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Prairie Fen Preserved in an Urban Environment

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Abstract

Prairie fens are a rare, fire-dependent wetland type found only in the glaciated Midwest in ice-contact topography along streams or lake boundaries that historically occurred adjacent to prairies and savannas. Due to a strong dependence on cool, alkaline groundwater seepage, they are extremely sensitive to hydrological alterations that result from urban development. While prairie fens are common in glacial interlobate regions, it was still surprising to discover one while conducting a botanical inventory in 2001 in an urban development in Kalamazoo, Michigan. The 295-acre planned unit development (PUD), known as Parkview Hills, is bordered by medium-density residential neighborhoods, a major federal highway, and open lands. Three state-listed plant species and two state-listed animals occur in the fen and calcareous seepage is active in many areas. However, the effects of fire suppression, urban development, and a millpond two miles upstream are apparent. Woody encroachment from invasive species, such as glossy buckthorn (*Frangula alnus*), is severe throughout much of the fen.

Keywords: prairie fen, wetlands, glossy buckthorn, invasive species, habitat description, land use

Introduction

Prairie fens are found primarily in the glaciated Midwest and are common in glacial interlobate regions (Albert 1995). Kalamazoo County, Michigan is located in such a region. A complex association of three or four different vegetation zones, they tend to occur on peaty soils on the lower slopes of moraines or ice-contact ridges at the junction of an outwash plain. Coarse-textured glacial deposits force alkaline groundwater to the surface through sediments of high hydraulic conductivity. These calcareous seeps, combined with a prairie flora and fauna component, are what make prairie fens unique (Michigan Natural Features Inventory 1997). Prairie fens are "rare or uncommon" in the state of Michigan (S3—on the order of 21 to 100 occurrences) and are either G3 (rare or uncommon) or G4 (globally secure) on a global scale. They are particularly sensitive to significant modifications in the surrounding landscape, due to their hydrological dependence, and to woody invasion in the absence of fire and beaver flooding. Succession to shrub-carr is typical when these disturbances are persistent.

Parkview Hills Fen (PVH Fen), a roughly 30-acre (12-hectare) prairie fen occurring within the city limits of Kalamazoo, was first encountered during a comprehensive natural features inventory of Parkview Hills Planned Unit Development (PUD) in August 2001. Meander surveys continued through the beginning of October of that year and then sporadically throughout 2002. Follow-up surveys were conducted biweekly from early June through early August of 2004. The fen was found to contain three state-listed plant species, two state-listed animal species, and have a Michigan Floristic Quality Index (FQI) of 55.6.

Setting

In 1970, 295 acres of oldfields, forests, wetlands, streams, and lakes in the southwest corner of Kalamazoo were developed as a PUD under the name Parkview Hills (PVH) (see Figure 1). It is currently occupied by almost 1,600 people. Since first being cultivated in the mid-nineteenth century, the site has supported a number of agricultural uses, including row crops, haying, orchard, and grazing animals. Livestock most likely were allowed to graze in the wetlands, which probably were hayed as well. There is no indication that the wetlands ever were drained or tiled, although more recent landscape-scale effects are present, including the dredging of a portion of a marsh downstream from the prairie fen to form a 4- and a 7-acre lake within the boundaries of Parkview Hills. Historical aerial photos show that wetlands at Parkview Hills have decreased to about one-third their 1970 acreage (Adams and others, unpublished data). Aside from these alterations, the development of Parkview Hills stressed clustering houses a significant distance from wetlands and waterways, minimal cutting of trees, and replacement of appropriate tree species where possible.

The presettlement vegetation of the area now encompassed by Parkview Hills is listed as mixed oak savanna (Comer and others 1995), with the exception of the wetlands on the property, which were not further characterized. The original 1825 General Land Office surveyor's notes list a number of specific individuals of both white and black oak (*Quercus alba* and *Q. velutina*) of varying sizes, and relics of that savanna community persist today. Although most wetland acreage has succeeded into shrub-carr, one prairie fen, located along the northwest and west shore of Lake Hill 'n'

