabra*, *Carpinus carolinianus*, *Carya cordiformis*, *C. ovata*, *Celtis occidentalis*, *Fagus grandifolia*, *Fraxinus americana*, *F. pennsylvanica*, *Juglans nigra*, *Liriodendron tulipifera*, *Prunus serotina*, *Quercus alba*, *Q. muhlenbergii*, *Q. rubra*, *Tilia americana*, *Ulmus americana*, and *U. rubra*. It is interesting to note that unlike most sites of east-central Indiana, there are no *Crataegus* spp. in the succession woods of Hayes Arboretum. The shrubs, vines, and herbaceous plants are essentially the same as listed for the beech-maple forest above. The noteworthy additions include *Arnoglossum reniforme*, *Carex hitchcockiana*, *Jeffersonia diphylla*, *Polemonium reptans*, *Prenanthes altissima* (abundant on the east side), *Sedum ternatum*, *Veronica anagallis-aquatica*, and *Zizia aurea*.

Steep slope and upland woods.—For whatever innate biological reasons, the steep slope and upland woods between the cattail marsh and Gravel Pit Road supports many species that are not typically found in other parts of the property. Referred to as Chinkapin Slope because of the high number of *Quercus*

muhlenbergii trees occurring here, this site also supports *Fraxinus quadrangulata*, *Lonicera maackii*, *Rhodotypos scandens*, and *Symphoricarpos orbiculatus*. The latter two occur only at this site. In the southern end of this wooded area is a thick, monoculture of *Lonicera maackii*. Herbaceous plants that are nearly unique to the Chinkapin Slope include *Aureolaria virginica*, *Carex pennsylvanica*, *Delphinium tricorne*, *Dodecatheon meadia*, *Heuchera americana*, *Luzula multiflora*, *Muhlenbergia tenuiflora*, *Ranunculus micranthus*, and *Trillium nivale*.

Floodplain woodland and meadow along Culmer's Run.—The tree species dominating this area include *Acer negundo*, *Aesculus glabra*, *Celtis occidentalis*, *Fraxinus pennsylvanica*, *Juglans nigra*, *Platanus occidentalis*, *Populus deltoides*, and *Ulmus americana*. Some of the shrubs occurring in this area include *Euonymus atropurpurea* (rare), *Lindera benzoin*, *Lonicera maackii*, *Prunus virginiana*, *Rosa multiflora*, *Sambucus nigra* subsp. *canadensis*, and *Viburnum lentago*. The most dominant plant in the herbaceous layer is *Equisetum arvense*. Graminoids of this layer include *Carex* spp., *Cinna arundinacea*, *Glyceria striata*, *Juncus dudleyi*, and *Phalaris arundinacea*. The herbaceous layer is rich in forbs, including *Agrimonia parviflora*, *Eupatorium perfoliatum*, *Floerkea proserpinacoides*, *Galium aparine*, *Hesperis matronalis*, *Impatiens capensis*, *Laportea canadensis*, *Lysimachia ciliata*, *L. nummularia*, *Pilea pumila*, *Rudbeckia laciniata*, *Rumex crispus*, and *Verbesina alternifolia*.

Other wet meadows.—There are two additional noteworthy wet meadows. The first occurs west of Culmer's Run near the railroad track. This meadow was dominated by three plants, *Glyceria striata*, *Leersia oryzoides*, and *Angelica atropurpurea*. This was the only site where purplestem angelica was found. The second is a small sedge meadow just north of the cattail marsh. The creek running through and draining the cattail meadow supplies water that keeps this meadow wet all year. This meadow was dominated by *Carex* spp., especially *C. hirsuta*, *C. shortiana*, and *C. stipata*. Forbs and grasses occurring at this site include *Chelone glabra*, *Eleocharis erythropoda*, *Lobelia siphilitica*, *Oxypolis rigidior*, *Poa trivialis*, *Polygonum punctatum*, and *Valerianella umbilicata*.

Cattail marsh.—This habitat is dominated by *Typha* spp., especially *T. angustifolia*. Other plants dominating this site include *Bidens cernua*, *Bidens tripartita*, *Carex lurida*, *Carex tribuloides*, *Chelone glabra*, *Eleocharis erythropoda*, *Epilobium coloratum*, *Leersia oryzoides*, *Lycopus americanus*, *L. uniflorus*, *Lysimachia nummularia*, *Mentha piperita*, *Pilea fontana*, *Polygonum hydropiper*, *Rorippa nasturtium-aquaticum*, *Rosa palustris*, *Sagittaria latifolia*, *Solanum dulcanara*, and *Symphotrichum puniceum*.

Seeps.—There are many minor seeps throughout the property. However, two large seeps occur from the slope running east to west between Gravel Pit Road and Culmer's Run, just south of Iron Gate Road. The larger seep (spring) flows north and supplies the water for the creek running through the cattail marsh. (See "cattail marsh" section for plants associated with this seep.) A smaller seep flows south from this slope forming a large wet area. This site does not support a large number of species throughout the year. The most common species are *Cardamine pennsylvanica*, *Carex oligocarpa*, *Cryptotaenia canadensis*, *Impatiens pallida*, *Poa trivialis*, and *Polygonum punctatum*.

Ponds.—Hayes Arboretum includes three ponds that are distinctly different from one another in both their physical environment and biodiversity. Millie's Pond is a small, man-made pond located just west of Hayes House. It is a seasonal pond, receiving full sunlight, and typically holds no water in late summer and fall of most years. Plants found typically only at this site include *Alisma subcordatum*, *Asclepias incarnata*, *Cirsium vulgare*, *Cyperus bipartitus*, *Eragrostis frankii*, *Euthamia graminifolia*, *Salix eriocephala*, *Solidago gigantea*, and *Symphotrichum novae-angliae*.

Research Pond has the lowest biodiversity due primarily to the fact that it receives very little direct sunlight because it is completely surrounded by woods. It is located in the north-central area of the west side, near the railroad track. Only the free-floating species *Lemna minor* and *Spirodela polyrrhiza* occur here. No submergent or emergent vegetation was seen.

Scott Pond is the largest and most botanically-diverse pond. Part of it receives full sunlight, while other parts are partially or fully shaded. The shallow southwestern part holds

no water from mid-to-late summer. The north-eastern part, next to the dam, is deep with a fairly steep slope. The plants found typically only at Scott Pond include *Cynanchum laeve*, *Cyperus esculentus* var. *leptostachyus*, *Eragrostis frankii* (also at Millie's Pond), *Eupatorium altissimum* (on the dam), *Ludwigia palustris*, *Onoclea sensibilis* (wooded edge of the pond), *Panicum capillare*, *Panicum dichotomiflorum*, *Penthorum sedoides*, *Phyla lanceolata*, *Polygonum lapathifolium*, *Potamogeton foliosus*, *Potamogeton nodosus*, *Scutellaria lateriflora* (drying edge), *Sida spinosa*, and *Xanthium strumarium*.

Fields.—The fields are dominated by grasses, including *Bromus inermis*, *Dactylis glomerata*, *Dichanthelium acuminatum* var. *fasciculatum*, *Digitaria* spp., *Elymus repens*, *Eragrostis* spp., *Lolium arundinaceum*, *Muhlenbergia schreberi*, *Phleum pratense*, *Poa pratensis*, *Setaria* spp., and *Tridens flavus*. One rare grass occurring in the field north of Scott Pond is *Danthonia spicata*. Herbaceous plants dominating the fields include *Achillea millefolium*, *Ambrosia* spp., *Barbarea vulgaris*, *Cichorium intybus*, *Daucus carota*, *Draba verna*, *Erigeron annuus*, *Leucanthemum vulgare*, *Oenothera biennis*, *Pastinaca sativa*, *Penstemon digitalis*, *Solidago* spp., including *Solidago nemoralis*, *Stellaria media*, *Symphotrichum lanceolatum*, *S. pilosum*, *Trifolium* spp., and *Vernonia gigantea*.

EXOTICS (ADVENTIVES)

As described earlier, Hayes Arboretum contains a high number of exotics. Of the 525 species documented in this study, 150, or 28.6%, are exotics. Most of the exotics were rare and occurred only in one or two sites. For example, *Yucca filamentosa* occurred only on the roadside between the Nature Center and the maintenance building. This species was obviously planted, but it has naturalized and is spreading at this site. Likewise, *Akebia quinata*, which was apparently planted, has become well-established in the small woods south of Hayes House. *Vincetoxicum nigrum* (*Cynanchum louiseae*) occurs in two large colonies. One is located along the red trail just south of Millie's Pond and the second along the railroad track between Elks Road and Hayes Arboretum Road. *Philadelphus coronarius*, which was planted on roadsides along

the auto tour south of Hayes House, has naturalized and become somewhat invasive.

Many adventives only occurred along the railroad track forming the northern border of the arboretum. These include *Aegilops cylindrica*, *Bromus racemosus*, *Bromus tectorum*, *Camelina microcarpa*, *Galium mollugo*, *Glycine max*, *Hordeum pusillum*, *Papaver dubium*, *Silene latifolia*, *Triticum aestivum*, and *Zea mays*. Likewise, several exotics were only abundant in the cattail marsh, including *Mentha x piperita* and *Rorippa nasturtium-aquaticum*.

There are a number of exotics species that have become widespread within the arboretum. *Acer platanoides* and *Duchesnea indica* are common in the woods just north of the Nature Center. Although infrequent, *Berberis thunbergii* occurs throughout these woods. *Euonymus alata* is common throughout the woods on the west side and is abundant in the woods between the Spring House and the fern garden. Although widespread, *Alliaria petiolata* and *Rosa multiflora* are not as common at the arboretum as other localities we have examined. *Hesperis matronalis* is a growing problem in the floodplain woods along Culmer's Run on the east side. Two exotic species abundant only on the east side are *Polygonum cespitosum*, which occurs along and in the dirt roads, and *Veronica hederifolia*, which occurs north from Iron Gate Road along the valley and hillside to the seep and around the east side of the cattail marsh.

In addition to *Euonymus alata*, the five most invasive adventives are *Ligustrum obtusifolium*, *Lonicera maackii*, *Maclura pomifera*, *Rhodotypos scandens*, and *Vinca minor*. *Ligustrum obtusifolium* was originally planted, but through the years it has become widespread along woody roadsides and throughout the woods, especially on the west side. *Lonicera maackii* is the most widespread exotic, occurring throughout the woods on both sides. It is so dense on the trail from the seep to the top of the hill on the east side that it has crowded out all other understory vegetation. *Maclura pomifera*, introduced to the mid-western U.S. from the western U.S., occurs along woody edges and open woods. A large colony of *Rhodotypos scandens* is growing in the upland woods between the cattail marsh and Gravel Pit Road. This species probably moved into the arboretum from the residences

along Gravel Pit Road. Once it was established, this species spread rapidly. Lastly, there are five or six colonies of *Vinca minor*. Although a relatively slow-growing exotic, it has become established in various woodland sites on the west side. One colony, located east of the Research Pond near the railroad track, covers about 0.1 ha.

DISCUSSION

The native and naturalized vascular flora at Hayes Arboretum includes the same core of plants, and consequently plant families, reported for other comparative sites in east-central Indiana (Rothrock et al. 1993; Rothrock 1997; Ruch et al. 1998, 2002, 2004; Stonehouse et al. 2003). These 12 plant families include the Apiaceae, Asteraceae, Brassicaceae, Caprifoliaceae, Cyperaceae, Fabaceae, Lamiaceae, Liliaceae, Poaceae, Ranunculaceae, Rosaceae, and Scrophulariaceae. In all of these studies as well as in the current one, these 12 families account for more than 50% of the plants reported. The flora at Hayes Arboretum is dominated by herbaceous plant species (413 species or 78.7%) including forbs (322 species), grasses (53 species), and sedges (39 species). Woody species (103 species) comprise 19.6% of the total species including trees (53 species), shrubs (35 species), and woody vines (15 species). Ferns and their allies account for only 1.7% (9 species) of the total.

Based on the inventory of the native vascular flora, Hayes Arboretum has a floristic quality index (FQI) of 72.0, with a mean coefficient of conservatism (C_{av}) of 3.7. The FQI indicates that the arboretum is of nature preserve quality, and suggests that it contains “noteworthy remnants of a region’s natural heritage” (Rothrock & Homoya 2005). The FQI at the arboretum exceeds or is similar to those at Barker Woods Nature Preserve in LaPorte County (FQI = 60.7), Bendix Woods Nature Preserve in St. Joseph County (FQI = 49.3), Botany Glen in Grant County (FQI = 68.5), Fall Creek Gorge Nature Preserve in Warren County (FQI = 64.1), Fogwell Forest Nature Preserve in Allen County (FQI = 59.3), Ginn Woods in Delaware County (FQI = 74.1), Hemlock Bluff Nature Preserve in Jackson County (FQI = 64.9), Lick Creek Summit in Wayne County (FQI = 68.9), and Wilbur Wright Fish and Wildlife Area in Hen-

ry County (FQI = 77.3) (Rothrock & Homoya 2005). The FQI at Mounds State Park (87.3) is considerably higher than that for the Hayes Arboretum.

According to Swink & Wilhelm (1994), species inventories from sites of natural quality will attain a C_{av} or 3.5 or higher, while those with high natural quality might be expected to have a C_{av} of 4.5 or greater. Because the average Indiana C values are 1.2 cohorts lower than those of the Chicago region (Rothrock & Homoya 2005), it is reasonable to anticipate that sites with high natural quality may have somewhat lower C_{av} values than those suggested by Swink & Wilhelm (1994). Rothrock & Homoya (2005) indicate that the best quality reference sites in central Indiana had C_{av} ranging from 3.8–4.1. The C_{av} of 3.7 for Hayes Arboretum, therefore, suggests that the site has remnant natural quality, although not in the higher quality category. The C_{av} for Hayes Arboretum is similar to those obtained for sites in neighboring counties, e.g., Ginn Woods in Delaware County (C_{av} = 3.9), and Wilbur Wright Fish and Wildlife Area in Henry County (C_{av} = 3.9). The C_{av} for Hayes Arboretum was lower than that for the other studies cited above (C_{av} of 4.0–4.5) with the exception of Fall Creek Gorge Nature Preserve (Rothrock & Homoya 2005). This may be due in part to the sampling procedure. As in our other studies at Ginn Woods and at Wilbur Wright Fish and Wildlife Area (Ruch 1998, 2002, 2004), we documented plants to the asphalt roads, to the railroad tracks, in manicured field and lawns, and in gardens and other disturbed areas. In addition to containing a high number of exotic species, these sites also include an inordinate number of native plants with low C values. Regardless of this, the lower C_{av} for the Hayes Arboretum compared to other sites suggests that for whatever historical or innate biological reasons, Hayes Arboretum has a limited number of species from the highest fidelity categories. In fact the flora from the arboretum contains only 18 species with C = 8, four species with C = 9, and only one species with C = 10.

The FQI and C_{av} for all species, both native and adventives, reveal additional information about the flora at the arboretum. The FQI for all species is 60.8, more than 10 units lower than the FQI for native species alone. Likewise, for all species, including adventives, the

C_{av} is 2.7, compared to a C_{av} of 3.7 for native species alone. Rothrock & Homoya (2005) have suggested that natural quality of an area is compromised when adventive diversity lowers C_{av} by more than 0.7 units. We documented 150 exotic species at the arboretum. The occurrence of these plants ranged from a few plants in a single location to species that are widespread and often locally abundant. It is obvious from our observations that exotics such as *Euonymus alata*, *Ligustrum obtusifolium*, *Lonicera maackii*, *Rhodotypos scandens*, and *Vinca minor* are having a severe impact on the native flora. In some locations on the east side of the arboretum, the *Lonicera maackii* is growing so thickly that it excludes any other plants. During its survey for the potential impact by gypsy moths on the arboretum in 2001, IDNR noted the high number of exotic invasive shrubs, 1196 per ha, in the old growth forest (Jayson R. Waterman, IDNR District Forester, pers. commun.).

