

A Vascular Plant Inventory and Vegetation Analysis
of the
Johnson County Heritage Trust's
Big Grove Preserve
in Johnson County, Iowa

Prepared for the Johnson County Heritage Trust

By

Thomas P. Madsen
Honor's Undergraduate in Environmental Sciences
University of Iowa
Iowa City, IA 52242

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EXECUTIVE SUMMARY

- 200 species of vascular plants have been documented from the Preserve and an unusually high percentage (90%) is native.
- The Preserve supports two natural communities, Woodland (Zone 1) and Successional Woodland (Zone 2), and one man-made community, Old Field (Zone 3).
- Four uncommon species have been documented on the Preserve, including a species known from no other localities in Johnson County.
- One half of the Preserve has remained wooded since 1937, while farm fields were established on the remaining half. While the wooded character of the Preserve is consistent with General Land Office descriptions, the open woodland and savanna characterizing the uplands has been largely replaced by young successional woodland.
- The primary management concern is the presence of the invasive alien species, garlic mustard (*Alliaria petiolata*), in scattered locations throughout the Preserve. Vigilant monitoring will be necessary to maintain control of this species.

INTRODUCTION

The Johnson County Heritage Trust's Big Grove Preserve is a 40-acre site located in sections 110, township 80N, range 6W (Fig. 1). It was acquired by the Johnson County Heritage Trust in 2004. Located along the heavily-wooded Iowa River valley, less than 1/4 mile from Coralville Lake, the Preserve lies within a significantly larger area of private and federally-owned woodland.

Figure 1. Topographic Map

Figure 2. 2002 Aerial Photograph

General Land Office Survey

Between June 28 and July 9, 1841, General Land Office Surveyor Thomas C. Child surveyed land immediately surrounding what is now the Big Grove Preserve. Child surveyed the western and southern boundaries of the Preserve, along the sections lines 9 and 10, and 10 and 15, respectively, of township 80N, range 6W.

The field notes describe the land as "second rate" and "very broken indeed", corresponding to the dissected terrain on the area (Figs. 3, 4). Several woodland species are noted, including white and red oak, elm, basswood ("lynn"), ironwood, hazel and sumac. While tree composition of the area is emphasized, recorded trees were of moderate size and encountered in low density. Along other section lines immediately surrounding the Preserve, such as between sections 10 and 11, Child notes the "open" character of the land (Fig. 3), as well as a distinction between the relatively open uplands and wooded ravines. Also noted is the "beautiful" character of the land.

Figure 3. General Land Office survey notes, line between sections 10 & 11, and 10 & 15

Figure 4. General Land Office survey notes, line between sections 9 & 10, and

Aerial Photographs

By 1937, all uplands on the present-day Preserve, comprising approximately one half of the land area, were actively farmed (Fig. 5). The impact of farming was limited to land above an elevation of approximately 780 feet. Land at lower elevations has remained almost entirely wooded (Fig. 5-11), and was probably never plowed. The geographic extent of farming on the area between 1937 and the present has not exceeded the 1937 limits (Fig. 5-11).

All remnants of woodland visible on the 1937 photograph have survived to the present (Fig 5-11). These remnants are visible on the 1937 photograph as three separate units located along the western and southern Preserve boundaries and on the northeastern corner (Fig. 5). By 1970, most farming appears to have ceased, with early signs of woodland succession detectable on the uplands (Fig. 8). While zone 1 appears to have been farmed again subsequently, rapid, uninterrupted woodland succession continued on the remaining uplands from 1970 to the present (Fig. 8-11).

Figure 5. 1937 Aerial Photograph

Figure 6. 1951 Aerial Photograph

Figure 7. 1963 Aerial Photograph

Figure 8. 1970 Aerial Photograph

Figure 9. 1983 Aerial Photograph

Figure 10. 1990 Aerial Photograph

Figure 11. 2002 Aerial Photograph

Soil Survey

The Preserve is covered entirely by Fayette silt loam, from 5 to 25 percent slopes (163C, 163D, 163E, 163F)(Fig. 12). The Fayette soils are characterized as well-suited to tree establishment.

Figure 12. Soil Survey Map

METHODS

Study Site

Iowa. Johnson County: Johnson County Heritage Trust's Big Grove Preserve, located at the end of Overview Drive.

Legal Description

Township 80N, Range 6W
SW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec. 10

Latitude/Longitude

41° 44' 52"N, 91° 32' 22"W to 41° 44' 39"N, 91° 32' 22"W

Field Research

The inventory was conducted during the 2005 growing season (Table 1), initiated in May, 2005 and continued through early October.

Table 1. Dates of field surveys.

May 15, 2005
May 26, 2005
June 1, 2005
June 18, 2005
July 20, 2005
July 30, 2005
August 7, 2005
August 17, 2005
September 18, 2005
October 1, 2005

Field visits to the study sites were made throughout the growing season, in order to observe and collect plants at an optimal stage (e.g., flowering or fruiting) for identification. Portions of plants were collected routinely for identification purposes. Most species were recorded from the first zone in which they were found and not from additional zones, unless they happened to be particularly characteristic of more than one area. Another exception was for the rare species, which were recorded from all zones in which they were found.