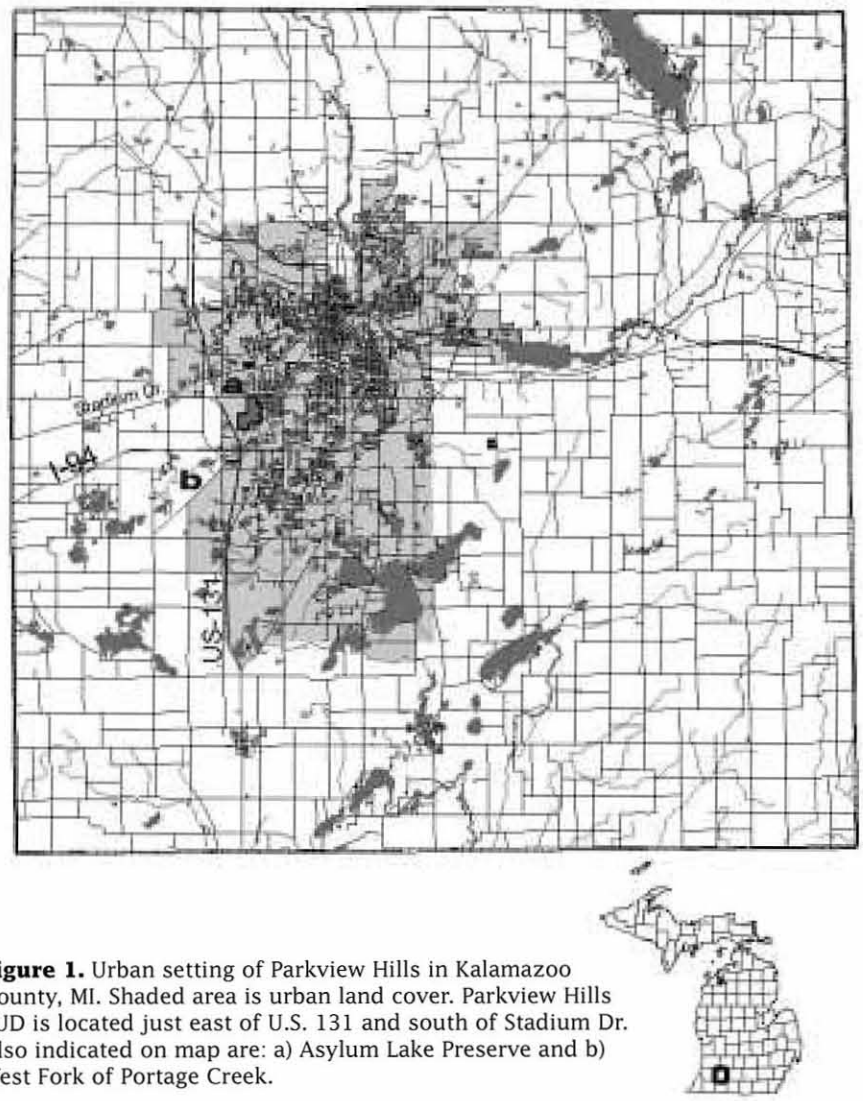

Figure 1. Urban setting of Parkview Hills in Kalamazoo County, MI. Shaded area is urban land cover. Parkview Hills PUD is located just east of U.S. 131 and south of Stadium Dr. Also indicated on map are: a) Asylum Lake Preserve and b) West Fork of Portage Creek.

Brook (Figure 2) has maintained its ecological integrity. The fen extends to the south outside of the boundaries of Parkview Hills.

Several surrounding land use practices negatively impact the fen. The fen is positioned near the junction of US–131 and I–94, just north of where the West Fork of Portage Creek flows through a culvert under US–131 (Figure 1). Business I–94/US–131 (Stadium Drive)—a major commercial highway—runs about one mile to the north. Directly upstream across US–131 is a millpond, now inactive. There are several nature preserves in the watershed, including three upstream on the West Fork of Portage Creek, and one on the stream that feeds into it from the north.

Description of Fen

Prairie fens are composed of three or four interspersed vegetative zones, all of which persist to varying degrees at Parkview Hills (Michigan Natural Features Inventory 1997). *Inundated flats*, dominated by bulrushes (*Schoenoplectus* spp.) and other members of the Sedge Family (Cyperaceae) and rush family (Juncaceae), occur submerged in up to 3 feet of water along the edge of a lake or stream. Tussock sedge (*Carex stricta*), shrubby cinquefoil (*Dasiphora floribunda* (Pursh) Kartesz, comb. nov. ined. [*Potentilla fruticosa* auct. Non L.]), and members of the Aster Family (Asteraceae) make up the major portion of the *sedge meadow* zone. This often occupies the largest area in a prairie fen. A *wooded fen* zone, comprised of tamarack (*Larix laricina*), willow (*Salix* spp.), dogwood (*Cornus* spp.) and poison sumac (*Toxicodendron vernix*), is usually adjacent to uplands. When fire is introduced or beaver flooding occurs, the encroachment of these and other woody species is inhibited. Finally, areas of strong groundwater seepage often form *calcareous seeps*, either as scattered pockets or as wide marl flats. These seeps are characterized by marl precipitate at the surface and sparse vegetation composed mostly of calciphilic species such as bog lobelia (*Lobelia kalmii*), grass-of-Parnassus (*Parnassia glauca*), and bog arrow-grass (*Triglochin maritimum*).

Michigan indicator species for prairie fen are all present at PVH Fen: *D. floribunda*, Virginia mountain mint (*Pycnanthemum virginianum*), Ohio and Riddell's goldenrod (*Oligoneuron ohioense* (Frank ex Riddell) G.N. Jones [*Solidago ohioensis* Frank ex Riddell] and *O. riddellii* (Frank ex Riddell) Rydb. [*Solidago r.* Frank ex Riddell]), *L. laricina*, and Indiangrass (*Sorghastrum nutans*). Other notable species include calciphilic species such as bog lobelia, grass-of-Parnassus, small-fringed gentian (*Gentianopsis virgata* (Raf.) Holub [*G. procera* (Holm) Ma]) and typical prairie species such as big bluestem (*Andropogon gerardii*), prairie cordgrass (*Spartina pectinata*) and black-eyed Susan (*Rudbeckia hirta*). Many plant species typical of prairie fens and occurring at PVH fen are considered "conservative" in Michigan (Herman and others 2001), due to their occurrence in only high-quality habitats. With an area of roughly 30 acres, the site yielded an FQI of 55.6 from a list of 223 species (see Appendix 1), representing 64 plant families.