There are several possible reasons for the occurrence of the high number of exotics at Hayes Arboretum. First, Hayes aspired to reforest the land with native trees as it was before European settlement. Although a noble goal, the focus was apparently on trees, with little attention being paid either to the herbaceous layer or especially the shrub layer. Second, due to the focus on trees, once shrubs were introduced, there was no effort to remove or control them. Most of the exotics were introduced by animals, especially birds. However, some, such as *Euonymus alata*, *Ligustrum obtusifolium*, and *Vinca minor*, were introduced by arboretum personnel. Once established, these species have spread, naturalized, and become the dominant species in cer-

tain sites. Lastly, except for the original wooded area north of the nature center, referred to as the "old-growth forest" by arborist personnel, most of the land currently covered by woodlands began as open fields. Although the features of an archetype old-field to mature forest succession can be seen, it is clear that the invasive exotics have altered the process by out-competing and replacing native flora. Additionally, Hayes Arboretum lies within the Richmond city limits. It is bordered on the south by highly-developed U.S. Route 40, residential development on the east and west sides, and fields that drop in elevation to the East Fork of the Whitewater River on the north. As such, it is isolated from other forested areas, particularly mature forests, which could serve as seed sources for native plants.

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APPENDIX I

CATALOG OF THE NATURAL VASCULAR FLORA AT HAYES ARBORETUM (arranged alphabetically by family)

Listed are voucher specimens for all naturally-occurring species observed at Hayes Arboretum. Nomenclature follows the U.S.D.A. Plants Database (U.S.D.A. 2005). Each species report contains the following information: (1) current scientific name based on the U.S.D.A. Plants Database; (2) current taxonomic synonyms, if appropriate; (3) common name(s), based primarily on Gleason & Cronquist (1991) and Swink & Wilhelm (1994); (4)

typical habitat(s) within the study site; (5) a visual estimate of its relative abundance; (6) its coefficient of conservatism (C-value) for Indiana (Rothrock 2004); and (7) the Ball State University Herbarium (BSUH) number(s).

The relative abundance for species is defined as follows: rare = < five sites although a species may be abundant at one site; infrequent = occasional, not widespread throughout its potential habitats, but

may be locally abundant at a site; frequent = common throughout its potential habitats and may be locally abundant at one or more sites; and abundant = common and numerous throughout its potential habitats.

The symbols in parentheses immediately preceding the C values refer to the following: * = naturalized (exotic), non-native species; # = Wayne County record; % = species in Hayes Arboretum herbarium but not found during this study. Species were deemed unreported for Wayne County (and hence considered a county record) if they did not appear in the computer database of Keller et al. (1984). (This is the same list of plants for Wayne County as the one at the Indiana Natural Heritage Data Center, IDNR).

The status categories of certain species in brackets (e.g., [Endangered], [Rare], [Threatened], and [Watch List]) are from the list compiled by the Indiana Natural Heritage Program (3 May 1996).

DIVISION EQUISETOPHYTA (Scouring Rushes)

Equisetaceae (Horsetail Family)

Equisetum arvense L.; Common or Field Horsetail; Floodplain meadow next to cattail marsh (east side); Frequent; C = 1; BSUH 11896.

Equisetum hyemale L. var. *affine* (Engelm.) A.A. Eat.; Common or Tall Scouring Rush; Along railroad track (east side) and in fern garden; Rare; C = 2; BSUH 11953.

DIVISION POLYPODIOPHYTA (Ferns)

Aspleniaceae (Spleenwort Family)

Cystopteris protrusa (Weatherby) Blasdell; Common Fragile Fern, Lowland Bladder Fern; Successional and old growth woods; Frequent; (#); C = 4; BSUH 12713.

Diplazium pycnocarpon (Spreng.) Broun; SYN: *Athyrium pycnocarpon* (Spreng.) Tidestrom; Glade Fern; Woods (west side); Rare; C = 9; BSUH 11289, 12986.

Polystichum acrostichoides (Michx.) Schott; Christmas Fern; Woods (west side); Infrequent; C = 5; BSUH 11755.

Onocleaceae (Sensitive Fern Family)

Onoclea sensibilis L.; Sensitive Fern; Wooded bank of Scott Pond; Rare; C = 4; BSUH 11270, 2549.

Ophioglossaceae (Adder's Tongue Family)

Botrychium dissectum Spreng. var. *obliquum* (Muhl.) Clute; Lace-frond Grape Fern, Bronze Fern; Woods; Infrequent; (#); C = 3; BSUH 11999.

Botrychium virginianum (L.) Swartz; Rattlesnake Fern; Woods; Frequent; C = 4; BSUH 11843.

Ophioglossum vulgatum L.; Southern Adder's Tongue Fern; Woods; Rare; (# %); C = 4; Hayes Arboretum Herbarium.

DIVISION CONIFEROPHYTA (Gymnosperms or Conifers)

Cupressaceae (Cypress Family)

Juniperus virginiana L.; Eastern Red Cedar; Edge of woods and in field; Infrequent; (#); C = 2; BSUH 11666, 12731.

DIVISION MAGNOLIOPHYTA (Angiosperms)

Acanthaceae (Acanthus Family)

Ruellia strepens L.; Smooth Ruellia, Limestone Wild Petunia; Woods north of Nature Center; Rare; C = 4; BSUH 11072, 11192, 11761.

Aceraceae (Maple Family)

Acer negundo L.; Boxelder; Ash-leaved Maple; Floodplain woods on east side; Infrequent; C = 1; BSUH 11879, 11912.

Acer nigrum Michx. f.; SYN: *Acer saccharum* s. *nigrum*; Black Maple; Floodplain woods on east side; Rare; C = 6; BSUH 11841, 11904.

Acer platanoides L.; Norway Maple; Woods just north of Nature Center; Infrequent, but locally frequent; (* #); C = 0; BSUH 11831.

Acer rubrum L.; Red Maple; Old growth woods near fern garden; Rare; (#); C = 5; BSUH 11885.

Acer saccharinum L.; Silver Maple; Floodplain woods and woods around Scott's Pond; Frequent; C = 1; BSUH 12699.

Acer saccharum Marshall; Sugar Maple; Woods; Abundant; C = 4; BSUH 12611.

Agavaceae (Agave Family)

Yucca filamentosa L.; Adam's Needle, Spanish Bayonet; Roadside east of Nature Center; Rare; (* #); C = 0; BSUH 12586.

Alismataceae (Water Plantain Family)

Alisma subcordatum Raf.; SYN: *Alisma plantago-aquatica* L. ssp. *subcordatum* (Raf.) Hultén; American, Southern, or Common Water Plantain; Millie's Pond; Rare; C = 2; BSUH 11159.

Sagittaria latifolia Willd.; Common or Broadleaf Arrowhead; Cattail marsh; Frequent; C = 3; BSUH 12997.

Amaranthaceae (Amaranth Family)

Amaranthus retroflexus L.; Redroot, Rough Pigweed, Redroot Amaranth; Disturbed ground near Nature Center; Rare; (* #); C = 0; BSUH 12622, 12631.

Anacardiaceae (Cashew Family)

Rhus glabra L.; Smooth Sumac; Field near Scott's Pond; Rare; (#); C = 1; BSUH 11115.

Toxicodendron radicans (L.) Kuntze var. *negundo* (Greene) Reveal; Common or Eastern Poison Ivy; Woods and fields; Abundant; (#); C = 1; BSUH 11860.

Annonaceae (Custard Apple Family)

Asimina triloba (L.) Dunal.; Pawpaw; Woods; Infrequent; (#); C = 6; BSUH 11837.

Apiaceae (Carrot Family)

Angelica atropurpurea L.; Great or Purplestem Angelica; Wet meadow west of Culmer's Run; Rare; C = 6; BSUH 11696.

Chaerophyllum procumbens (L.) Crantz; Spreading or Common Streambank Chervil; Woods on west side; Infrequent; (#); C = 2; BSUH 11797, 12692.

Conium maculatum L.; Poison Hemlock; Moist field and bank of Culmer's Run; Infrequent; (*); C = 0; BSUH 11864.

Cryptotaenia canadensis (L.) DC.; Canadian Honewort; Woods; Abundant; C = 3; BSUH 11862.

Daucus carota L.; Wild Carrot, Queen Anne's Lace; Fields and along railroad track; Frequent; (* #); C = 0; BSUH 12594.

Erigenia bulbosa (Michx.) Nutt.; Harbinger-of-Spring; Woods; Frequent; (#); C = 5; BSUH 11828.

Osmorhiza claytonii (Michx.) C.B. Clarke; Bland or Hairy Sweet Cicely; Woods; Frequent; C = 3; BSUH 12724.

Osmorhiza longistylis (Torr.) DC.; Long-styled Sweet Cicely, Aniseroot; Woods; Abundant; (#); C = 3; BSUH 11669.

Oxypolis rigidior (L.) Raf.; Cowbane; Wet meadow north of cattail marsh; Rare; C = 7; BSUH 11771.

Pastinaca sativa L.; Wild Parsnip; Fields and roadside; Frequent; (*); C = 0; BSUH 12696.

Sanicula canadensis L.; Canada Sanicle, Canadian Black Snakeroot; Woods; Frequent; C = 2; BSUH 11881, 11923, 12688.

Sanicula odorata (Raf.) K.M. Pryer & L.R. Philippe; SYN: *Sanicula gregaria* Bickn.; Cluster Sanicle, Clustered Black Snakeroot; Woods; Abundant; C = 2; BSUH 12723.

Torilis arvensis (Huds.) Link; Field or Spreading Hedge Parsley; Fields and roadside on east side near Iron Gate Road; Infrequent; (* #); C = 0; BSUH 11989.

Zizia aurea (L.) Koch; Common Golden Alexanders, Golden Zizia; Woods between cattail marsh and Culmer's Run; Rare; C = 7; BSUH 12678, 13000.

Apocynaceae (Dogbane Family)

Apocynum cannabinum L.; Dogbane, Indian Hemp; Fields and season wet area east of Nature Center; Infrequent; C = 2; BSUH 12504.

Vinca minor L.; Common Periwinkle; Woods;

Frequent (several large, spreading colonies); (* #); C = 0; BSUH 11827.

Araceae (Arum Family)

Arisaema dracontium (L.) Schott; Green Dragon, Dragon Root; Small woods east of fountain; Rare; C = 5; BSUH 12706.

Arisaema triphyllum (L.) Schott; Jack-in-the-Pulpit, Indian Turnip; Woods; Frequent; C = 4; BSUH 11791.

Araliaceae (Ginseng Family)

Aralia racemosa L.; American Spikenard; Woodland bank near railroad track on west side; Rare; C = 8; BSUH 11976.

Panax quinquefolius L.; American Ginseng; Woods on west side; Rare; C = 7; BSUH 11752. [Watch List]

Aristolochiaceae (Birthwort Family)

Aristolochia tomentosa Sims; Pipe Vine, Woolly Dutchman's Pipe; Northwest corner of west side (a large colony); Rare; (#); C = 7; BSUH 12585.

Asarum canadense L.; Canadian Wild Ginger; Woods; Frequent; C = 5; BSUH 11794.

Asclepiadaceae (Milkweed Family)

Asclepias incarnata L.; Swamp Milkweed; Millie's Pond; Rare; C = 4; BSUH 11179.

Asclepias syriaca L.; Common Milkweed; Field east of Scott Pond; Infrequent; (#); C = 1; BSUH 12658.

Asclepias verticillata L.; Whorled or Horsetail Milkweed; Southeast corner of first intersection on auto tour north of Nature Center; Rare; C = 4; BSUH 11965.

Cynanchum laeve (Michx.) Pers.; SYN: *Ampe-lamus albidus* (Nutt.) Britt.; Sandvine, Bluevine, Honeyvine; Around Scott Pond; Rare, but locally abundant; (#); C = 1; BSUH 11145, 11340, 12657.

Cynanchum louiseae Kartesz & Gandhi; SYN: *Vincetoxicum nigrum* (L.) Moench; Black Swallowwort; Louis Swallowwort; Open area along red trail south of Millie's Pond and northwest corner of west side along railroad track between Elks Road and Hayes Arboretum Road; Rare (two colonies); (* #); C = 0; BSUH 11086.

Asteraceae (Aster Family)

Achillea millefolium L.; Common Yarrow; Common Milfoil; Fields and roadside; Abundant; C = 0; BSUH 12702.

Ageratina altissima (L.) R.M. King & H. Rob.; SYN: *Eupatorium rugosum* Houtt.; White Snake-root; Woods; Abundant; C = 2; BSUH 11850, 12643.

Ambrosia artemisiifolia L. var. *elatior* Descourt.; Common or Annual Ragweed; Fields and roadside; Frequent; (#); C = 0; BSUH 11846.

Ambrosia trifida L.; Giant Ragweed; Fields; Abundant; (#); C = 0; BSUH 12634.

Antennaria neglecta Greene; Cat's Foot, Field Pussytoes; Field north of Nature Center; Rare; (# %); C = 3; Hayes Arboretum Herbarium.

Antennaria plantaginifolia (L.) Richards.; Common or Plantain Pussytoes, Woman's Tobacco; Fields east of Nature Center; Rare; (#); C = 3; BSUH 11399, 11906.

Arctium minus Bernh.; Common or Lesser Burdock; Seasonal wet area east of Nature Center and in various fields; Infrequent, but locally abundant; (#); C = 0; BSUH 12503.

Arnoglossum reniforme (Hook.) H. Rob.; SYN: *Cacalia muehlenbergii* (Schultz-Bip.) Fernald, *Arnoglossum muehlenbergii* (Schultz-Bip.) H. Rob.; Great Indian Plantain; Woods and roadside (east side); Infrequent; (#); C = 8; BSUH 12603.

Bidens cernua L.; Nodding Bur Marigold, Nodding Beggar Ticks; In and around cattail marsh; Infrequent; (#); C = 2; BSUH 11732.

Bidens tripartita L.; SYN: *Bidens comosa* (Gray) Wieg.; Three-lobe Beggar's Ticks, Strawstem Beggar's Ticks, Swamp Tickseed; In and around cattail marsh; Infrequent; (#); C = 2; BSUH 12510.

Bidens frondosa L.; Common or Devil's Beggar's Ticks; Wet areas, especially Culmer's Run, Salamander Creek, and Scott Pond; Abundant; (#); C = 1; BSUH 11777, 12516, 12527.

Cichorium intybus L.; Chicory; Fields and roadside; Abundant; (*); C = 0; BSUH 12588.

Cirsium arvense (L.) Scop.; SYN: *Cirsium arvense* (L.) Scop. var. *horridum* Wimmer & Grab.; Field or Canada Thistle; Field around concrete steps on east side; Rare; (*); C = 0; BSUH 12673.

Cirsium discolor (Muhl.) Spreng.; Field or Pasture Thistle; Fields; Abundant; (#); C = 3; BSUH 11170.

Cirsium vulgare (Savi) Ten.; Bull Thistle; North bank of Millie's Pond; Rare; (* #); C = 0; BSUH 11168.

Conyza canadensis var. *canadensis* (L.) Cronquist; Canadian Horseweed; Along railroad track, roadside, and in fields; Frequent; (#); C = 0; BSUH 11106.

Coreopsis tripteris L.; Tall Tickseed, Tall Coreopsis; Southeast corner of first intersection on auto tour north of Nature Center; Rare; (#); C = 8; BSUH 12506.

Elephantopus carolinianus Raesch.; Leafy or Carolina Elephant's Foot; Woods east of fern garden; Rare; (#); C = 5; BSUH 11968.