Identifications

Plants collected during the course of the inventory were identified using dichotomous keys, mainly those in the *Manual of Vascular Plants of Northeastern United States and Adjacent Canada* (Gleason & Cronquist, 1991).

Nomenclature of vascular plants follows *The Vascular Plants of Iowa* (Eilers & Roosa, 1994).

Land Survey Records

Land survey records for the study sites include General Land Office Survey notes, aerial photographs, U.S. Geological Survey topographic maps, and U.S. Department of Agriculture soil survey. Images used as figures in this report were obtained from several sources. General Land Office Survey records were obtained from the Library of the State Historical Society of Iowa at their Iowa City location. Aerial photographs dating from 1937, 1951, 1963, 1970 and 1990 were obtained from the University of Iowa Main Library Map Collection. The photo dating from 2002, and the U.S. Geological Survey topographic map, were obtained from the Iowa Geographic Map Server (<http://ortho.gis.iastate.edu/>). The soil survey maps and index were obtained from the University of Iowa Geoscience Library.

RESULTS AND DISCUSSION

Species Diversity

A total of 200 species of vascular plants, representing 151 genera and 61 families, were recorded from Big Grove Preserve (Table 2, Appendix 1). Ninety percent (176) of these species are native.

Table 2. Vascular plant species diversity of the Big Grove Preserve.

Study site	# of species	# of native species	% native	# of genera	# of families
Big Grove Preserve	200	176	90	151	61

Table 5. State-listed plant species on the Preserve.

State-listed species:	Status:
Spring avens (<i>Geum vernum</i>)	Special Concern
Oval ladies'-tresses (<i>Spiranthes ovalis</i>)	Threatened

Table 6. Uncommon plant species on the Preserve.

State-listed species:
Leafcup (<i>Polymnia canadensis</i>)
Snow Trillium (<i>Trillium nivale</i>)

VEGETATION ANALYSIS

The Preserve was subdivided into the three zones as a result of the current inventory. These zones reflect vegetation, elevation and historical land use, and are identified by the plant communities within them. The Preserve supports two natural communities, Woodland (Zone 1) and Successional Woodland (Zone 2), and one man-made community, Old Field (Zone 3).

Figure 13. Vegetation zone topographic map

Figure 14. Vegetation zone aerial photos

Zone 1, Woodland

As previously suggested in the aerial photograph analysis, the woodland occurs in three separate units, a Western, an Eastern, and a Southern Unit. These are somewhat difficult to distinguish on the ground, given the rapid growth of the Successional Woodland, particularly between the Western and Southern Units. However, they are useful to describe the distribution of several plant species.

The woodland is characterized by such tree species as sugar maple (*Acer saccharum*), box elder (*Acer negundo*), shagbark hickory (*Carya ovata*), hackberry (*Celtis occidentalis*), white ash (*Fraxinus americana*), ironwood (*Ostrya virginiana*), cottonwood (*Populus deltoides*), white oak (*Quercus alba*), red oak (*Quercus borealis* var. *maxima*), bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*), American elm (*Ulmus americana*), and slippery elm (*Ulmus rubra*). Moist, north-facing slopes on the western unit support river birch (*Betula nigra*), black ash (*Fraxinus nigra*) and several large stands of big-tooth aspen (*Populus grandidentata*).

Shrubs of the woodland include pagoda dogwood (*Cornus alternifolia*), rough-leaved dogwood (*Cornus drummondii*), grey dogwood (*Cornus foemina* ssp. *racemosa*), hazel (*Corylus americana*), choke cherry (*Prunus virginiana*), prickly gooseberry (*Ribes cynosbati*), gooseberry (*Ribes missouriense*), blackberry (*Rubus allegheniensis*), black raspberry (*Rubus occidentalis*), elderberry (*Sambucus canadensis*), and prickly ash (*Zanthoxylum americanum*). An alien species, barberry (*Berberis thunbergii*), is also present in small numbers.

Several vining species are present, including bittersweet (*Celastrus scandens*), wild yam (*Dioscorea villosa*), wild honeysuckle (*Lonicera prolifera*), Canada moonseed (*Menispermum canadense*), carrion flower (*Smilax herbacea*), and greenbriar (*Smilax hispida*).

The woodland supports an attractive spring flora, including such species as white baneberry (*Actaea pachypoda*), jack-in-the-pulpit (*Arisaema triphyllum*), blue cohosh (*Caulophyllum thalictroides*), spring beauty (*Claytonia virginica*), toothwort (*Dentaria laciniata*), dutchman's breeches (*Dicentra cucullaria*), trout lily (*Erythronium albidum*), wild geranium (*Geranium maculatum*), blue phlox (*Phlox divaricata*), Jacob's ladder (*Polemonium reptans*), swamp buttercup (*Ranunculus septentrionalis*), false Solomon's seal (*Smilacena racemosa*), rue anemone (*Thalictrum thalictroides*), bellwort (*Uvularia grandiflora*), common blue violet (*Viola pratincola*), and downy yellow violet (*Viola pubescens*). Snow trillium (*Trillium nivale*) is present here in small numbers (Connie Mutel, pers. comm.). While several extant populations of this species are known in Johnson county, it is generally uncommon in Iowa.