Noteworthy Species

Two state-threatened plant species and one species of special concern were observed at PVH Fen. Cut-leaved water parsnip (*Berula erecta*), which is listed as threatened in Michigan, occurs rooted in the substrate along seeps and partially submerged in cool, slow-flowing alkaline water (Voss 1985). Two separate, stable sub-populations were observed at PVH

Fen, both in spring runs. The other species is wild rice (*Zizania aquatica* var. *aquatica*)—a state-threatened annual grass that typically occurs in solid stands in shallow, slow-flowing water (Penskar and others 2000). It covers many acres at PVH Fen at the inlet to Lake Hill 'n' Brook. This plant has been established intentionally to provide wild duck forage at many State Game Areas and elsewhere. There are no records to indicate this type of planting occurred at PVH. This species has been observed upstream on the West Fork of the Portage Creek, so it is possible that intentional establishment occurred elsewhere along the creek.

In southwestern Michigan, prairie Indian-plantain (*Arnoglossum plantagineum* Raf. [*Cacalia plantaginea* (Raf.) Shinners]), a species of special concern, is restricted to prairie fens, typically in the sedge meadow zone (Penskar and Higman 2000). A population of only four individuals was observed at PVH Fen, at a location near the shore of Lake Hill 'n' Brook.

Two state special concern animal species have been observed at the site—the Eastern box turtle (*Terrapene carolina carolina*) and the Eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*). The box turtle uses various wetlands for breeding and forage, while depending upon adjacent sandy uplands for nesting (Hyde 1999). Several individuals were observed numerous times. The rattlesnake is a federal candidate species for listing under the Endangered Species Act and is rare throughout its range. It uses wetlands and uplands similarly to the box turtle. In addition, it hibernates in shallow water between hummocks, preferring to return to the same hibernacula year-after-year (Lee and Legge 2000). It is usually associated with prairie fens and other open wetlands in southern Michigan, although massasaugas are found in a variety of open and forested wetland habitats in Michigan and throughout their range. I observed this species only once in the fen in 2004, after four years of study and countless visits. PVH residents have reported it from adjacent uplands on a few occasions.

Many plant species considered ecologically invasive are also well established at the site. Most significant among these are the non-native bush honeysuckles (*Lonicera* spp.), glossy buckthorn (*Frangula alnus* P. Mill [*Rhamnus frangula* L.]), giant reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), reed canarygrass (*Phalaris arundinacea*), and watercress (*Rorippa nasturtium-aquaticum* (L.) Hayek [*Nasturtium officinale* Ait. f.]).

Figure 2. Aerial photograph of Parkview Hills (property boundary indicated by thick solid line). The large lake in the SW corner is Lake Hill n' Brook. PVH Fen indicated by thin solid line in southern part of property. Photo: Michigan DNR, 1988; courtesy WMU Geography Dept.

Discussion

Parkview Hill Fen has persisted in spite of surrounding land use pressures and modifications up- and downstream. This is partly attributable to, and partly in spite, of the manner in which the surrounding uplands were developed during the past 35 years. Groundwater seepage is strong in a few areas, maintaining viable calcareous seeps mostly devoid of trees and shrubs (see areas labeled "A" in Figure 3). The importance of intact hydrology should not be underestimated in maintaining the ecological integrity of calcareous wetlands such as prairie fens (Doss 1995, Michigan Natural Features Inventory 1997). The presence of strong groundwater seepage with, perhaps, little interannual variability may provide the stable hydrological conditions necessary for the persistence of this fen even given several local disturbances in the presence of a variety of disturbance factors. Many conservative plant species thrive in these areas, including bog lobelia, small-fringed gentian, and two stable populations of state threatened cut-leaved water parsnip. watercress, a common plant invader, is abundant in spring runs flowing from these seeps. Judging by its extent and

Figure 3. Prairie fen zones: A) calcareous seeps, B) degraded sedge meadow, C) floristically diverse sedge meadow, D) wooded fen, E) broad creek bed occupied by wild rice. Note large areas occupied by glossy buckthorn and other shrubs (dark areas in center of fen). Thin line indicates Parkview Hills' property boundary. Photo: Michigan DNR, 1998

cover, cut-leaved water parsnipappears to be cohabitating adequately with this invasive. The greater portion of the remainder of the fen suffers from woody encroachment from dogwood species, willow species and, primarily, glossy buckthorn. Honeysuckle species are common throughout, but are most important along the relatively drier forest edge.