Erechtites hieracifolia (L.) Raf.; Fireweed; Fields near Scott Pond and east of the fountain; Infrequent; (#); C = 2; BSUH 11741, 12558.

Erigeron annuus (L.) Pers.; Annual Fleabane, Eastern Daisy Fleabane; Roadside and fields; Frequent; (#); C = 0; BSUH 11857.

Erigeron philadelphicus L.; Philadelphia Daisy;

Marsh Fleabane; Field around concrete steps on east side; Infrequent; C = 3; BSUH 11611.

Eupatoriadelphus maculatus (L.) R.M. King & H. Rob.; SYN: *Eupatorium maculatum* L.; Spotted Joe Pye Weed; Wet site along railroad track on west side; Rare; C = 5; 11155.

Eupatoriadelphus purpureus (L.) R.M. King & H. Rob.; SYN: *Eupatorium purpureum* L.; Purple-node or Sweet-scented Joe Pye Weed; In open and closed woods; Frequent; C = 5; BSUH 11440, 12666.

Eupatorium altissimum L.; Tall Eupatorium, Tall Boneset, Tall Thoroughwort; On dam of Scott Pond; Rare; (#); C = 1; BSUH 11736.

Eupatorium perfoliatum L.; Common Boneset; Moist field south of Iron Gate Road; Frequent; C = 4; BSUH 12638.

Euthamia graminifolia (L.) Nutt.; Common Flat-topped Goldenrod, Grass-leaved Goldenrod; Around Millie's Pond; Rare; (#); C = 3; BSUH 11767.

Galinsoga quadriradiata Cav.; Common Quickweed, Peruvian Daisy; Gardens and fields around Nature Center; Rare; (* #); C = 0; BSUH 12690.

Helianthus decapetalus L.; Forest, Pale, or Thin-leaf Sunflower; Woods; Abundant, especially on the east side; (#); C = 5; BSUH 11778, 12669.

Heliopsis helianthoides (L.) Sweet; Sunflower Everlasting, False Sunflower, Smooth Oxeye; Woods; Abundant; C = 4; BSUH 11141, 12656.

Krigia biflora (Walter) S.F. Blake; Two-Flowered False Dandelion, Orange Dwarf Dandelion; Woody roadside bank near gravel pit; Rare; (# %); C = 5; Hayes Arboretum Herbarium.

Lactuca canadensis L.; Tall or Canada Wild Lettuce; along railroad track; Near Scott and Millie's Ponds and edge of woods; Frequent; C = 2; BSUH 11955, 12560, 12659.

Lactuca serriola L.; Prickly Lettuce; Roadside at edge of field near fountain; Rare; (* #); C = 0; BSUH 12559.

Leucanthemum vulgare Lam.; SYN: *Chrysanthemum leucanthemum* L.; Ox-eye Daisy; Roadside and in fields; Infrequent; (* #); C = 0; BSUH 12727.

Matricaria discoidea DC.; SYN: *Matricaria matricarioides* (Less.) Porter; Pineapple Weed, Disc Mayweed; Gravel parking lot near Nature Center; Rare; (*); C = 0; BSUH 12725.

Packera glabella (Poir.) C. Jeffrey; SYN: *Senecio glabellus* Poir.; Butterweed, Yellowtop; Woods' edge in field west of annex; Rare; (#); C = 0; BSUH 11921.

Packera obovata (Muhl.) W.A. Weber & A. Löve; SYN: *Senecio obovatus* Muhl.; Round-Leaved Ragwort, Running Groundsel; Woods and fields; Abundant; C = 7; BSUH 11783.

Polymnia canadensis L.; Pale-flowered or White-flower Leafcup; Woods north of Nature Center, es-

pecially along the railroad track; Abundant; C = 3; BSUH 12587.

Prenanthes altissima L.; Tall White Lettuce; Woods; Abundant; (#); C = 5; BSUH 11742.

Ratibida pinnata (Vent.) Barnh.; Globular or Gray Headed Coneflower, Pinnate Prairie Coneflower, Yellow Coneflower; Along the path west of the Spring House; Rare; (#); C = 5; BSUH 11209.

Rudbeckia laciniata L.; Cut-Leaf Coneflower, Wild Golden Glow; Along Culmer's Run; Rare but locally abundant; (#); C = 3; BSUH 11724.

Silphium perfoliatum L.; Cup Plant; Low moist area in woods on west side; Rare; C = 4; BSUH 11413.

Solidago caesia L.; Axillary Goldenrod, Blue-stem Goldenrod; Woods; Abundant, especially on west side; C = 7; BSUH 12522.

Solidago canadensis L.; SYN: *Solidago canadensis* L. var. *scabra* T. & G.; Common or Canada Goldenrod; Fields and roadside; Abundant; C = 0; BSUH 11756, 12556.

Solidago gigantea Aiton; Giant, Late, or Smooth Goldenrod; Around Millie's Pond; Rare; C = 4; BSUH 11151.

Solidago nemoralis Aiton; Old-Field or Gray Goldenrod; Fields north and east of Scott Pond; Frequent, but locally abundant in the field to the east; C = 3; BSUH 11757, 12507.

Solidago riddellii Frank; Riddell's Goldenrod; Southeast corner of first intersection on auto tour north of Nature Center; Rare; C = 9; BSUH 12518.

Sonchus asper (L.) Hill; Prickly or Spiny Sow Thistle; Woods' edge and roadside (east side); Frequent; (* #); C = 0; BSUH 12567, 12996.

Symphotrichum cordifolium (L.) Nesom; SYN: *Aster cordifolius* L.; Common Blue Wood Aster, Common Blue Heart-Leaved Aster; Woods; Abundant, especially on the west side; C = 5; BSUH 12505.

Symphotrichum cordifolium (L.) Nesom; SYN: *Aster sagittifolius* Willd.; Arrow-leaved Aster, Common Blue Wood Aster; Woods; Abundant, especially on the west side; C = 5; BSUH 12519.

Symphotrichum lanceolatum (Willd.) Nesom; SYN: *Aster lanceolatus* Willd. var. *simplex* (Willd.) A.G. Jones, *Aster simplex* Willd.; White Panicle Aster, Eastern Lined Aster; Fields on west side; Frequent; (#); C = 3; BSUH 11997.

Symphotrichum lateriflorum (L.) A. & D. Löve; SYN: *Aster lateriflorus* (L.) Britt.; Goblet, Calico, or Side-Flowering Aster; Fields and woods; Abundant; (#); C = 3; BSUH 11774.

Symphotrichum novae-angliae (L.) Nesom; SYN: *Aster novae-angliae* L.; New England Aster; Around Millie's Pond; Rare; C = 3; BSUH 11745, 11759, 12553.

Symphotrichum pilosum (Willd.) Nesom; SYN: *Aster pilosus* var. *pilosus* Willd.; Awl Aster, Hairy

White Old-Field Aster; Dry fields; Frequent; (#); C = 0; BSUH 11739.

Symphotrichum puniceum (L.) A. & D. Löve; SYN: *Aster puniceus* L.; Bristly or Purple-Stem Aster; In and around the cattail marsh; Infrequent; (#); C = 7; BSUH 12529.

Taraxacum officinale Weber; Common Dandelion; Fields and open woods; Frequent; (* #); C = 0; BSUH 11790.

Tragopogon dubius Scop.; Fistulose Goat's Beard; Along railroad track, west side; Infrequent; (* #); C = 0; BSUH 12590.

Tragopogon pratensis L.; Common or Showy Goat's Beard; Northeast corner of east side along railroad track; Rare; (* #); C = 0; BSUH 11925.

Verbesina alternifolia (L.) Britt.; Wingstem; Woods, especially the east side; Abundant; C = 3; BSUH 12647.

Vernonia gigantea (Walt.) Trel.; Tall Ironweed; Fields and roadside; Infrequent; C = 2; BSUH 11723, 12555.

Xanthium strumarium L.; Common Cocklebur; Drying areas of Scott Pond; Abundant at this site; (#); C = 0; BSUH 11762, 12512.

Balsaminaceae (Touch-Me-Not Family)

Impatiens capensis Meerb.; Orange or Spotted Touch-Me-Not or Jewelweed; Scattered in moist to wet sites; Frequent; (#); C = 2; BSUH 11987, 12629.

Impatiens pallida Nutt.; Pale or Yellow Touch-Me-Not or Jewelweed; Northeast corner of east side along railroad tracks and around seep south of cattail marsh; Rare, but locally abundant; C = 4; BSUH 12538, 12589.

Berberidaceae (Barberry Family)

Berberis thunbergii DC.; Japanese Barberry; Woods on west side; Infrequent; (* #); C = 0; BSUH 11798.

Jeffersonia diphylla (L.) Pers.; Twinleaf; Slope woods along Iron Gate Road west of Culmer's Run. Rare, but locally frequent; C = 7; BSUH 11832.

Podophyllum peltatum L.; Mayapple; Woods; Abundant; (#); C = 3; BSUH 11624, 11627.

Betulaceae (Birch Family)

Betula papyrifera Marshall; White or Paper Birch; Open woods north of Iron Gate Road (probably planted); Rare; (#); C = 7; BSUH 12684.

Carpinus caroliniana Walt. var. *virginiana* (Marshall) Furlow; American Hornbeam, Blue Beech, Muscledwood; Woods; Frequent; C = 5; BSUH 11940.

Ostrya virginiana (Mill.) K. Koch; Hop Hornbeam, Ironwood; Woods; Frequent; (#); C = 5; BSUH 12683.

Bignoniaceae (Trumpet Creeper Family)

Campsis radicans (L.) Seem.; Trumpet Creeper; Woods on west side; Infrequent; (#); C = 1; BSUH 11339, 12502.

Catalpa speciosa Warder; Northern Catalpa, Cigar Tree; Field north of Scott Pond (probably planted); Rare; (#); C = 0; BSUH 12685.

Boraginaceae (Borage Family)

Buglossoides arvensis (L.) I.M. Johnst.; SYN: *Lithospermum arvense* L.; Corn Gromwell; Along railroad track, west side; Rare; (*); C = 0; BSUH 11945, 11995.

Hackelia virginiana (L.) I.M. Johnst.; Stickseed, Beggar's Lice; Woods; Frequent; C = 0; BSUH 11367, 11719.

Mertensia virginica (L.) Pers.; Virginia or Eastern Bluebells; Old growth woods north of Nature Center; Rare; C = 6; BSUH 11799.

Brassicaceae (Mustard Family)

Alliaria petiolata (Bieb.) Cavara & Grande.; Garlic Mustard; Woods and edges of fields; Abundant; (* #); C = 0; BSUH 11784.

Arabis laevigata (Muhl.) Poir.; Smooth Rock Cress; Woods; Infrequent; (#); C = 5; BSUH 11820, 11897.

Barbarea vulgaris Aiton f.; Yellow Rocket; Fields and creek banks; Frequent; (* #); C = 0; BSUH 11834.

Camelina microcarpa DC.; Small-fruited False Flax; Along the railroad tracks, east side; Rare but locally abundant; (* #); C = 0; BSUH 11871, 11933.

Capsella bursa-pastoris (L.) Medik.; Shepherd's Purse; Disturbed ground around Nature Center and roadside; Infrequent; (* #); C = 0; BSUH 11809, 11825.

Cardamine bulbosa (Schreb. ex Muhl.) B.S.P.; SYN: *Cardamine rhomboidea* (Pers.) DC.; Bulbous Bittercress, Spring Cress; Woods, first stretch of auto tour; Infrequent; C = 4; BSUH 11907.

Cardamine concatenata (Michx.) Sw.; Cutleaf or Five-parted Toothwort; Woods; Abundant; C = 4; BSUH 11817.

Cardamine douglassii Britton; Purple Spring Cress, Limestone Bittercress, Northern Bitter Cress; Woods; Frequent; C = 5; BSUH 11890.

Cardamine hirsuta L.; Hoary or Hairy Bittercress; Widespread in woods and fields; Abundant, especially in the east side; (* #); C = 0; BSUH 11592, 11829, 11902.

Cardamine pensylvanica Muhl.; Pennsylvania Bittercress; Wet woods around the seep north of Iron Gate Road, east side; Infrequent; C = 2; BSUH 11845, 11924.

Draba verna L.; Whitlow Grass, Spring Draba, Mouse-eared Whitlow Cress; Fields, roadside, and

around the Nature Center; Abundant; (* #); C = 0; BSUH 11892.

Hesperis matronalis L.; Dame's Rocket; Floodplain woods, east side; Infrequent, but locally abundant; (* #); C = 0; BSUH 11835.

Lepidium campestre (L.) Aiton f.; Field Pepper Grass or Pepper Weed, Field Cress; Scattered along railroad track and fields; Infrequent; (*); C = 0; BSUH 11926.

Lepidium virginicum L.; Poor Man's Pepper, Common or Wild Pepper Grass, Virginia Pepper Weed; Scattered along roadsides and in fields; Infrequent; C = 0; BSUH 11852.

Rorippa nasturtium-aquaticum (L.) Hayek; SYN: *Nasturtium officinale* R. Br.; Water Cress; In the creek running through the cattail marsh; Rare but locally abundant; (*); C = 0; BSUH 11861.

Thlaspi arvense L.; Field Penny Cress; Along railroad track, west side; Rare; (* #); C = 0; BSUH 11949.

Campanulaceae (Bellflower Family)

Campanula rapunculoides L.; European, Rover or Rampion Bellflower; Along woodland path west of fern garden; Rare; woods; abundant, especially on the west side; (#); C = 0; BSUH 11069.

Campanulastrum americanum (L.) Small; SYN: *Campanula americana* L.; Tall or American Bellflower; Woods; Abundant; C = 4; BSUH 11994.

Lobelia inflata L.; Indian Tobacco; Woods, fields, around Millie's Pond; Frequent; (#); C = 3; BSUH 11758, 12637.

Lobelia siphilitica L.; Great Blue Lobelia; Moist field south of Iron Gate Road and sedge meadow north of the cattail marsh; Infrequent, but locally frequent; C = 3; BSUH 12636.

Triodanis perfoliata (L.) Nieuwl.; Round-Leaved Triodanis, Claspig Venus's Looking Glass; Along railroad track near Hayes Arboretum Road; Rare; (#); C = 2; BSUH 11958.

Caprifoliaceae (Honeysuckle Family)

Lonicera × bella Zabel; Showy Fly or Bell's Honeysuckle; Woods; Rare; (* #); C = 0; BSUH 11918.

Lonicera japonica Thunb.; Japanese Honeysuckle; Fence row along Culmer's Run at Iron Gate Road and around Scott Pond; Infrequent; (* #); C = 0; BSUH 11865, 12998.

Lonicera maackii (Rupt.) Herder; Amur Honeysuckle; Woods; Abundant; (* #); C = 0; BSUH 11922.

Lonicera morrowii A. Gray; Morrow's Honeysuckle; Woods; Infrequent; (* #); C = 0; BSUH 11631.

Lonicera reticulata Raf.; SYN: *Lonicera prolifera* (Kirch.) Rehder; Grape Honeysuckle; McClure Preserve; Rare; (# %); C = 8; Hayes Arboretum Herbarium.

Sambucus nigra L. ssp. *canadensis* (L.) R. Bolli; SYN: *Sambucus canadensis* L.; Common Elder or Elderberry; Floodplain woods and other moist woods; Abundant, especially on the east side; C = 2; BSUH 12563.

Symphoricarpos orbiculatus Moench; Coralberry; Wooded slope northeast of cattail marsh; Rare; (#); C = 1; BSUH 12651.

Viburnum dentatum L. var. *lucidum* Aiton; SYN: *V. recognitum* Fernald; Smooth or Southern Arrowwood; Edge of woods west of Nature Center; Rare (probably escaped); (* #); C = 0; BSUH 11398.