Sedge meadow occurs mostly as small pockets of rougly 50 to 1,000 square feet (4.5 to 90 square meters) (see areas labeled "B" in Figure 3), although there is one degraded sedge meadow 5 acres in size. These are low-diversity areas dominated less by tussock sedge and more by forbs, such as Joe-pye-weed and swamp aster (*Symphyotrichum puniceum* (L.) A. & D. Love *var. puniceum* [*Aster puniceus* L.]) and grasses, such as rice cutgrass (*Leersia oryzoides*) and reed canarygrass. However, one narrow band of high-diversity sedge meadow persists along the edge of Lake Hill 'n' Brook, bordered entirely on the other side by a wall of glossy buckthorn(see areas labeled "C" in Figure 3). This strip varies in width from 3–4 feet to no more than 20 feet. Many conservative species occur here, such as Ohio goldenrod, whorled loosestrife (*Lysimachia quadriflora*), sweetgrass (*Hierochloe odorata*), marsh wild-timothy (*Muhlenbergia glomerata*) and many others, as well as less conservative but indicative components of prairie fen such as big bluestem and Indiangrass. The special concern plant species is found here, prairie Indian-plantain, almost completely shaded out by glossy buckthorn. Four individuals were observed in 2002, but only two were in bloom. In 2004, none were observed in bloom. Prairie Indian-plantain, when occurring in higher quality Michigan prairie fens, is typically quite abundant, though scattered in distribution (pers. obs.). This population is doubtfully stable without intensive shrub removal and prescribed fire. Along the shore of Lake Hill 'n' Brook, *inundated flats* are evidenced by a long line of emergent hardstem bulrush (*Schoenoplectus acutus*). Other notable species include swamp loosestrife (*Decodon verticillatus*), arrow-arum (*Peltandra virginica*), and water pennywort (*Hydrocotle umbellata*). This zone is composed mostly of typical emergent vegetation, but is consistently associated with prairie fen, and supports a few more conservative species like water pennyworkand spike-rush (*Eleocharis rostellata*) (not observed at PVH Fen). Giant reed is established on about twenty feet of shoreline, otherwise surrounded by glossy buckthorn. Giant reed may be problematic in the future, especially if competition from glossy buckthornis reduced. One factor that may contribute to its spread is excess salts washed into the stream from the adjacent highway.

A *wooded fen* zone is apparent in the southern portion of the fen, near the inlet of the West Fork of the Portage Creek (area "D" in Figure 3). This area is dominated by tamarack, interspersed with small seeps and pockets of sedge meadow. It is unclear whether this tamarack zone is advancing or retreating.

As the creek passes through the culvert under US–131, it flows slowly into a shallow, broad zone dominated by wild-rice (area "E" in Figure 3). This is an impressive sight, especially when viewed from atop a nearby tamarack. Views like this, no doubt, greeted early settlers to the region. This is the only area currently facing threats from purple loosestrife, where it has established on the periphery of the stream.

Presumably the prairie fen once occupied a much larger area, but has since decreased in size due to succession to shrub-carr. At 55.6, the FQI is high, but misleading. The conservative species are mostly few in number and limited to small pockets, especially as compared to higher-quality prairie fens. Furthermore, large areas are dominated by glossy buckthorn and other adventive and non-conservative species. An FQI above 50 generally indicates a site of rarely encountered quality (Herman and others 2001). In this case, I believe the FQI suggests the potential for the site more than its present quality.

Threats and Opportunities

Threats to this prairie fen include surrounding land use in a rapidly developing area, spread of invasive plant species, the continued suppression of fire and lack of occasional beaver damming. Threats from surrounding land use include contamination and stormwater from a highway and an interstate (US–131 and I–94) and a major urban artery (Stadium Drive) (see Figure 1). Medium-density residential development that surrounds Parkview Hills likely contributes warm, nutrient-rich stormwater to the fen and adjacent wetland areas due to the large area of impervious surfaces (lawns, roads, parking lots, driveways). In particular, the southern shore of Lake Hill 'n' Brook is occupied by individual lots outside of PVH with sparse or non-existent shoreline vegetation and large lawns sloping down to the lake's edge. These effects are further compounded by the stormwater from within PVH which is eroding away at the banks of two intermittent drains directly upslope from the fen; every rain event carries considerable loads of silt into the PVH Fen basin. The storm drains within the PUD were designed to recharge the groundwater by directing stormwater from roads within the PUD into recharge basins, but this approach has resulted in the deposition of silt in the woodlands above the fen and in the fen itself, as the recharge basins have filled with sediment during the past 35 years. The drainage patterns are evident here, especially the constant disturbance as stormwater fans out into the bottomlands adjacent to the fen. This can have a number of effects—burying fen vegetation and providing nutrient-rich substrate and disturbance for invasive species. These effects are evidenced by a band of disturbance-adapted vegetation, dominated by *Lonicera* spp., around the upland edge of the fen.

This is not only a source of harmful erosion into the lowlands occupied by the fen, but suggests that large loads of water are washed out over the top of the fen and its surrounding area during storm events. The groundwater seepage that maintains the structure of prairie fens depends upon groundwater being recharged in adjacent uplands as opposed to allowing it to run over the surface of the ground as sheet flow. Despite somewhat localized erosion, the surrounding oak-hickory forest provides an essential buffer for the fen by holding soil in place and providing recharge areas for water flowing from lawns and roofs from upslope residences.

Whereas the threat of invasive species has recently been a major focus of concern (Mack and others 2000, Pimentel and others 2000, Simberloff 2001), the severity of this threat has also been called into question (Theodoropoulos 2003, Houlahan and Findlay 2004). In the case of glossy buckthorn, this species has clearly altered the structure of PVH Fen, and will continue to spread to the exclusion of countless conservative native species. In addition to shading out conservative species, glossy buckthorn's ecological effects include lowering of the water table, and potential allelopathic effects similar to those observed in common buckthorn (*Rhamnus cathartica*) (Seltzner and Eddy 2003). Glossy buckthorn dominates an estimated one-half of the fen. The edges of these monocultures are well populated with recently dead tussock sedge hummocks, indicating an advancing front of this shrub shading out numerous shade-intolerant species. The quick advance of glossy buckthornis apparent, as a band of recently dead tussock sedge hummocks on the edge of the glossy buckthornmonocultures is on the order of 33 feet (10 meters) thick in some places. Removal of glossy buckthornfrom even a small area and reintroduction of fire would likely help maintain the more shade-intolerant plant communities of higher botanical value (Bowles and and others 1996, Kost and De Steven 2000).

The uplands surrounding PVH Fen were once occupied by a fire-maintained oak savanna community (Comer and others 1995). Historically, fires spread from the adjacent savanna (Michigan Natural Features Inventory 1997). Continued fire suppression may adversely affect this unique wetland, as has been shown for remnant ecosystems being encroached upon by urbanization (e.g., Chiwaukee Prairie in southeastern Wisconsin [T. Small, pers. comm.]). Beaver-induced flooding may have played a more continuous role reducing woody cover in the past (Kost 2001), but flooding would not be practical today because of the proximity of homes to the lake. Therefore, the reintroduction of fire is imperative for the health of this fen. Its location within the city limits may well impede the reintroduction of fire. Fear and/or lack of education on the part of Parkview Hill's residents may also make the reintroduction of fire locally unpopular. However, Asylum Lake Preserve directly to the north (see Figure 1) is also within the city limits. A mesic tallgrass prairie reconstruction at Asylum Lake is burned every two to three years. With enough resident education, fire may return to PVH Fen.

Conclusions

Parkview Hills Fen is a surprisingly high-quality prairie fen, considering its recent history and surrounding land use pressures. The lack of development directly adjacent to or within this wetland has allowed much of the vegetative and hydrological structure to persist, including three state-listed plants and two state-listed animals, and abundant groundwater seepage. That said, the level of degradation is acute, and there are many challenges to overcome before this fen can be restored to something approximating its presettlement struc-

ture and function. Aside from the lessening of erosion and sheet flow, improving groundwater recharge and the reduction in cover of glossy buckthorn, the residents of Parkview Hills must believe that a prairie fen is something worth restoring for a restoration project involving the fen to be successful.

Parkview Hills Fen provides an enormous opportunity for education on the effects of erosion and invasive plant species, and the benefits of prescribed burns. One small step in educating residents is underway. Selective cutting of some shrubby growth along a trail adjacent to the fen will provide a better view of a seepage area, allowing for greater appreciation on the part of the residents.

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Appendix 1. Plant Species Observed at PVH Fen 2001–2004

Taxonomy follows the USDA PLANTS database (plants.usda.gov/). Synonymy follows taxonomy used in the Michigan Floristic Quality Assessment (Herman and others 2001).