Viburnum lantana L.; Wayfaring Tree; Woods on east side; Infrequent; (* #); C = 0; BSUH 11937.

Viburnum lentago L.; Nannyberry, Sheepberry; Woods; Infrequent; C = 5; BSUH 11677, 12975.

Viburnum opulus L.; Guelder Rose, European High-Bush Cranberry; Beech woods, east side near Hayes Arboretum Road; Rare; (* #); C = 0; BSUH 12662.

Viburnum prunifolium L.; Black Haw; Woods; Infrequent; (#); C = 4; BSUH 11662, 11838.

Caryophyllaceae (Pink Family)

Arenaria serpyllifolia L.; Thyme-leaved Sandwort; Field; Rare; (* # %); C = 0; Hayes Arboretum Herbarium.

Cerastium fontanum Baumg. ssp. *vulgare* (Hartman) Greuter & Burdet; SYN: *Cerastium vulgatum* L.; Common Mouse-Ear or Big Chickweed; Field around concrete steps in Iron Gate Road; Rare, but locally abundant; woods; infrequent; (* #); C = 0; BSUH 11920.

Dianthus armeria L.; Deptford Pink; Field north of Scott Pond; Rare; (* #); C = 0; BSUH 12574.

Saponaria officinalis L.; Bouncing Bet; Roadside; Infrequent; (* #); C = 0; BSUH 11988.

Silene antirrhina L.; Sleepy Catchfly; Sleepy Silene; Along railroad track, west side; rare, but locally abundant; (#); C = 0; BSUH 11950.

Silene latifolia Poir. ssp. *alba* (Mill.) Greuter & Burdet; White or Bladder Campion; Woods to railroad track, west side; Infrequent, but locally abundant; (* #); C = 0; BSUH 11960, 12583.

Stellaria graminea L.; Common Stitchwort; Grasslike Starwort; Field south of Millie's Pond and field north of Scott Pond; Rare, but locally frequent; (* #); C = 0; BSUH 12557.

Stellaria media (L.) Vill.; Common Chickweed; Widespread in fields and woods; Abundant; (*); C = 0; BSUH 11796, 11808, 11900.

Stellaria pubera Michx.; Giant or Star Chickweed; Woods; Abundant; C = 7; BSUH 11789.

Celastraceae (Staff Tree Family)

Celastrus orbiculatus Thunb.; Oriental Bittersweet; Floodplain woods east side and old growth woods west side; Rare; (* #); C = 0; BSUH 12681, 13770.

Celastrus scandens L.; American or Climbing Bittersweet; Woods north of Scott Pond; Rare; (#); C = 2; BSUH 12541.

Euonymus alata (Thunb.) Sieb.; Winged Burning Bush, Winged Euonymus; Throughout the woods on the west side, but especially abundant in the woods south of the fern garden; Abundant; (* #); C = 0; BSUH 12719.

Euonymus atropurpurea Jacq.; Eastern Wahoo; Floodplain woods on east side, next to path; Rare; C = 5; BSUH 11855.

Euonymus fortunei (Turcz.) Hand.-Maz.; Wintercreeper; Woods on west side where Salamander Creek flowing under the railroad track; Rare, but locally abundant at this site; (* #); C = 0; BSUH 11807.

Euonymus obovata Nutt.; Running Strawberry Bush; Woods; Infrequent; C = 7; BSUH 13892.

Chenopodiaceae (Goosefoot Family)

Chenopodium album L.; Lamb's Quarters; Along Culmer's Run near Iron Gate Road and disturbed soil; Rare; (* #); C = 0; BSUH 11738.

Clusiaceae (Mangosteen Family)

Hypericum perforatum L.; Common St. John's Wort; Fields; Rare; (* # %); C = 0; Hayes Arboretum Herbarium.

Hypericum punctatum Lam.; Spotted St. John's Wort; Fields and open woods around Scott Pond; Rare; C = 3; BSUH 11425, 12665.

Commelinaceae (Spiderwort Family)

Commelina communis L.; Common or Asiatic Dayflower; Fields and woods edge along railroad track, west side, and near Nature Center; Infrequent; (* #); C = 0; BSUH 12582.

Tradescantia subaspera Ker-Gawl.; Zigzag or Wide-leaved Spiderwort; Woods and woods edge along railroad track; Infrequent; C = 4; BSUH 12597, 12988.

Tradescantia virginiana L.; Virginia Spiderwort; Along railroad track, west side, and woods east of Research Pond; Rare; (#); C = 7; BSUH 11947.

Convolvulaceae (Morning Glory Family)

Calystegia sepium (L.) R. Br.; American or Hedge Bindweed; Woods and field; Infrequent; C = 1; BSUH 12579.

Convolvulus arvensis L.; Field Bindweed; Field next to Woodside Drive; Rare; (*); C = 0; BSUH 12562.

Ipomoea pandurata (L.) G. Mey.; Wild Sweet Potato; Along auto tour east of Hayes House; Rare; C = 3; BSUH 11720.

Ipomoea purpurea (L.) Roth; Common Morning Glory; Field; Rare; (* # %); C = 0; Hayes Arboretum Herbarium.

Cornaceae (Dogwood Family)

Cornus alternifolia L.f.; Pagoda Dogwood, Alternate-leaf Dogwood; McClure Nature Preserve; Rare; C = 8; BSUH 12618.

Cornus drummondii C.A. Mey.; Rough-leaved Dogwood; Open woods, woods' edge and along auto tour; Frequent; (#); C = 2; BSUH 11709, 12676.

Cornus florida L.; Flowering Dogwood; Woods; Rare; C = 4; BSUH 11932.

Nyssa sylvatica Marshall; Black Gum or Tupelo; Old growth woods; Rare (planted?); (#); C = 5; BSUH 11065.

Crassulaceae (Stonecrop Family)

Sedum ternatum Michx.; Woodland or Three-leaved Stonecrop; Floodplain woods on east side; Infrequent; C = 8; BSUH 11840.

Cucurbitaceae (Gourd Family)

Echinocystis lobata (Michx.) Torr. & A. Gray; Balsam Apple, Wild Cucumber; Old growth woods along path parallel to RR track between Salamander Creek and Research Pond; Rare, but frequent here; (#); C = 3; BSUH 11754.

Sicyos angulatus L.; One-seed Bur Cucumber; Along Culmer's Run; Rare; (#); C = 3; BSUH 12625.

Cyperaceae (Sedge Family)

Carex aggregata Mack.; Smooth Clustered Sedge; Wet areas and moist fields; Frequent to abundant; (#); C = 2; BSUH 11217, 11239, 11241.

Carex albicans Willd. ex Spreng.; Blunt-scaled Oak Sedge; Woods; Infrequent; (#); C = 6; BSUH 11243, 13747.

Carex albursina Sheldon; Blunt-scaled Wood Sedge; Woods; Infrequent; (#); C = 7; BSUH 12663, 13741, 13742.

Carex amphibola Steud.; False Gray Sedge; Woods; Infrequent; C = 8; BSUH 13737, 13738.

Carex blanda Dewey; Common Wood Sedge; Woods and moist field; Frequent; C = 1; BSUH 13733, 13734.

Carex cephalophora Muhl. ex Willd.; Short-headed Bracted Sedge; Old growth woods on west side; Infrequent; C = 3; BSUH 11224.

Carex communis Bailey; Common Beech Sedge; Beech-maple woods on east and west side; Infrequent; (#); C = 8; BSUH 13739.

Carex conjuncta Boott; Green-headed Fox Sedge; Moist field south of Iron Gate Road; Rare; C = 6; BSUH 11222.

Carex digitalis Willd.; Narrow-leaved Wood Sedge; Old growth woods on west side; Rare; C = 7; BSUH 11219.

Carex frankii Kunth; Bristly Cattail or Frank's Sedge; Seasonal wet area just east of Nature Center; Rare, but common here; C = 2; BSUH 11229.

Carex granularis Muhl. ex Willd.; Pale or Limestone Meadow Sedge; Floodplain woods east side and seasonal wet area just east of Nature Center; Infrequent; C = 2; BSUH 11231, 12722.

Carex grisea Wahlenb.; Wood Gray Sedge; Woods; Frequent; (#); C = 2; 11445, 11490, 11502.

Carex hirsutella Mack.; Hairy Green Sedge; Woods; Infrequent; C = 3; BSUH 11478, 11488.

Carex hirtifolia Mack.; Hairy Wood Sedge; Woods; Infrequent; C = 5; BSUH 12721, 13745.

Carex hitchcockiana Dewey; Hairy Gray or Hitchcock's Sedge; Woods; Infrequent; (#); C = 8; BSUH 11486.

Carex jamesii Schwein.; Grass Sedge; Floodplain woods east side; Infrequent; C = 4; BSUH 11485, 13744.

Carex laevivaginata (Kuk.) Mack.; Smooth-sheathed Fox Sedge; Open woods and wet meadow next to cattail marsh and woods; Infrequent; C = 7; BSUH 11483, 11509.

Carex laxiculmis Schwein.; Weak-stemmed Wood Sedge; Woods; Infrequent; (#); C = 7; BSUH 11474, 11505, 11512, 13735, 13736.

Carex laxiflora Lam.; Beech Wood Sedge; Woods; Infrequent; C = 7; BSUH 11497, 13740.

Carex lurida Wahlenb.; Bottlebrush Sedge; Cattail marsh and sedge meadow north of cattail marsh; Abundant; C = 4; BSUH 11515, 11966.

Carex molesta Mack. ex Bright; Field Oval Sedge; Fields and open woods around Scott Pond; Infrequent; (#); C = 2; BSUH 11493, 11503.

Carex normalis Mack.; Spreading Oval Sedge; Fields and open woods around Scott Pond; Infrequent; (#); C = 3; BSUH 11451.

Carex oligocarpa Schk.; Few-fruited Gray Sedge; Seep just south of cattail marsh; Rare, but locally abundant; (#); C = 8; BSUH 11468.

Carex pennsylvanica Lam.; Pennsylvania Oak Sedge; Woods; Infrequent; (#); C = 5; BSUH 13743.

Carex radiata (Wahlenb.) Small; Straight-styled Bracted Sedge; Woods; Infrequent; (#); C = 4; BSUH 11471, 11929.

Carex rosea Schk.; Rosy or Curly-styled Bracted Sedge; Woods on west side; Infrequent; (#); C = 5; BSUH 11466, 11517.

Carex shortiana Dewey; Short's Sedge; Seasonal wet areas (along Culmer's Run and just east of the Nature Center) and the sedge meadow just north of the cattail marsh; Frequent; C = 3; BSUH 11530, 11535, 12720.

Carex sparganioides Muhl. ex Willd.; Loose-headed Bracted Sedge; Woods; Infrequent; C = 4; BSUH 11463.

Carex stipata Muhl.; Common Fox Sedge; Open woods and meadow between Culmer's Run and the cattail marsh and in the sedge meadow north of the cattail marsh; Abundant; (#); C = 2; BSUH 11227, 11491.

Carex tribuloides Wahlenb.; Broad-leaved Oval Sedge; Open woods and meadow between Culmer's Run and the cattail marsh; Abundant, especially in cattail marsh; C = 5; BSUH 11374, 11435, 11975.

Carex vulpinoidea Michx.; Brown Fox Sedge; Seasonal wet area just east of Nature Center; Infrequent; C = 2; BSUH 13893.

Carex woodii Dewey; Wood's Stiff Sedge; Woods on the west side; Infrequent; (#); C = 8; BSUH 11465, 13746.

Cyperus bipartitus Torr.; SYN: *Cyperus rivularis* Kunth; Slender or Shining Flat Sedge; Drying areas of Millie's Pond; Rare, but locally frequent; C = 3; BSUH 11747, 11764.

Cyperus esculentus L. var. *leptostachyus* Boeckl.; Field Nut Sedge, Yellow Nut Sedge; Chufa Flat Sedge; Around Scott Pond; Infrequent; (#); C = 0; BSUH 11772, 11970.

Cyperus strigosus L.; False Nut Sedge, Long-scaled Nut Sedge, Straw-colored Flat Sedge; Millie's Pond, drainage ditch along Woodside Drive, and moist field south of Iron Gate Road; Infrequent, but locally frequent; (#); C = 0; BSUH 11743, 11744, 11765.

Eleocharis erythropoda Steud.; Red-rooted Spike Rush; Moist meadow between Culmer's Run and the cattail marsh and in the sedge meadow just north of the cattail marsh; Infrequent; (#); C = 2; BSUH 11496.

Scirpus atrovirens Willd.; Dark-Green Bulrush; Open meadows along Culmer's Run and seasonal wet area just east of Nature Center; Infrequent; C = 4; BSUH 11457, 11748, 12578.

Scirpus hattorianus Makino; Early Dark-Green Bulrush; Open meadows along Culmer's Run; Rare; (#); C = 3; BSUH 11514.

Scirpus pendulus Muhl.; Red or Rufous Bulrush; Along auto tour between Nature Center and Spring House; Rare, but locally abundant; (#); C = 2; BSUH 11876.

Dipsacaceae (Teasel Family)

Dipsacus fullonum L. ssp. *sylvestris* (Huds.) Clapham; SYN: *Dipsacus sylvestris* Huds.; Common or Fuller's Teasel; Floodplain woods, ditches, and cattail marsh; Infrequent; (* #); C = 0; BSUH 11990.

Ebenaceae (Ebony Family)

Diospyros virginiana L.; Common Persimmon; Successional woods just south of Hayes House; Rare; (#); C = 2; BSUH 11718.

Elaeagnaceae (Oleaster Family)

Elaeagnus umbellata Thunb.; Autumn Olive; Scattered in woods and fields; Infrequent; (* #); C = 0; BSUH 11948.

Euphorbiaceae (Spurge Family)

Acalypha rhomboidea Raf.; Rhombic Copper-leaf, Virginia Three-seed Mercury; Woods, fields, roadside; Abundant; C = 0; BSUH 11740, 11848.

Chamaesyce maculata (L.) Small; SYN: *Euphorbia maculata* L.; Milk Purslane, Spotted Spurge, Spotted Sandmat; Around Nature Center and roadside; Infrequent; C = 0; BSUH 11728.

Chamaesyce nutans (Lag.) Small; SYN: *Euphorbia nutans* Lag.; Small Eyebane; Dry ground around Scott Pond and roadside; Infrequent; (#); C = 0; BSUH 12660.

Euphorbia dentata Michx.; Toothed Spurge; Woods' edge along railroad track; Infrequent; (#); C = 0; BSUH 12537, 12592.

Fabaceae (Pea or Bean Family)

Amphicarpaea bracteata (L.) Fernald; American Hog Peanut; Along Culmer's Run near Iron Gate Road; Rare; (#); C = 5; BSUH 12627.

Cercis canadensis L.; Eastern Redbud; Woods (especially the edge) and fields; Abundant; (#); C = 3; BSUH 11800, 12728.

Coronilla varia L.; Purple Crown Vetch; Iron Gate Road near Culmer's Run; Rare; (* #); C = 0; BSUH 12694.

Desmodium glutinosum (Muhl.) A. Wood; Cluster-leaf or Pointed-leaf Tick Trefoil; Woods; Infrequent; C = 6; BSUH 11977.

Desmodium paniculatum (L.) DC.; Panicked Tick Trefoil; Fields around Scott Pond; Infrequent; (#); C = 2; BSUH 12664.

Gleditsia triacanthos L.; Honey Locust; Woods on east side; Infrequent; (#); C = 1; BSUH 11941.

Glycine max (L.) Merr.; Volunteer Soybean; Along railroad track; Rare; (* #); C = 0; BSUH 11161.