Common Name	Scientific Name	Family
Box-elder	*Acer negundo*	Aceraceae
Red Maple	*Acer rubrum*	Aceraceae
Silver Maple	*Acer saccharinum*	Aceraceae
Purple Gerardia	*Agalinis purpurea*	Scrophulariaceae
White Snakeroot	*Ageratina altissima* var. *altissima* (= *Eupatorium rugosum*)	Asteraceae
Tall Agrimony	*Agrimonia gryposepala*	Rosaceae
Redtop	*Agrostis gigantea*	Poaceae
Garlic Mustard	*Alliaria petiolata*	Brassicaceae
Giant Ragweed	*Ambrosia trifida*	Asteraceae
Hog-peanut	*Amphicarpaea bracteata*	Fabaceae
Big Bluestem	*Andropogon gerardii*	Poaceae
Angelica	*Angelica atropurpurea*	Apiaceae
Groundnut	*Apios americana*	Fabaceae
Indian-hemp	*Apocynum cannabinum*	Apocynaceae
Common Burdock	*Arctium minus*	Asteraceae
Jack-in-the-pulpit	*Arisaema triphyllum*	Araceae
Prairie Indian-plantain	*Arnoglossum plantagineum* (= *Cacalia plantaginea*)	Asteraceae
Swamp Milkweed	*Asclepias incarnata*	Apocynaceae
Common Milkweed	*Asclepias syriaca*	Apocynaceae
Japanese Barberry	*Berberis thunbergii*	Berberidaceae
Cut-leaved Water Parsnip	*Berula erecta*	Apiaceae
Tickseed-sunflower	*Bidens coronata*	Asteraceae
False Nettle	*Boehmeria cylindrica*	Urticaceae
Fringed Brome	*Bromus ciliatus*	Poaceae
Blue-joint Grass	*Calamagrostis canadensis*	Poaceae
Marsh-marigold	*Caltha palustris*	Ranunculaceae
Hedge Bindweed	*Calystegia sepium*	Convulvaceae
Marsh Bellflower	*Campanula aparinoides*	Campanulaceae
Broad-winged Sedge	*Carex alata*	Cyperaceae
Sedge	*Carex bebbii*	Cyperaceae
Sedge	*Carex comosa*	Cyperaceae
Porcupine Sedge	*Carex hystericina*	Cyperaceae
Slender Sedge	*Carex lasiocarpa*	Cyperaceae
Sedge	*Carex leptalea*	Cyperaceae
Sedge	*Carex lurida*	Cyperaceae
Sedge	*Carex prairea*	Cyperaceae
Awl-fruited Sedge	*Carex stipata*	Cyperaceae
Tussock Sedge	*Carex stricta*	Cyperaceae
Oriental Bittersweet	*Celastrus orbiculata*	Celastraceae
Hackberry	*Celtis occidentalis*	Ulmaceae
Turtlehead	*Chelone glabra*	Scrophulariaceae
Enchanter's-nightshade	*Circaea lutetiana*	Onagraceae
Swamp Thistle	*Cirsium muticum*	Asteraceae
Bull Thistle	*Cirsium vulgare*	Asteraceae
Virgin's Bower	*Clematis virginiana*	Ranunculaceae
Pagoda Dogwood	*Cornus alternifolia*	Cornaceae
Silky or Pale Dogwood	*Cornus amomum*	Cornaceae
Gray Dogwood	*Cornus racemosa* ssp. *foemina* (= *C. foemina*)	Cornaceae
Red-osier Dogwood	*Cornus sericea* ssp. *sericea* (= *C. stolonifera*)	Cornaceae
Hazelnut	*Corylus americana*	Betulaceae
Common Dodder	*Cuscuta gronovii*	Cuscutaceae
Shrubby Cinquefoil	*Dasiphora floribunda* (= *Potentilla fruticosa*)	Rosaceae
Swamp Loosestrife	*Decodon verticillatus*	Lythraceae
Hairgrass	*Deschampsia caespitosa*	Poaceae
Flat-topped Aster	*Doellingeria umbellata* var. *umbellata* (= *Aster umbellatus*)	Asteraceae

Indian-strawberry	*Duchesnea indica*	Rosaceae
Autumn-olive	*Elaeagnus umbellata*	Elaeagnaceae
Spike Rush	*Eleocharis obtusa*	Cyperaceae
Slender Wheatgrass	*Elymus trachycaulus* ssp. *trachycaulus (= Agropyron trachycaulum)*	Poaceae
Cinnamon Willow-herb	*Epilobium coloratum*	Onagraceae
Downy Willow-herb	*Epilobium strictum*	Onagraceae
Common Horsetail	*Equisetum arvense*	Equisetaceae
Scouring Rush	*Equisetum hyemale*	Equisetaceae
Common Fleabane	*Erigeron philadelphicus*	Asteraceae
Winged Euronymus	*Euonymus alata*	Celastraceae
Spindle Tree	*Euonymus europaea*	Celastraceae
Joe-pye-weed	*Eupatorium maculatum*	Asteraceae
Boneset	*Eupatorium perfoliatum*	Asteraceae
Grass-leaved Goldenrod	*Euthamia graminifolia*	Asteraceae
Wild Strawberry	*Fragaria virginiana*	Rosaceae
Glossy Buckthorn	*Frangula alnus (= Rhamnus frangula)*	Rhamnaceae
White Ash	*Fraxinus americana*	Oleaceae
Cleavers	*Galium aparine*	Rubiaceae
Rough Bedstraw	*Galium asprellum*	Rubiaceae
Northern Bedstraw	*Galium boreale*	Rubiaceae
Fragrant Bedstraw	*Galium triflorum*	Rubiaceae
Small Fringed Gentian	*Gentianopsis virgata (= G. procera)*	Gentianaceae
White Avens	*Geum canadense*	Rosaceae
Fowl Manna Grass	*Glyceria striata*	Poaceae
Stickseed	*Hackelia virginiana*	Boraginaceae
Tall Sunflower	*Helianthus giganteus*	Asteraceae
Sweet Grass	*Hierochloe odorata*	Poaceae
Water-pennywort	*Hydrocotyle umbellata*	Apiaceae
Spotted Touch-me-not	*Impatiens capensis*	Balsaminaceae
Southern Blue Flag	*Iris virginica*	Iridaceae
Black Walnut	*Juglans nigra*	Juglandaceae
Rush	*Juncus brachycephalus*	Juncaceae
Soft-stemmed Rush	*Juncus effusus*	Juncaceae
Path Rush	*Juncus tenuis*	Juncaceae
Wild Lettuce	*Lactuca canadensis*	Asteraceae
Tamarack; Larch	*Larix laricina*	Pinaceae
Cut Grass	*Leersia oryzoides*	Poaceae
Motherwort	*Leonurus cardiaca*	Lamiaceae
Common Privet	*Ligustrum vulgare*	Oleaceae
Spicebush	*Lindera benzoin*	Lauraceae
Tulip-tree	*Liriodendron tulipifera*	Magnoliaceae
Bog Lobelia	*Lobelia kalmii*	Campanulaceae
Great Blue Lobelia	*Lobelia siphilitica*	Campanulaceae
Japanese Honeysuckle	*Lonicera japonica*	Caprifoliaceae
Amur Honeysuckle	*Lonicera maackii*	Caprifoliaceae
Morrow Honeysuckle	*Lonicera morrowii*	Caprifoliaceae
Honeysuckle	*Lonicera tatarica*	Caprifoliaceae
Belle Honeysuckle	*Lonicera x bella*	Caprifoliaceae
Northern Bugleweed	*Lycopus uniflorus*	Lamiaceae
Whorled Loosestrife	*Lysimachia quadriflora*	Primulaceae
Tufted Loosestrife	*Lysimachia thyrsiflora*	Primulaceae
Purple Loosestrife	*Lythrum salicaria*	Lythraceae
False Spikenard	*Maianthemum racemosum* ssp. *racemosum (= Smilacina racemosa)*	Liliaceae
Wild or Sweet Crab	*Malus coronaria*	Rosaceae
Apple	*Malus pumila*	Rosaceae
Moonseed	*Menispermum canadense*	Menispermaceae
Wild Mint	*Mentha arvensis*	Lamiaceae
Monkey-flower	*Mimulus ringens*	Scrophulariaceae
Wild-bergamot	*Monarda fistulosa*	Lamiaceae
Marsh Wild-timothy	*Muhlenbergia glomerata*	Poaceae
Leafy Satin Grass	*Muhlenbergia mexicana*	Poaceae
Yellow Pond-lily	*Nuphar lutea* ssp. *advena (= N. advena)*	Nympaeaceae

Sweet-scented Water-lily	*Nymphaea odorata*	Nympaeaceae
Ohio Goldenrod	*Oligoneuron ohioense (= Solidago ohioensis)*	Asteraceae
Riddell's Goldenrod	*Oligoneuron riddellii (= Solidago r.)*	Asteraceae
Sensitive Fern	*Onoclea sensibilis*	Dryopteridaceae
Royal Fern	*Osmunda regalis*	Osmundaceae
Cowbane	*Oxypolis rigidior*	Apiaceae
Golden Ragwort	*Packera aurea (= Senecio aureus)*	Asteraceae
Grass-of-Parnassus	*Parnassia glauca*	Saxifragaceae
Virginia Creeper	*Parthenocissus quinquefolia*	Vitaceae
Swamp Betony	*Pedicularis lanceolata*	Scrophulariaceae
Arrow-arum	*Peltandra virginica*	Araceae
Reed Canarygrass	*Phalaris arundinacea*	Poaceae
Giant Reed	*Phragmites australis*	Poaceae
Pokeweed	*Phytolacca americana*	Phytolaccaceae
Bog Clearweed	*Pilea fontana*	Urticaceae
Clearweed	*Pilea pumila*	Urticaceae
Kentucky Bluegrass	*Poa pratensis*	Poaceae
Bluegrass	*Poa trivialis*	Poaceae
May-apple	*Podophyllum peltatum*	Berberidaceae
Water Smartweed	*Polygonum amphibium*	Polygonaceae
Erect Knotweed	*Polygonum erectum*	Polygonaceae
Mild Water-pepper	*Polygonum hydropiperoides*	Polygonaceae
Smartweed	*Polygonum punctatum*	Polygonaceae
Tear–Thumb	*Polygonum sagittatum*	Polygonaceae
Jumpseed	*Polygonum virginianum*	Polygonaceae
Cottonwood	*Populus deltoides*	Salicaceae
Quaking Aspen	*Populus tremuloides*	Salicaceae
Heal-all	*Prunella vulgaris*	Lamiaceae
Sweet Cherry	*Prunus avium*	Rosaceae
Wild Black Cherry	*Prunus serotina*	Rosaceae
Choke Cherry	*Prunus virginiana*	Rosaceae
Mountain Mint	*Pycnanthemum virginianum*	Lamiaceae
Bur Oak	*Quercus macrocarpa*	Fagaceae
Red Oak	*Quercus rubra*	Fagaceae
Small-flowered Buttercup	*Ranunculus abortivus*	Ranunculaceae
Hooked Crowfoot	*Ranunculus recurvatus*	Ranunculaceae
Alder-leaved buckthorn	*Rhamnus alnifolia*	Rhamnaceae
Common Buckthorn	*Rhamnus cathartica*	Rhamnaceae
Staghorn Sumac	*Rhus hirta (= R. typhina)*	Anacardiaceae
Wild Black Currant	*Ribes americanum*	Grossulariaceae
Watercress	*Rorippa nasturtium-aquaticum (= Nasturtium officinale)*	Brassicaceae
Multiflora Rose	*Rosa multiflora*	Rosaceae
Swamp Rose	*Rosa palustris*	Rosaceae
Common Blackberry	*Rubus allegheniensis*	Rosaceae
Wild Red Raspberry	*Rubus idaeus* ssp. *strigosus (= R. strigosus)*	Rosaceae
Black Raspberry	*Rubus occidentalis*	Rosaceae
Bramble	*Rubus pensilvanicus*	Rosaceae
Black-eyed Susan	*Rudbeckia hirta*	Asteraceae
Cutleaf Coneflower	*Rudbeckia laciniata*	Asteraceae
Bitter Dock	*Rumex obtusifolius*	Polygonaceae
Great Water Dock	*Rumex orbiculatus*	Polygonaceae
Wapato	*Sagittaria latifolia*	Alismataceae
Weeping Willow	*Salix sepulcralis*	Salicaceae
Peach-leaved Willow	*Salix amygdaloides*	Salicaceae
Pussy Willow	*Salix discolor*	Salicaceae
Shining Willow	*Salix lucida*	Salicaceae
Black Willow	*Salix nigra*	Salicaceae
Meadow Willow	*Salix petiolaris*	Salicaceae
Elderberry	*Sambucus nigra* ssp. *canadensis (= S. canadensis)*	Caprifoliaceae
Black Snakeroot	*Sanicula trifoliata*	Apiaceae
Hardstem Bulrush	*Schoenoplectus acutus*	Cyperaceae
Softstem Bulrush	*Schoenoplectus tabernaemontani*	Cyperaceae