Medicago lupulina L.; Black Medic; Fields, roadside and around the Nature Center; Infrequent; (* #); C = 0; BSUH 12605.

Medicago sativa L.; Common Alfalfa; Field west of Scott Pond; Frequent; (* #); C = 0; BSUH 11107.

Melilotus alba Medik.; White Sweet Clover; Woods' edge along railroad track on the west side; Rare; (* #); C = 0; BSUH 13894.

Melilotus officinalis (L.) Lam.; Yellow Sweet Clover; Woods' edge along railroad track on the west side; Abundant; (* #); C = 0; BSUH 11946.

Robinia pseudoacacia L.; Black Locust; Woods; Infrequent, but occasionally locally frequent; (#); C = 1; BSUH 12726.

Trifolium campestre Schreb.; Pinnate or Low Hop Clover; Roadside; Rare; (* # %); C = 0; Hayes Arboretum Herbarium.

Trifolium hybridum L.; Alsike Clover; Fields; Frequent; (* #); C = 0; BSUH 11862.

Trifolium pratense L.; Red Clover; Fields and roadside; Abundant; (* #); C = 0; BSUH 11939.

Trifolium repens L.; White Clover; Fields; Abundant; (* #); C = 0; BSUH 11962.

Vicia cracca L.; Cow Vetch; Field; Rare; (* # %); C = 0; Hayes Arboretum Herbarium.

Fagaceae (Beech Family)

Fagus grandifolia Ehrh.; American Beech; Old growth woods; Abundant; (#); C = 8; BSUH 12540.

Quercus alba L.; White Oak; Woods; Abundant; (#); C = 5; BSUH 12604.

Quercus imbricaria Michx.; Shingle or Jack Oak; Woods and McClure Preserve; Rare; (#); C = 3; BSUH 11753.

Quercus macrocarpa Michx.; Burr Oak; Woods; Frequent; (#); C = 5; BSUH 12679.

Quercus muhlenbergii Engelm.; Yellow, Chin-kapin, or Chinquapin Oak; Woods (especially on the east side); Frequent, occasionally locally abundant; (#); C = 4; BSUH 11842, 12680.

Quercus palustris Muenchh.; Pin Oak; Woods; Rare; (#); C = 3; BSUH 11717.

Quercus rubra L.; Northern Red Oak; Woods; Frequent; (#); C = 4; BSUH 11909.

Fumariaceae (Fumitory Family)

Corydalis flavula (Raf.) DC.; Pale or Short-spurred Corydalis; Woods; Rare; (# %); C = 3; Hayes Arboretum Herbarium.

Dicentra canadensis (Goldie) Walp.; Squirrel Corn; Woods near the overlook on the west side; Infrequent, but locally frequent; (#); C = 7; BSUH 11803.

Dicentra cucullaria (L.) Bernh.; Dutchman's Breeches; Woods; Frequent to locally abundant; (#); C = 6; BSUH 11822.

Geraniaceae (Geranium Family)

Geranium bicknellii Britton; Northern Cranesbill; Sandy roadside; Rare; (# %); C = 9; Hayes Arboretum Herbarium. [Endangered].

Geranium carolinianum L.; SYN: *Geranium carolinianum* L. var. *confertiflorum* Fernald; Carolina Geranium or Crane's Bill; Edge of woods along railroad track on west side; Rare, but locally abundant; (#); C = 2; BSUH 11952.

Geranium maculatum L.; Wild Geranium; Woods; Frequent to abundant; C = 4; BSUH 11675.

Geranium molle L.; Dove's Foot Crane's Bill or Geranium; Roadside along auto tour, north of maintenance buildings; Rare; (* #); C = 0; BSUH 11887.

Grossulariaceae (Gooseberry Family)

Ribes americanum Mill.; Eastern or Wild Black Current; Mouth of small seep in woods near northern entrance into east side; Rare; (#); C = 5; BSUH 13768.

Hippocastanaceae (Horse Chestnut Family)

Aesculus glabra Willd.; Ohio Buckeye; Woods, especially floodplain woods on east side; Frequent; C = 5; BSUH 11596.

Hydrangeaceae (Hydrangea Family)

Hydrangea arborescens L.; American or Wild Hydrangea; Side hills of woods and along railroad track of east side; Infrequent; C = 7; BSUH 11052, 11936.

Philadelphus coronarius L.; European or Sweet Mock Orange; Edge of woods along auto tour south of Hayes House; Rare, but locally frequent; (* #); C = 0; BSUH 12607.

Hydrophyllaceae (Waterleaf Family)

Hydrophyllum appendiculatum Michx.; Biennial or Great Waterleaf; Woods; Abundant; C = 6; BSUH 12715.

Hydrophyllum macrophyllum Nutt.; Hairy or Large-leaf Waterleaf; Woods; Frequent to abundant; C = 7; BSUH 11884.

Iridaceae (Iris Family)

Sisyrinchium angustifolium Mill.; Stout Blue-eyed Grass; Edge of woods' along the railroad track and Gravel Pit Road and in moist fields; Infrequent; C = 3; BSUH 11954, 12995.

Juglandaceae (Walnut Family)

Carya cordiformis (Wangenh.) K. Koch; Bitternut Hickory; Woods; Infrequent; C = 5; BSUH 12575.

Carya laciniosa (Michx. f.) G. Don; Shellbark Hickory; McClure Preserve and along auto tour west of fountain; Rare; (#); C = 8; BSUH 12551.

Carya ovata (Mill.) K. Koch; Shagbark Hickory; Woods north of cattail marsh; Infrequent; (#); C = 4; BSUH 12645.

Juglans nigra L.; Black Walnut; Woods; Infrequent; (#); C = 2; BSUH 12709.

Juncaceae (Rush Family)

Juncus dudleyi Wieg.; Dudley's Rush; Moist fields north and south of Iron Gate Road and around Scott Pond; Frequent, and locally abundant; (#); C = 2; BSUH 13895.

Juncus tenuis Willd.; Path or Poverty Rush; Woodland paths and field around concrete steps on Iron Gate Road; Infrequent; (#); C = 0; BSUH 11454, 11869, 12695.

Juncus torreyi Coville; Torrey's Rush; Cattail marsh; Infrequent; (#); C = 3; BSUH 11969.

Luzula multiflora (Retz.) Lej.; Common Wood Rush; Woods; Infrequent, but locally frequent; (#); C = 6; BSUH 11786, 11787, 13748.

Lamiaceae (Mint Family)

Glechoma hederacea L.; Ground Ivy, Gill-over-the-Ground, Creeping Charlie; Lawns, gardens, moist fields, moist woods; Abundant; (*); C = 0; BSUH 11901, 12718.

Lamium amplexicaule L.; Henbit, Henbit Dead Nettle; Various habitats around the Nature Center; Infrequent; (*); C = 0; BSUH 11806.

Lamium purpureum L.; Purple Dead Nettle; Lawns, gardens, fields, roadside; Frequent; (* #); C = 0; BSUH 11810.

Leonurus cardiaca L.; Common Motherwort; Northeast corner of east side, along woods' edge and railroad track; Rare; (*); C = 0; BSUH 12580.

Lycopus americanus Muhl.; Common or American Water Horehound; Various wet sites throughout arboretum; Frequent; (#); C = 3; BSUH 12661.

Lycopus uniflorus Michx.; Northern Water Horehound or Bugleweed; Floodplain woods along Culmer's Run, cattail marsh, and along Salamander Creek on the west side; Frequent; (#); C = 5; BSUH 11731, 11766, 12511, 12525.

Mentha arvensis L. var. *canadensis* (L.) Kuntze; SYN: *Mentha arvensis* L. var. *villosa* (Benth.) S.R. Stewart; Field or Wild Mint; Various wet areas, but especially moist field south of Iron Gate Road; Infrequent; (#); C = 4; BSUH 12635.

Mentha × piperita L.; Peppermint; Cattail marsh; Infrequent, but locally abundant; (*); C = 0; BSUH 11733, 12545.

Monarda fistulosa L.; Wild Bergamot; Edge of woods' along auto tour north of Scott Pond; Rare; C = 3; BSUH 12989.

Nepeta cataria L.; Catnip; Edge of woods along auto tour; Rare; (* %); C = 0; Hayes Arboretum Herbarium.

Prunella vulgaris L.; Common Seal Heal, Lawn Prunella; Lawns, moist fields; McClure Preserve; Infrequent; (*); C = 0; BSUH 11055.

Scutellaria incana Biehler; Downy or Hoary Skullcap; Slope and upland, older successional woods on the east side; Infrequent; C = 4; BSUH 11727, 12987.

Scutellaria lateriflora L.; Mad-dog Skullcap; Moist meadows along Culmer's Run and drying areas of Scott Pond; Infrequent; C = 4; BSUH 11730, 11737.

Stachys nuttallii Shuttlw. ex Benth.; SYN: *Stachys cordata* Riddell; Heart-Leaved Hedge Nettle; Roadside in woods at Salamander Creek; Rare, but locally frequent; C = 7; BSUH 11061.

Teucrium canadense L.; SYN: *Teucrium canadense* var. *virginicum* (L.) Eat.; American Germanander; Edge of woods on auto tour east of Nature Center and on Gravel Pit Road; Rare, but locally frequent; C = 3; BSUH 11335.

Lardizabalaceae (Lardizabala Family)

Akebia quinata (Houtt.) Decne.; Five-leaved Akebia, Chocolate Vine; Woods just south of Hayes House; Rare; (* #); C = 0; BSUH 12971.

Lauraceae (Laurel Family)

Lindera benzoin (L.) Blume; Northern or Hairy Spice Bush; Along Salamander Creek on west side and floodplain woods on east side; Infrequent; C = 5; BSUH 12526.

Sassafras albidum (Nutt.) Nees; Sassafras; Edge of woods east of Hayes House; Rare; (#); C = 1; BSUH 11984.

Lemnaceae (Duckweed Family)

Lemna minor L.; Lesser, Small, or Common Duckweed; Culmer's Run and Research Pond; Abundant; (#); C = 3; BSUH 12535.

Spirodela polyrhiza (L.) Schleid.; Great or Giant Duckweed; Research Pond; Abundant; (#); C = 5; BSUH 12534.

Liliaceae (Lily Family)

Allium canadense L.; Wild or Meadow Garlic; Moist field south of Iron Gate Road and open woods north of Iron Gate Road; Abundant; (#); C = 1; BSUH 11622, 11870.

Allium burdickii (Hanes) A.G. Jones; SYN: *Allium tricoccum* Ait. var. *burdickii* Hanes; Narrow-leaf Wild Leek; Woods; Abundant; (#); C = 6; BSUH 11813, 11839.

Allium vineale L.; Field or Wild Garlic; Seasonal wet area east of Nature Center and open moist woods between Culmer's Run and cattail marsh; Infrequent; (* #); C = 0; BSUH 11856, 11883.

Asparagus officinalis L.; Garden Asparagus; Field north of Scott Pond, three plants; Rare; (* #); C = 0; BSUH 12701.

Camassia scilloides (Raf.) Cory; Wild Hyacinth, Atlantic Camas; Low areas in woods east of Salamander Creek and north of the fern garden; Rare; C = 5; BSUH 12711.

Convallaria majalis L.; Lily of the Valley; Small woods east of Hayes House; Rare, but locally abundant; (* #); C = 0; BSUH 12668.

Erythronium albidum Nutt.; White Trout Lily, White Adder's Tongue, White Fawn Lily; Woods near fern garden; Rare; (#); C = 3; BSUH 12983.

Erythronium americanum Ker-Gawl.; Yellow Trout Lily, Yellow Adder's Tongue, Dog Tooth Violet; Woods north of Nature Center; Rare; C = 5; BSUH 13897.

Heremacallis fulva (L.) L.; Orange Day Lily; Iron Gate Road near Culmer's Run; Rare; (* #); C = 0; BSUH 12596.

Lilium michiganense Farw.; Michigan Lily; Woods next to auto tour at Salamander Creek; Rare, but locally frequent; C = 5; BSUH 12985.

Matantherum racemosum (L.) Link; SYN: *Smilacina racemosa* (L.) Desf.; Feathery False Solomon's Seal; Woods; Abundant; C = 4; BSUH 12717.

Ornithogalum umbellatum L.; Common Star-of-Bethlehem; Seasonal wet area east of Nature Center; Rare; (* #); C = 0; 11624.

Polygonatum biflorum (Walt.) Ell.; Small or Smooth Solomon's Seal; Woods; Frequent; (#); C = 4; BSUH 11882.

Trillium flexipes Raf.; Bent or Declined Trillium,

Nodding Wakerobin; Woods north of Nature Center; Rare, two small colonies; (#); C = 5; BSUH 11785.

Trillium grandiflorum (Michx.) Salisb.; Large White or Large Flowered Trillium; Woods north of Nature Center; Abundant; C = 8; BSUH 11782.

Trillium nivale Riddell; Snow Trillium, Dwarf White Wakerobin; Steep wooded hillside east of cattail marsh and in the fern garden; Rare; C = 8; BSUH 11814.

Trillium recurvatum Beck; Prairie or Red Trillium; Woods; Frequent; C = 4; BSUH 11819.

Trillium sessile L.; Toadshade, Sessile Trillium; Slope and upland woods; Frequent, especially on the east side; C = 4; BSUH 11792, 11833.

Uvularia grandiflora Sm.; Large-Flower Bellwort; Woods; Infrequent; C = 7; BSUH 11802.

Limnanthaceae (Meadow Foam Family)

Floerkea proserpinacoides Willd.; False Mermaid Weed; Floodplain woods on east side; Abundant; C = 5; BSUH 11899.

Magnoliaceae (Magnolia Family)

Liriodendron tulipifera L.; Tulip Tree, Tulip Poplar, Yellow Poplar; Woods; Abundant; (#); C = 4; BSUH 12714.

Malvaceae (Mallow Family)

Abutilon theophrasti Medik.; Velvetleaf; Disturbed soil west of Nature Center; Rare; (* #); C = 0; BSUH 12623.

Hibiscus trionum L.; Flower-of-an-Hour; Disturbed ground around butterfly house; Rare; (* #); C = 0; BSUH 11421.

Malva neglecta Wallr.; Common Mallow, Cheeses; Lawn east of Nature Center; Rare, but locally abundant; (*); C = 0; BSUH 11059, 11872.

Sida spinosa L.; Prickly Sida, Prickly Mallow; Drying areas of Scott Pond and woods' edge in northeast corner of east side; Frequent, but locally abundant; (*); C = 0; BSUH 12536.

Menispermaceae (Moonseed Family)

Menispermum canadense L.; Common Moonseed; Woods and woods' edge; Frequent; C = 3; BSUH 11880.

Monotropaceae (Indian Pipe Family)

Monotropa uniflora L.; Indian Pipe; Woods north of Nature Center; Rare; (#); C = 7; BSUH 13896.

Moraceae (Mulberry Family)

Maclura pomifera (Raf.) C.K. Schneid.; Osage Orange, Hedge Apple; Woods; Frequent; (* #); C = 0; BSUH 11867.

Morus alba L.; White Mulberry; Field south of Iron Gate Road, scattered along the edge of woods; Infrequent; (* #); C = 0; BSUH 11914.

Oleaceae (Olive Family)

Fraxinus americana L.; White Ash; Woods; Frequent; C = 4; BSUH 12682.

Fraxinus pennsylvanica Marshall var. *pennsylvanica*; Red Ash; Field along road north of Scott Pond; Rare (one tree); C = 3; BSUH 12602.

Fraxinus pennsylvanica Marshall var. *subintegririma* (Vahl) Fernald; SYN: *Fraxinus pennsylvanica* Marshall var. *lanceolata* (Borkh.) Sarg.; Green Ash; Woods; Frequent; C = 1; BSUH 12700.