Bulrush	*Scirpus atrovirens*	Cyperaceae
Wool-grass	*Scirpus cyperinus*	Cyperaceae
Common Skullcap	*Scutellaria galericulata*	Lamiaceae
Mad-dog Skullcap	*Scutellaria lateriflora*	Lamiaceae
Carrion-flower	*Smilax lasioneura*	Liliaceae
Bittersweet	*Solanum dulcamara*	Solanaceae
Canada Goldenrod	*Solidago canadensis*	Asteraceae
Tall Goldenrod	*Solidago canadensis* var. *scabra (= S. altissima)*	Asteraceae
Rough-leaved Goldenrod	*Solidago patula*	Asteraceae
Bog Goldenrod	*Solidago uliginosa*	Asteraceae
Perrenial Sow Thistle	*Sonchus arvensis*	Asteraceae
Indiangrass	*Sorghastrum nutans*	Poaceae
Bur-reed	*Sparganium erectum* ssp. *stoloniferum (= S. chlorocarpum)*	Sparganiaceae
Cordgrass	*Spartina pectinata*	Poaceae
Slender Wedgegrass	*Sphenopholis intermedia*	Poaceae
Meadowsweet	*Spiraea alba*	Rosaceae
Nodding Ladies'-tresses	*Spiranthes cernua*	Orchidaceae
Northern Bog-aster	*Symphyotrichum boreale (= Aster borealis)*	Asteraceae
Panicled Aster	*Symphyotrichum lanceolatum* ssp. *lanceolatum (= Aster lanceolatus)*	Asteraceae
New England Aster	*Symphyotrichum novae-angliae (= Aster novae-angliae)*	Asteraceae
Swamp Aster	*Symphyotrichum puniceum* var. *puniceum (= Aster firmus, A. puniceus)*	Asteraceae
Skunk-cabbage	*Symplocarpus foetidus*	Araceae
Common Dandelion	*Taraxacum officinale*	Asteraceae
Purple Meadow-rue	*Thalictrum dasycarpum*	Ranunculaceae
Marsh Fern	*Thelypteris palustris*	Dryopteridaceae
Basswood	*Tilia americana*	Tiliaceae
Poison-ivy	*Toxicodendron radicans*	Anacardiaceae
Poison Sumac	*Toxicodendron vernix*	Anacardiaceae
Shrubby St.-John's Wort	*Triadenum fraseri*	Clusiaceae
Common Bog Arrow-grass	*Triglochin maritimum*	Jungacinaceae
Narrow-leaved Cat-tail	*Typha angustifolia*	Typhaceae
Common Cat-tail	*Typha latifolia*	Typhaceae
Red or Slippery Elm	*Ulmus rubra*	Ulmaceae
Stinging Nettle	*Urtica dioica*	Urticaceae
Blue Vervain	*Verbena hastata*	Verbenaceae
White Vervain	*Verbena urticifolia*	Verbenaceae
Missouri Ironweed	*Vernonia missurica*	Asteraceae
Arrow-wood	*Viburnum dentatum*	Caprifoliaceae
Wayfaring Tree	*Viburnum lantana*	Caprifoliaceae
Nannyberry	*Viburnum lentago*	Caprifoliaceae
Highbush Cranberry	*Viburnum opulus*	Caprifoliaceae
Marsh Violet	*Viola cucullata*	Violaceae
English or Sweet Violet	*Viola sororia*	Violaceae
River-bank Grape	*Vitis riparia*	Vitaceae
Prickly Ash	*Zanthoxylum americanum*	Rutaceae
Wild-Rice	*Zizania aquatica* var. *aquatica*	Poaceae