Fraxinus quadrangulata Michx.; Blue Ash; Around Scott Pond and slope and upland woods on east side; Infrequent; (#); C = 7; BSUH 12687, 12999.

Ligustrum obtusifolium Sieb. & Zucc.; Regal Privet, Border Privet; Woods, woods' edge and roadside, throughout but especially the west side; Abundant; (* #); C = 0; BSUH 11873.

Onagraceae (Evening Primrose Family)

Circaea lutetiana L. ssp. *canadensis* (L.) Aschers. & Magnus; Broadleaf Enchanter's Nightshade; Woods and open woods southeast of Hayes House; infrequent, but locally frequent; C = 2; BSUH 11701, 12566.

Epilobium coloratum Biehler; Eastern, Cinnamon, or Purple-leaf Willow Herb; In and around the cattail marsh; infrequent; (#); C = 3; BSUH 11735, 12546.

Ludwigia palustris (L.) Eil.; Common Water Purslane, Marsh Purslane, Marsh Seedbox; Scott Pond; Rare; (#); C = 3; BSUH 12508.

Oenothera biennis L.; Common Evening Primrose; Fields, roadside, along railroad track; Frequent; (#); C = 0; BSUH 11080.

Orchidaceae (Orchid Family)

Corallorhiza odororhiza (Willd.) Nutt.; Autumn Coral Root; Woods; Rare; (# %); C = 3; Hayes Arboretum Herbarium.

Liparis liliifolia (L.) Rich.; Large Twayblade; Mauve Sleekwort; Brown Widelpip Orchid; Woods between Nature Center and Spring House; Rare; (#); C = 3; BSUH 12520.

Spiranthes cernua (L.) Rich.; Nodding Ladies' Tresses; Edge of cattail marsh; Rare; (# %); C = 3; Hayes Arboretum Herbarium.

Orobanchaceae (Broomrape Family)

Epifagus virginiana (L.) W. Bart.; Beech Drops; Old growth woods north of Nature Center; Abundant (but not every year); C = 8; BSUH 11996, 12974.

Oxalidaceae (Wood Sorrel Family)

Oxalis stricta L.; SYN: *Oxalis dillenii* Jacq.; Tall or Common Yellow Wood Sorrel; Various habitats; Frequent; C = 0; BSUH 11959, 12675.

Papaveraceae (Poppy Family)

Papaver dubium L.; Long-Pod, Long-Headed, or Smooth-Fruited Poppy; Along railroad tracks on east side, two large colonies; Rare, but locally abundant; (* #); C = 0; BSUH 11930, 11951.

Sanguinaria canadensis L.; Bloodroot; Woods; Abundant; C = 5; BSUH 11812.

Stylophorum diphylllum (Michx.) Nutt.; Celandine Poppy; Woods north of Nature Center; Rare; (#); C = 7; BSUH 11818.

Phytolaccaceae (Pokeweed Family)

Phytolacca americana L.; American Pokeweed; Along railroad track and open areas in woods; Infrequent; C = 0; BSUH 12593.

Plantaginaceae (Plantain Family)

Plantago lanceolata L.; English or Narrow-leaf Plantain; Lawns, fields, roadside; Frequent; (* #); C = 0; BSUH 11875.

Plantago major L.; Common Plantain; Gravel parking lot east of Nature Center; Rare, but locally frequent; (* #); C = 0; BSUH 11119.

Plantago rugelii Decne.; American or Red-Stalked Plantain; Various sites; Frequent; C = 0; BSUH 11961.

Platanaceae (Plane Tree Family)

Platanus occidentalis L.; American Sycamore; Along Culmer's Run, Salamander Creek, and other moist woodlands; Infrequent; (#); C = 3; BSUH 12599.

Poaceae (Grass Family)

Aegilops cylindrica Host; Jointed Goat Grass; Along railroad track on west side; Rare; (* #); C = 0; BSUH 11546.

Agrostis stolonifera L.; Creeping Bent Grass; Fields and woods; Infrequent; (*); C = 0; BSUH 11547.

Alopecurus pratensis L.; Meadow Foxtail; Wet meadow between Iron Gate Road and the seep; Rare; (* #); C = 0; BSUH 11545.

Andropogon virginicus L.; Broom Sedge Bluestem, Virginia Bluestem, Broom Sedge; Field south of Millie's Pond and roadside along auto tour; Infrequent; (#); C = 1; BSUH 11998, 12981.

Bromus inermis Leyss.; Smooth or Hungarian Brome; Fields and roadside; Frequent, but locally abundant; (* #); C = 0; BSUH 11542.

Bromus japonicus Thunb.; Japanese Chess, Japanese Brome; Woods' edge along railroad track; Infrequent; (* #); C = 0; BSUH 11544.

Bromus racemosus L.; Smooth or Bald Chess or Brome; Along railroad track and roadside; Infrequent, but locally abundant; (* #); C = 0; BSUH 11582.

Bromus tectorum L.; Junegrass, Cheat Grass; Woods' edge along railroad track near Gravel Pit

Road; Rare, but locally abundant; (* #); C = 0; BSUH 13749.

Cinna arundinacea L.; Common Wood Reed; Floodplain woods and moist meadows; Abundant; C = 4; BSUH 12644.

Dactylis glomerata L.; Orchard Grass; Fields; Abundant; (* #); C = 0; BSUH 11963.

Danthonia spicata (L.) P. Beauv.; Poverty Oat Grass; Dry field north of Scott Pond; Rare; (#); C = 3; BSUH 11584.

Diarrhena americana P. Beauv.; American Beak Grass; Wooded hillside just north of the Spring House; Rare; C = 5; BSUH 11779.

Dichanthelium acuminatum (Sw.) Gould & C.A. Clark var. *fasciculatum* (Torr.) Freckmann; SYN: *Panicum implicatum* Britton, *Panicum lanuginosum* Ell. var. *implicatum* (Scribn.) Fernald; Woolly, Western, or Old-field Panic Grass; Fields and grassy open woods; Abundant; (#); C = 2; BSUH 11652.

Digitaria ischaemum (Schreb.) Schreb. ex Muhl.; Smooth Crab Grass; Roadside; Infrequent; (* #); C = 0; BSUH 11576.

Digitaria sanguinalis (L.) Scop.; Northern or Hairy Crab Grass; Lawns, fields, roadside; Abundant; (*); C = 0; BSUH 11565.

Echinochloa crusgalli (L.) P. Beauv.; Barnyard Grass; Roadside and in drainage ditches; Infrequent; (*); C = 0; BSUH 11967, 11722.

Eleusine indica (L.) Gaertn.; Yard Grass; Indian Goosegrass; Crowfoot Grass; Roadside; gravel parking lots, along railroad track; Frequent; (* #); C = 0; BSUH 11121, 12539.

Elymus hystrix L.; Eastern Bottlebrush Grass; Woods, especially on east side; Abundant; C = 5; BSUH 12697.

Elymus repens (L.) Gould; SYN: *Elytrigia repens* (L.) Nevski.; Fields on east side; Infrequent; Quack Grass; (* #); C = 0; BSUH 12672.

Elymus villosus Muhl. ex Willd.; Downy or Hairy Wild Rye; Woods; Abundant; (#); C = 4; BSUH 11554, 11559, 11579.

Elymus virginicus L.; Virginia Wild Rye; Woods; Frequent; (#); C = 3; BSUH 11858.

Eragrostis cilianensis (All.) Janchen; Stink Grass; Fields; Infrequent; (* #); C = 0; BSUH 11549.

Eragrostis frankii C.A. Mey.; Sandbar Love Grass; Around Scott and Millie's Ponds, in and along moist dirt roads on the east side; Frequent, but locally abundant; C = 2; BSUH 11749, 11750, 11974.

Eragrostis minor Host; SYN: *Eragrostis poaeoides* Roem. & Schult.; Little, Lesser, or Low Love Grass; Fields and roadsides east of Nature Center; Infrequent; (* #); C = 0; BSUH 11570.

Eragrostis spectabilis (Pursh.) Steud.; Field north of maintenance building; Rare, but locally abundant; Purple Love Grass; (#); C = 3; BSUH 11590, 12515.

Festuca subverticillata (Pers.) E. Alexeev; Nodding Fescue; Woods; Frequent; (#); C = 4; BSUH 11828.

Glyceria striata (Lam.) A.S. Hitchc.; Fowl Manna Grass; Along Culmer's Run and in moist to wet meadows; Abundant; (#); C = 4; BSUH 11586, 12564.

Hordeum pusillum Nutt.; Little Barley; Along railroad track, Rare; (* #); C = 0; BSUH 11575, 13,771.

Leersia oryzoides (L.) Sw.; Rice Cut Grass; Wet field west of Culmer's run and cattail marsh; Infrequent, but locally abundant; C = 2; BSUH 11768.

Leersia virginica Willd.; White Grass; Woods; Frequent; C = 4; BSUH 11303, 11568.

Lolium arundinaceum (Schreb.) S.J. Darbyshire; SYN: *Festuca arundinacea* Schreb., *Festuca elatior* L. var. *arundinacea* (Schreb.) C.F.H. Wimmer, *Schedonorus pratensis* (Hudson) P. Beauv.; Tall Fescue; Fields and roadside; Frequent; (* #); C = 0; BSUH 11868.

Lolium perenne L.; English or Perennial Rye Grass; Fields along Iron Gate Road near Culmer's Run; Rare; (* #); C = 0; BSUH 11691.

Muhlenbergia frondosa (Poir.) Fernald; Common Satin Grass, Wirestem Muhly; Sandy creek bank along Culmer's Run; Rare; (#); C = 3; BSUH 11683.

Muhlenbergia schreberi J.F. Gmel.; Nimbwill; Fields and paths; Abundant; C = 0; BSUH 11657, 11973.

Muhlenbergia tenuiflora (Willd.) B.S.P.; Slender Satin Grass, Slender Muhly; Wooded hillsides east of cattail marsh; Rare; (#); C = 7; BSUH 11972.

Panicum capillare L.; Old Witch Grass; Moist area at woods' edge along railroad track and around Scott Pond; Infrequent, but locally abundant near pond; C = 0; BSUH 11641, 11661, 12542.

Panicum dichotomiflorum Michx.; Knee Grass, Fall Panic Grass; Flower gardens around the arboretum and around Scott Pond; Infrequent, but locally abundant around pond; (#); C = 0; BSUH 12514.

Panicum flexile (Gatt.) Scribn.; Slender or Wiry Panic Grass; Grassy roadside along auto tour north of Nature Center; Rare; (#); C = 5; BSUH 11964.

Paspalum setaceum Michx. var. *muhlenbergii* (Nash) D. Banks; SYN: *Paspalum ciliatifolium* Michx. var. *muhlenbergii* (Nash) Fernald; Thin Paspalum, Hairy Lens Grass; Roadside along auto tour north of Nature Center; Rare; C = 3; BSUH 11971.

Phalaris arundinacea L.; Reed Canary Grass; Floodplain meadows and open woods; Frequent, but locally abundant; (* #); C = 0; BSUH 11672.

Phleum pratense L.; Timothy Grass; Fields; Frequent; (* #); C = 0; BSUH 12606.

Poa annua L.; Speargrass, Annual Blue Grass;

Waste areas, field edges, and roadside; Abundant; (*); C = 0; BSUH 11815.

Poa compressa L.; Canada Blue Grass; Dry woods and along railroad track, Abundant; (*); C = 0; BSUH 12584.

Poa pratensis L.; Kentucky Blue Grass; Fields and roadside; Abundant; (* #); C = 0; BSUH 13750.

Poa sylvestris A. Gray; Forest or Woodland Blue Grass; Woods; Abundant; C = 5; BSUH 11637, 11938.

Poa trivialis L.; Rough Blue Grass; Seep north of cattail marsh and moist meadows and fields; Abundant; (* #); C = 0; BSUH 11645.

Setaria faberi R. Herrm.; Nodding or Giant Foxtail Grass; Fields and roadside; Frequent, but locally abundant; (* #); C = 0; BSUH 11721.

Setaria pumila (Poir.) Roemer & J.A. Schult. ssp. *pallidifusca* (Schumacher) B.K. Simon; SYN: *Setaria glauca* (L.) Beauv.; Pigeon Grass, Yellow Foxtail Grass; Fields and disturbed ground; Frequent, but locally abundant; (*); C = 0; BSUH 11726.

Sorghum halepense (L.) Pers.; Johnson Grass; Roadside along Woodside Drive; Rare; (* #); C = 0; BSUH 12624.

Sphenopholis intermedia (Rydb.) Rydb.; SYN: *Sphenopholis obtusata* (Michx.) Scribn. var. *major* (Torr.) K.S. Erdman; Slender Wedge Grass; Sunlit trails around Spring House; Rare, but locally abundant; C = 3; BSUH 11877.

Tridens flavus (L.) Hitchc.; Common Purpletop, Purpletop Tridens; Fields; Abundant; (#); C = 1; BSUH 12642.

Triticum aestivum L.; Common Wheat; Edge of woods along railroad track; Rare; (* #); C = 0; BSUH 11957.

Zea mays L.; Volunteer Corn; Edge of woods along railroad track; Rare; (* #); C = 0; BSUH 11101.

Polemoniaceae (Phlox Family)

Phlox divaricata L.; Forest or Wild Blue Phlox; Woods; Abundant; C = 5; BSUH 11788.

Phlox paniculata L.; Summer or Garden Phlox; Woods; Infrequent; C = 3; BSUH 11333, 12614, 12990.

Polemonium reptans L.; Spreading Jacob's Ladder, Greek Valerian; Upland woods west of Iron Gate Road; Rare; C = 5; BSUH 11927.

Polygonaceae (Smartweed Family)

Polygonum aviculare L.; Doorweed, Common or Prostrate Knotweed; Lawns and fields; Frequent; (* #); C = 0; BSUH 11138.

Polygonum cespitosum Blume var. *longisetum* (de Bruyn) Stewart; SYN: *Persicaria caespitosa*; Creeping Smartweed, Oriental Lady's Thumb; Dirt roads and floodplain woods; Frequent, but locally

abundant; (* #); C = 0; BSUH 11063, 11991, 12548, 126476.

Polygonum hydropiper L.; SYN: *Persicaria hydropiper* (L.) Opiz; Water Pepper, Marsh Pepper Knotweed; Cattail marsh; Infrequent, but in large colonies; (* #); C = 0; BSUH 11729, 12547.

Polygonum lapathifolium L.; SYN: *Persicaria lapathifolia* (L.) S.F. Gray; Dock-Leaved Smartweed, Curlytop Knotweed, Curlytop Lady's Thumb; Drying banks of Scott Pond; Rare; (#); C = 0; BSUH 11776.

Polygonum pensylvanicum L.; SYN: *Persicaria pensylvanica* (L.) G. Maza; Pennsylvania Smartweed, Pinkweed; Fields around Scott Pond; Infrequent; C = 0; BSUH 11775.

Polygonum persicaria L.; SYN: *Persicaria vulgaris* Webb & Moq.; Spotted Lady's Thumb; Along Culmer's Run and disturbed ground at butterfly house; Infrequent; (*); C = 0; BSUH 11330.

Polygonum punctatum Ell. var. *confertiflorum* (Meisn.) Fassett; SYN: *Persicaria punctata* (Ell.) Small; Dotted Smartweed; Seep north of Iron Gate Road, floodplain woods on east side, and wet meadow north of cattail marsh; Frequent; (#); C = 3; BSUH 11773, 12641.

Polygonum scandens L.; SYN: *Fallopia scandens* (L.) Holub; Climbing False Buckwheat; Climbing on other vegetation throughout the east side; Frequent; (#); C = 0; BSUH 11763, 12533.

Polygonum virginianum L.; SYN: *Tovara virginiana* (L.) Raf.; Jumpseed, Virginia Knotweed; Woods; Frequent; C = 3; BSUH 12649.

Rumex crispus L.; Curly Dock; Moist meadows and open woods east of Culmer's Run; Frequent; (* #); C = 0; BSUH 11705.

Rumex obtusifolius L.; Bitter Dock; Iron Gate Road at Culmer's Run; Rare; (*); C = 0; BSUH 12705.

Portulacaceae (Purslane Family)

Anagallis arvensis L.; Scarlet Pimpernel, Poor Man's Weatherglass; Gravel parking lot south of Hayes House; Rare; (* #); C = 0; BSUH 11853.

Claytonia virginica L.; Virginia Spring Beauty; Woods and dry fields; Abundant; C = 2; BSUH 11823.

Portulaca oleracea L.; Common Purslane; Disturbed ground; Rare; (* # %); C = 0; Hayes Arboretum Herbarium.

Potamogetonaceae (Pondweed Family)

Potamogeton foliosus Raf.; Leafy Pondweed; Scott Pond; Frequent; (#); C = 4; BSUH 11174, 11176.

Potamogeton nodosus Poir.; American or Long-leaf Pondweed; Scott Pond; Frequent; (#); C = 4; BSUH 11182.

Primulaceae (Primrose Family)

Dodecatheon meadia L.; Eastern Shooting Star; Fern garden and upland woods east of cattail marsh; Rare; C = 7; BSUH 12710.

Lysimachia ciliata L.; Fringed Loosestrife; Floodplain woods along Culmer's Run and around Scott Pond; Frequent to abundant; C = 4; BSUH 12569, 12577.

Lysimachia nummularia L.; Moneywort; Creeping Jenny; Open wet meadow between Culmer's Run and cattail marsh, cattail marsh, and wet meadow north of cattail marsh; Abundant; (*); C = 0; BSUH 11854.

Ranunculaceae (Buttercup Family)

Actaea pachypoda Ell.; SYN: *Actaea alba* (L.) Miller; Doll's eyes, White Baneberry; Woods; Infrequent; (#); C = 7; BSUH 12712.

Anemone quinquefolia L.; Wood Anemone; Upland woods west of Culmer's Run; Frequent; C = 7; BSUH 11898.

Anemone virginiana L.; Tall Anemone, Tall Thimbleweed; Fields and open woods around Scott Pond; Infrequent; C = 4; BSUH 12571.

Aquilegia canadensis L.; Canada or Red Columbine; Path next to season wet area east of Nature Center; Rare; (#); C = 5; BSUH 12610.

Aquilegia vulgaris L.; European Columbine; Plant dump on east side; Rare; (* #); C = 0; BSUH 11888.

Caltha palustris L.; Yellow Marsh Marigold, Cowslip; Salamander Creek; Rare (one plant); C = 7; BSUH 12972.

Cimicifuga racemosa (L.) Nutt.; Black Cohosh, Black or False Bugbane; Fern garden; Rare; C = 9; BSUH 11978.

Delphinium tricorne Michx.; Dwarf Larkspur; Upland woods east of cattail marsh; Rare; C = 5; BSUH 11602.

Enemion biternatum Raf.; SYN: *Isopyrum biter-natum* Torr. & Gray; Eastern False Rue Anemone; Woods; Infrequent; C = 5; BSUH 11795.

Eranthis hyemalis (L.) Salisb.; Mountain Winter Aconite, Hellebore; Edge of woods just east of Nature Center; Rare, but locally abundant; (* #); C = 0; BSUH 13898.

Hepatica nobilis Schreb. var. *acuta* (Pursh) Steyer-mark; SYN: *Hepatica acutiloba* DC., *Anemone acutiloba* (DC.) G. Lawson; Sharp-lobed Hepatica; Bank of Salamander Creek and the woods west; Infrequent; C = 8; BSUH 11894.

Hydrastis canadensis L.; Golden Seal; Along Salamander Creek in woods between auto tour and railroad track; Rare; (#); C = 7; BSUH 13128.

Ranunculus abortivus L.; Small-Flowering Crowfoot; Little-Leaf Buttercup; Moist fields, woods around Nature Center, and along Culmer's Run; Frequent; C = 0; BSUH 11821.

Ranunculus hispidus Michx. var. *caricetorum*

(Greene) T. Duncan; Bristly Buttercup, Hispid Swamp Buttercup; Floodplain woods along and west of Culmer's Run; Infrequent; C = 10; BSUH 11911.

Ranunculus micranthus Nutt.; Small-Flowered Crowfoot, Rock Buttercup; Slope and upland woods south and east of cattail marsh; Infrequent; (#); C = 4; BSUH 11607.

Ranunculus recurvatus Poir.; Hooked Crowfoot; Wet meadows and along creeks; Infrequent; C = 5; BSUH 11613, 12973.

Ranunculus sceleratus L.; Cursed Crowfoot, Cursed Buttercup; Salamander Creek; Rare; (#); C = 3; BSUH 11639.

Thalictrum dioicum L.; Early Meadow Rue; Upland woods east of the cattail marsh; Rare; C = 7; BSUH 11844.

Thalictrum pubescens Pursh; Late or Tall Meadow Rue; Meadow along Culmer's Run; (This collection may possibly be *Thalictrum perelegans* Greene of Deam [1940], but this species is not recognized by Gleason & Cronquist [1991].); Rare; (#); C = 6; BSUH 11992. [Threatened].

Thalictrum thalictroides (L.) Eames & Boivin; SYN: *Anemonella thalictroides* (L.) Spach.; Rue Anemone; Woods; Infrequent; C = 7; BSUH 11629, 11793.

Rosaceae (Rose Family)

Agrimonia gryposepala Wallr.; Tall Agrimony; Beneath power lines in recently cleared area east of Hayes Arboretum Road and in woods; Infrequent; (#); C = 2; BSUH 11443.

Agrimonia parviflora Aiton; Southern or Swamp Agrimony; Moist fields and meadows and moist open woods; Abundant, especially on the east side; (#); C = 4; BSUH 12653.

Agrimonia pubescens Wallr.; Downy Agrimony; Woods; Frequent; (#); C = 5; BSUH 11327, 12652.

Amelanchier arborea (Michx. f.) Fernald; Downy Serviceberry, Juneberry; Woods north of Nature Center; Rare; (#); C = 6; BSUH 11830, 12521.

Crataegus succulenta Schrad.; Fleshy Hawthorn; Meadow south of Iron Gate Road and west of Culmer's Run; Rare (one tree); (#); C = 6; BSUH 11781. [Rare].

Duchesnea indica (Andr.) Focke; Indian Strawberry; Woods just north of Nature Center; Abundant; (* #); C = 0; BSUH 11805.

Fragaria virginiana Duchesne; Thick-leaved Wild Strawberry; Grassy roadsides and fields; Infrequent, but locally frequent; (#); C = 2; BSUH 11598, 12979.

Geum canadense Jacq.; White Avens; Woods; Infrequent; C = 1; BSUH 11859.

Geum vernum (Raf.) Torr. & Gray; Spring Avens; Woods and moist fields; Abundant; C = 1; BSUH 11594, 11895.

Potentilla norvegica L.; Rough Cinquefoil; fields; infrequent; C = 0; BSUH 12595.

Potentilla recta L.; Sulphur Five-fingers or Cinquefoil; Fields and roadside; Infrequent; (*); C = 0; BSUH 12601.

Potentilla simplex Michx.; Old Field Five-Fingers, Common Cinquefoil; Woods and woods edge, especially along the railroad track on the west side; Frequent, but locally abundant; C = 2; BSUH 11934.

Prunus americana Marshall; American or Wild Plum; Edge of woods along auto tour; Infrequent; C = 4; BSUH 12984, 13769.

Prunus serotina Ehrh.; Wild Black Cherry; Woods; Frequent; C = 1; BSUH 12612.

Prunus virginiana L.; Common Choke Cherry; Floodplain woods on east side; Infrequent, but locally abundant; (#); C = 3; BSUH 11641.

Pyrus malus L.; Apple; SYN: *Malus domestica* Borkh.; Fields and woods; Infrequent; (* #); C = 0; BSUH 11826, 12982.

Rhodotypos scandens (Thunb.) Makino; Jetbead; Upland woods east of cattail marsh; Abundant at this site; (* #); C = 0; BSUH 11889.

Rosa multiflora Thunb.; Multiflora or Japanese Rose; Woods; Frequent; (* #); C = 0; BSUH 11874.

Rosa palustris Marshall; Swamp Rose; Cattail marsh and banks of Scott Pond; Infrequent; C = 5; BSUH 11116, 12530.

Rosa setigera Michx.; Climbing Prairie Rose, Illinois Rose; Woods' edge; Abundant; C = 4; BSUH 11189, 12598.

Rubus flagellaris Willd.; Common or Northern Dewberry; Sunlit areas of woods; Infrequent; (#); C = 2; BSUH 11396, 11626.

Rubus occidentalis L.; Black Raspberry; Woods edge; Infrequent; C = 1; BSUH 11956.

Rubus pensilvanicus Poir.; SYN: *Rubus abactus* Bailey; Pennsylvania or Yankee Blackberry; Along the railroad track and scattered sites in open woods or the edge of woods; Infrequent; (#); C = 5; BSUH 11935, 11943.

Rubiaceae (Madder Family)

Galium aparine L.; Cleavers, Annual Bedstraw; Successional woods, especially on the east side; Abundant; C = 1; BSUH 11910.

Galium circaezans Michx.; Forest Bedstraw, Smooth Wild Licorice, Licorice Bedstraw; Woods, especially on the east side; Abundant; C = 7; BSUH 11944, 12677.

Galium concinnum Torr. & Gray; Shining Bedstraw; Woods; Frequent; C = 5; BSUH 12573.

Galium mollugo L.; White Bedstraw; Woods' edge along railroad track on the west side; Rare, but locally abundant; (* #); C = 0; BSUH 12581.

Galium triflorum Michx.; Sweet-scented or Fragrant Bedstraw; Woods on the east side; Infrequent; (#); C = 5; BSUH 11406.

Rutaceae (Rue Family)

Ptelea trifoliata L.; Common Hop Tree, Smooth Wafer Ash; Woods' edge near Spring House and prairie planting; Rare (two trees); (#); C = 4; BSUH 11133.

Salicaceae (Willow Family)

Populus deltoides Marshall; Eastern Cottonwood; Floodplain forest east side, along ravines and creeks on west side; Frequent; (#); C = 1; BSUH 11919, 13132.

Salix eriocephala Michx.; Diamond or Heart-Leaved Willow; Around Millie's Pond; Rare; (#); C = 4; BSUH 11746.

Salix exigua Nutt.; SYN: *Salix interior* Rowlee; Sandbar or Narrow-leaf Willow; Along Culmer's Run and around Scott Pond; Infrequent; (#); C = 1; BSUH 11916, 12691.

Salix nigra Marshall; Black Willow; Along Culmer's Run; Rare; C = 3; BSUH 12693.

Salix × *rubens* Schrank; Hybrid Crack Willow; Floodplain woods west of Culmer's Run; Rare; (* #); C = 0; BSUH 11412.

Saxifragaceae (Saxifrage Family)

Heuchera americana L.; American, Common, or Tall Alumroot; Slope woods east of the cattail marsh; Rare; (#); C = 7; BSUH 12509.

Penthorum sedoides L.; Ditch Stonecrop; Drying areas around Scott Pond; Rare, but locally abundant; C = 2; BSUH 12640.

Scrophulariaceae (Figwort Family)

Aureolaria virginica (L.) Pennell; Downy Yellow False Foxglove; Open moist woods north of Iron Gate Road and upland woods east of cattail marsh; Infrequent; (#); C = 8; BSUH 11985.

Chaenorrhinum minus (L.) Lange; Lesser Toad-flax, Dwarf Snapdragon; Roadside along auto tour south of Hayes House; Infrequent; (*); C = 0; BSUH 11692.

Chelone glabra L.; White Turtlehead; Cattail marsh and moist meadow north of cattail marsh; Infrequent; C = 7; BSUH 12531.

Penstemon calycosus Small; SYN: *Penstemon laevigatus* Ait. ssp. *calycosus* (Small) Bennett; Eastern Smooth Beard Tongue; Field and woods around Scott Pond; Infrequent, but locally frequent; (#); C = 4; BSUH 12570.

Penstemon digitalis Nutt. ex Sims; Tall White Beard Tongue, Foxglove Beard Tongue; Fields, open woods, and roadside along auto tour south of Hayes House; Frequent, but locally abundant; C = 4; BSUH 11851.

Scrophularia marilandica L.; Eastern or Late Figwort; Along Culmer's Run; Rare; C = 5; BSUH 11986.

Verbascum blattaria L.; Moth Mullein; Fields, especially around Iron Gate Road; Infrequent, but locally abundant; (*); C = 0; BSUH 11707, 12674.

Verbascum thapsus L.; Common or Woolly Mullein; Roadside and along railroad track; Infrequent; (* #); C = 0; BSUH 11951, 12600.

Veronica anagallis-aquatica L.; SYN: *Veronica catenata* Pennell; Water Speedwell; In and around Culmer's Run; Rare; (#); C = 5; BSUH 12632. [Threatened].

Veronica arvensis L.; Corn Speedwell; Roadside, gravel parking lots, fields; Abundant; (* #); C = 0; BSUH 11816, 11917.

Veronica hederifolia L.; Ivy-Leaved Speedwell; Slope woods from Iron Gate Road to the cattail marsh; Abundant; (* #); C = 0; BSUH 11903.

Veronica officinalis L.; Common Speedwell; Woods east of fern garden; Rare; (* #); C = 0; BSUH 11886.

Veronica peregrina L.; Purslane Speedwell, Smooth Purslane; Field south of Iron Gate Road; Rare, but locally frequent; (#); C = 0; BSUH 11915.

Veronica persica Poir.; Bird's-Eye Speedwell; Field near maintenance building, Rare; (* #); C = 0; BSUH 11891.

Simaroubaceae (Quassia Family)

Ailanthus altissima (Miller) Swingle; Tree of Heaven; Woods along railroad track between Research Pond and path to fern garden; Rare; (* #); C = 0; BSUH 11046.

Smilacaceae (Catbrier Family)

Smilax hispida Muhl.; SYN: *Smilax tamnoides* L., *Smilax tamnoides* L. var. *hispida* (Muhl. ex Torr.) Fernald; Bristly Greenbrier or Catbrier; Woods; Abundant; (#); C = 3; BSUH 11780, 12689.

Smilax lasioneura Hook.; SYN: *Smilax herbacea* L. var. *lasioneura* (Small) Rydb.; Common Carrion Flower; Woods' edge; Rare; (%); C = 4; Hayes Arboretum Herbarium.

Solanaceae (Nightshade Family)

Physalis longifolia Nutt. var. *subglabrata* (MacKenzie & Bush) Cronq.; Longleaf or Smooth Ground Cherry; Field east of Nature Center; Rare; (# %); C = 0; Hayes Arboretum Herbarium.

Solanum americanum Mill.; SYN: *Solanum nigrum* L. var. *virginicum* L., *Solanum ptycanthum* Dun.; American Black Nightshade; along Culmer's Run, Around Scott Pond, and along the railroad track; Infrequent; C = 0; BSUH 12543, 12591, 12630.

Solanum carolinense L.; Carolina Horse Nettle; Fields and woods' edge, especially around Scott Pond; Infrequent; (#); C = 0; BSUH 11124.

Solanum dulcamara L.; Bittersweet Nightshade, Climbing Nightshade; Along Culmer's Run near the railroad tract and in the cattail marsh; Rare; (* #); C = 0; BSUH 12633.

Tiliaceae (Linden Family)

Tilia americana L.; American Basswood, American Linden; Woods, especially on the east side; Frequent; C = 5; BSUH 12572, 12703.

Typhaceae (Cattail Family)

Typha angustifolia L.; Narrow-Leaved Cattail; Cattail marsh; Frequent; (* #); C = 0; BSUH 12698.

Typha latifolia L.; Common or Broad-Leaved Cattail; Cattail marsh; Abundant; (#); C = 1; BSUH 11993.

Ulmaceae (Elm Family)

Celtis occidentalis L.; Northern or Common Hackberry; Woods; Abundant; (#); C = 3; BSUH 12568.

Ulmus americana L.; White or American Elm; Woods, especially the east side; Abundant; C = 3; BSUH 12650.

Ulmus rubra Muhl.; Slippery or Red Elm; Woods and woods' edge; Frequent; C = 3; BSUH 12576.

Urticaceae (Nettle Family)

Boehmeria cylindrica (L.) Sw.; Small-spike False Nettle; Moist field south of Iron Gate Road, moist meadows and open woods north of Iron Gate Road, and around Scott Pond; Infrequent, but locally frequent; C = 3; BSUH 12639, 12654.

Laportea canadensis (L.) Wedd.; Canadian Wood Nettle; Woods, especially the floodplain woods on east side; Abundant; (#); C = 2; BSUH 12655.

Pilea fontana (Lunell) Rydb.; Bog Clearweed; Cattail marsh; Frequent and in large colonies; (#); C = 5; BSUH 12513, 12532.

Pilea pumila (L.) A. Gray; Canadian Clearweed; Woods, dirt roads, moist meadows; Abundant; C = 2; BSUH 12648, 12991.

Valerianaceae (Valerian Family)

Valerianella umbilicata (Sulliv.) A. Wood; Corn Salad; Wet meadow north of cattail marsh; Abundant at this site; C = 5; BSUH 11928.

Verbenaceae (Vervain Family)

Phryma leptostachya L.; American Lopseed; Woods; Frequent; C = 4; BSUH 12565.

Phyla lanceolata (Michx.) Greene; Lance-leaf Fogfruit; Around Scott Pond and in drying areas; Abundant at this site; C = 2; BSUH 11110.

Verbena hastata L.; Common or Blue Vervain; Field; Rare; (%); C = 3; Hayes Arboretum Herbarium.

Verbena stricta Vent.; Hoary Vervain; Field east of Nature Center; Rare; (%); C = 4; Hayes Arboretum Herbarium.

Verbena urticifolia L.; White Vervain; Cattail marsh and moist meadow between Culmer's Run and cattail marsh; Infrequent; C = 3; BSUH 11979.

Violaceae (Violet Family)

Viola pubescens Aiton; Yellow Forest Violet, Downy Yellow Violet; Woods; Abundant; (#); C = 5; BSUH 11801.

Viola sororia Willd.; Dooryard Violet, Common or Woolly Blue Violet; Woods and fields; Abundant; (#); C = 1; BSUH 11804.

Viola striata Aiton; Striped Creamy Violet, Common White Violet; Woods and roadside; Infrequent; C = 4; BSUH 11824.

Vitaceae (Grape Family)

Parthenocissus quinquefolia (L.) Planch.; Virginia Creeper, Woodbine; Woods; Abundant; C = 2; BSUH 11908.

Vitis riparia Michx.; Riverbank Grape; Woods; Infrequent; (#); C = 1; BSUH 12609.

Vitis vulpina L.; Frost Grape; Woods; Frequent; (#); C = 3; BSUH 12501.

APPENDIX 2

Ferns and Allies Documented in the Fern Garden, Hayes Arboretum

This list includes ferns documented in the Fern Garden located north of the Spring House. Species are arranged alphabetically, not according to phylogenetic relationships. Nomenclature follows the U.S.D.A. Plant Data Base. Following each species are current synonyms, if any, common names, and the BSUH number.

Adiantum pedatum L.; Northern Maidenhair Fern; BSUH 11247; 12716.

Asplenium platyneuron (L.) Oakes; Ebony Splenwort; BSUH 11251.

Athyrium filix-femina (L.) Roth.; Lady Fern; BSUH 11235.

Athyrium pycnocarpon (Spreng.) Tidestrom; Glade Fern; BSUH 11289, 12986.

Athyrium thelypteroides (Michx.) Desv.; Silvery Glade Fern; BSUH 11057.

Cystopteris bulbifera (L.) Bernh.; Bulblet Bladder Fern; BSUH 11291.

Cystopteris protrusa (Weatherby) Blasdell; Lowland Bladder Fern; BSUH 12713.

Dryopteris carthusiana (Villars.) H.P. Fuchs; Toothed Wood Fern; BSUH 11233.

Dryopteris goldiana (Hook.) A. Gray; Goldie's Wood Fern; 11253.

Dryopteris marginalis (L.) A. Gray; Marginal Wood Fern; BSUH 11283.

- Equisetum arvense* L.; Common or Field Horsetail; 11896.
Matteuccia struthiopteris (L.) Todaro.; Ostrich Fern; BSUH 11273.
Onoclea sensibilis L.; Sensitive Fern; BSUH 11270, 12549.
Polystichum acrostichoides (Michx.) Schott; Christmas Fern; BSUH 11266.
Thelypteris hexagonoptera (Michx.) Weatherby; Broad or Southern Beech Fern; BSUH 11287.
Thelypteris noveboracensis (L.) Nieuwl.; New York Fern; 11049.

APPENDIX 3

Plants Documented in the Three Prairie Plantings, Hayes Arboretum

- This list includes species documented in the three small prairie plantings located south of Hayes House. Species are arranged alphabetically, not according to phylogenetic relationships. Nomenclature follows the U.S.D.A. Plant Data Base. Following each species are current synonyms, if any, common names, and the BSUH number.
- Achillea millefolium* L.; Common Yarrow; BSUH 12702.
Allium cernuum Roth; Nodding Onion; BSUH 11983.
Andropogon gerardii Vitman; Big Bluestem; BSUH 12670.
Anemone virginiana L.; Tall Anemone, Tall Thimbleweed; 12571.
Ceanothus americanus L.; SYN: *Ceanothus americanus* L. var. *pitcheri* Torr. & Gray; New Jersey Tea; BSUH 11199.
Conoclinium coelestinum (L.) DC.; SYN: *Eupatorium coelestinum* L.; Blue Mistflower; BSUH 12552.
Coreopsis lanceolata L.; Longstalk or Lanceleaf Tickseed; BSUH 12608.
Coreopsis palmata Nutt.; Finger or Stiff Tickseed; BSUH 11127.
Crataegus monogyna Jacq.; Oneseed Hawthorn; BSUH 11361.
Daucus carota L.; Wild Carrot, Queen Anne's Lace; BSUH 12594.
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark var. *fasciculatum* (Torr.) Freckmann; Western Panic Grass, Old-Field Panic Grass; BSUH 11652.
Echinacea pallida (Nutt.) Nutt.; Prairie or Pale Purple Coneflower; BSUH 11207, 13001.
Echinacea purpurea (L.) Moench.; Eastern Purple Coneflower; BSUH 11205.
Erigeron annuus (L.) Pers.; Annual Fleabane, Eastern Daisy Fleabane; BSUH 11857.
Eryngium yuccifolium Michx.; Rattlesnake Master, Button Eryngo; BSUH 11981.
Euphorbia corollata L.; Flowering Spurge; BSUH 12615.
Fragaria virginiana Duchesne; Thick-Leaved Wild Strawberry; BSUH 11598, 12979.
Gaillardia pulchella Foug.; Rosering Blanket Flower, Firewheel; BSUH 12993.
Helianthus occidentalis Riddell; Naked-Stemmed or Few-Leaf Sunflower; BSUH 12620.
Heliopsis helianthoides (L.) Sweet; Sunflower Everlasting, False Sunflower, Smooth Oxeye, BSUH 11141.
Lathyrus latifolius L.; Everlasting or Perennial Pea; BSUH 11332.
Leucanthemum vulgare Lam.; SYN: *Chrysanthemum leucanthemum* L.; Oxeye Daisy; BSUH 12727.
Liatris spicata (L.) Willd.; Sessile or Dense Blazing Star; 11131.
Liatris pycnostachya Michx.; Thick-spike or Prairie Blazing Star; BSUH 11129, 11439.
Liatris ligulistylis (A. Nels.) K. Schum.; Northern Plains or Rocky Mountain Blazing Star; BSUH 12626.
Medicago lupulina L.; Black Medic; BSUH 12605.
Monarda fistulosa L.; Wild Bergamot; BSUH 11982.
Oligoneuron rigidum (L.) Small; SYN: *Solidago rigida* L.; Stiff Goldenrod; BSUH 12621.
Panicum virgatum L.; Switchgrass; BSUH 11769.
Parthenium integrifolium L.; Wild Quinine, Eastern Parthenium; BSUH 11186.
Phleum pratense L.; Timothy; BSUH 12606.
Phlox paniculata L.; Summer or Fall Phlox; BSUH 11333, 12614, 12990.
Physostegia virginiana (L.) Benth.; Obedience, Obedient Plant, False Dragonhead; BSUH 11760.
Plantago lanceolata L.; English or Narrow-Leaf Plantain; BSUH 11875.
Pycnanthemum virginianum (L.) Durand & Jackson; Virginia Mountain Mint; BSUH 11980.
Raietida pinnata (Vent.) Barnh.; Globular or Gray Headed Coneflower, Pinnate Prairie Coneflower; BSUH 11209.
Rosa setigera Michx.; Climbing Prairie Rose; BSUH 11189, 12598.
Rudbeckia hirta L. var. *pulcherrima* Farw.; Black-eyed Susan; BSUH 11211.
Rudbeckia triloba L.; Three-lobed Coneflower, Brown-eyed Susan; BSUH 11849.
Rudbeckia subtomentosa Pursh; Sweet Coneflower; BSUH 12628.
Rudbeckia fulgida Ait. var. *speciosa* (Wender.) Per-

- due; Eastern or Orange Coneflower; BSUH 11403.
- Ruellia strepens* L.; Smooth Ruellia, Limestone Wild Petunia; BSUH 11072, 11192, 11761.
- Schizachyrium scoparium* (Michx.) Nash; Little Bluestem; BSUH 12554.
- Scirpus pendulus* Muhl.; Red or Rufous Bulrush; BSUH 11876.
- Scutellaria incana* Biehler; Hoary Skullcap; BSUH 11727, 12987.
- Silphium laciniatum* L.; Compass Plant; BSUH 11365, 12671.
- Silphium terebinthinaceum* Jacq.; Basal-leaved or Prairie Rosinweed, Prairie Dock; BSUH 11215, 11336.
- Sisyrinchium angustifolium* Mill.; Stout or Narrow-Leaf Blue-Eyed Grass; BSUH 11954, 12995.
- Solidago nemoralis* Aiton; Gray Goldenrod; BSUH 11757, 12507.
- Sorghastrum nutans* (L.) Nash; Indian Grass; BSUH 12619.
- Symphytotrichum novae-angliae* (L.) Nesom; SYN: *Aster novae-angliae* L.; New England Aster; BSUH 11745, 11759, 12553.
- Thaspium trifoliatum* (L.) A. Gray; Smooth or Purple Meadow Parsnip; BSUH 11197.
- Toxicodendron radicans* (L.) Kuntze var. *negundo* (Greene) Reveal; Common or Eastern Poison Ivy; BSUH 11860.
- Tradescantia ohioensis* Raf.; Smooth or Ohio Spiderwort, Bluejacket; BSUH 12992.
- Trifolium pratense* L.; Red Clover; BSUH 11393.
- Veronicastrum virginicum* (L.) Farw.; Culver's Root; BSUH 11202.
- Vitis riparia* Michx.; Riverbank Grape; BSUH 12609.
- Zizia aurea* (L.) Koch; Common Golden Alexanders, Golden Zizia; BSUH 12678, 13000.

APPENDIX 4

Display/Educational Plants Planted (Not Naturalized), Hayes Arboretum

This list includes species that have been planted at various sites in the arboretum for education or display. Species are arranged alphabetically, not according to phylogenetic relationships. Nomenclature follows the U.S.D.A. Plant Data Base. Following each species are current synonyms, if any, common names, and the BSUH number.

- Aesculus flava* Aiton; Sweet or Yellow Buckeye; BSUH 11866.
- Amelanchier arborea* (Michx. f.) Fernald; Downy or Common Serviceberry; BSUH 11830.
- Buddleja davidii* Franch.; Orange-eye Butterfly Bush; BSUH 11725.
- Carya illinoensis* (Wengen.) K. Koch; Pecan; BSUH 12517.
- Cimicifuga racemosa* (L.) Nutt.; Black Cohosh, Black Bugbane; BSUH 11978.
- Corylus americana* Walt.; American Hazelnut; BSUH 12616.
- Dasiphora floribunda* (Pursh) Kartesz; SYN: *Potentilla fruticosa* L.; Shrubby Five-Finger, Shrubby Cinquifol; BSUH 11184.
- Dodecatheon meadia* L.; Eastern Shooting Star; BSUH 12710.
- Fagus sylvatica* "Asplenifolia" L.; European Cut-leaf Beech; BSUH 12523.
- Forsythia* × *intermedia* Zabel; Golden Bell, Forsythia; BSUH 11893.
- Gleditsia triacanthus* f. *inermis* (L.) Zabel; Thornless Honey Locust; BSUH 12686.
- Hibiscus syriacus* L.; Rose of Sharon; BSUH 11847.
- Hypericum prolificum* L.; Shrubby St. John's Wort; BSUH 11237.
- Liquidambar styraciflua* L.; Sweetgum; BSUH 12707.
- Magnolia acuminata* (L.) L.; Cucumber Tree; BSUH 12708.
- Metasequoia glyptostroboides* Hu & Cheng; Dawn Redwood; BSUH 12977.
- Monarda didyma* L.; Oswego Tea, Scarlet Bee Balm; BSUH 12524.
- Narcissus pseudonarcissus* L.; Daffodil; BSUH 11811.
- Physocarpus opulifolius* (L.) Maxim.; Common Ninebark; BSUH 12704.
- Picea pungens* Engelm.; Blue Spruce; BSUH 11913.
- Picea abies* (L.) Karst.; Norway Spruce; BSUH 12980.
- Pinus strobus* L.; Eastern White Pine; BSUH 11905.
- Pinus resinosa* Soland.; Red Pine; BSUH 12528.
- Pinus nigra* Arnold; Austrian Pine; 11942.
- Pyracantha coccinea* (Medik.) Roem.; Scarlet Firethorn; BSUH 11432, 12667.
- Quercus bicolor* Willd.; Swamp White Oak; BSUH 12994.
- Quercus coccinea* Muenchh.; Scarlet Oak; BSUH 11716.
- Rhus aromatica* Aiton; Squaw Bush, Fragrant Sumac; BSUH 12550.
- Rhus copallinum* L.; Shining or Flameleaf Sumac; BSUH 11770, 12544.
- Rhus hirta* (L.) Sudworth; SYN: *Rhus typhina* L.; Staghorn Sumac; BSUH 11304.
- Salix cinerea* L.; Large Gray Willow; BSUH 11328.
- Salix discolor* Muhl.; Pussy Willow; BSUH 11363.

Spiraea × *vanhouttei* (Briot) Carr.; Vanhoutte Spiraea, Bridal Wreath; BSUH 12613.
Spiraea alba Du Roi; White Meadowsweet; BSUH 12617.
Taxodium distichum (L.) Rich.; Bald Cypress; BSUH 12730, 12978.
Tsuga canadensis (L.) Carr.; Eastern Hemlock; BSUH 11067.

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