Numerous showy summer and fall-flowering species are also present, including tall agrimony (*Agrimonia gryposepala*), wild leek (*Allium tricoccum*), puttyroot orchid (*Aplectrum hyemale*), Drummond's aster (*Aster drummondii*), side-flowered aster (*Aster lateriflorus*), Ontario aster (*Aster ontarionis*), wood mint (*Belphilia hirsuta*), pointed tick-trefoil (*Desmodium glutinosum*), purple Joe-pye-weed (*Eupatorium purpureum*), white snakeroot (*Eupatorium rugosum*), heartleaf scullcap (*Scutellaria ovata*), zig-zag goldenrod (*Solidago flexicaulis*), elm-leaved goldenrod (*S. ulmifolia*), American germander (*Teucrium canadense* var. *virginicum*), meadow parsnip (*Thaspium barbinode*), and culver's root (*Veronicastrum virginicum*).

Other herbaceous species include waterpod (*Ellisia nyctelea*), shining bedstraw (*Galium concinnum*), sweet-scented bedstraw (*G. triflorum*), white avens (*Geum canadense*), stickseed (*Hackelia virginiana*), wood nettle (*Laportea canadensis*), sweet cicely (*Osmorhiza claytonii*), anise root (*O. longistylis*), jumpseed (*Polygonum virginianum*), small-flowered crowfoot (*Ranunculus abortivus*), common snakeroot (*Sanicula gregaria*), and figwort (*Scrophularia marilandica*).

Several woodland ferns occur on the Preserve, including maidenhair fern (*Adiantum pedatum*), lady fern (*Athyrium filix-femina* var. *angustum*), rattlesnake fern (*Botrychium virginianum*), interrupted fern (*Osmunda claytoniana*), and spinulose wood fern

(*Dryopteris carthusiana*). Most are present in small numbers and limited to moist, north-facing slopes on the western unit.

A number of sedges are present, including eastern narrowleaf sedge (*Carex amphibola* var. *turgida*), eastern woodland sedge (*C. blanda*), thinleaf sedge (*C. cephaloidea*), oval-leaf sedge (*C. cephalophora*), Davis' sedge (*C. davisii*), pubescent sedge (*C. hirtifolia*), James' sedge (*C. jamesii*), greater straw sedge (*C. normalis*), richwoods sedge (*C. oligocarpa*), rosy sedge (*C. rosea*), and burr reed sedge (*C. sparganioides*). Also present are several grasses, including Canada wild rye (*Elymus canadensis*), slender wild rye (*E. villosus*), Virginia wild rye (*E. virginicus*), nodding fescue (*Festuca obtusa*), fowl manna grass (*Glyceria striata*), and wedge grass (*Sphenopholis obtusata* var. *major*).

Leafcup (*Polymnia canadensis*), a species restricted to limestone outcrops, is locally abundant on the Eastern Unit, as well as the immediately adjacent Successional Woodland. This species is uncommon in Iowa, typically occurring as localized populations, though it is often abundant where it does occur (Madsen, unpublished data). Prior to its discovery on the Preserve, this species was unknown in Johnson County (Thorne, 1955). While outcrops do not occur on the Preserve, several outcrops occur within one-eighth mile to the east. Soils on the Preserve are undoubtedly influenced by the limestone lying shallowly beneath the surface.

A single individual of oval ladies-tresses (*Spiranthes ovalis*), a Threatened species, was observed near the base of a large ravine on the Southern Unit. While uncommon, this species may not be as rare in Iowa as previously thought. Several new populations have been discovered recently in Johnson County (Madsen, unpublished data).

Zone 2, Successional Woodland

Situated on formerly farmed uplands, the successional woodland occurs, in large part, on two distinguishable ridges, herein referred to as the West and East Ridge, respectively. The West Ridge is aligned toward the southwest, terminating at the southwest corner of the Preserve. The East Ridge has a north-south orientation, and borders the eastern Preserve boundary.

Woodland succession on the West Ridge has proceeded relatively rapidly, resulting in a nearly closed canopy. Woody species characteristic of this area include black walnut (*Juglans nigra*), black cherry (*Prunus serotina*), bitternut hickory (*Carya cordiformis*), rough-leaved dogwood (*Cornus drummondii*), and prickly gooseberry (*Ribes cynosbati*). An aggressive alien species, multiflora rose (*Rosa multiflora*), is locally abundant, particularly on the southern one half of the West Ridge. Two additional alien species, autumn olive (*Elaeagnus umbellata*) and white mulberry (*Morus alba*), are also present in small numbers.

Herbaceous species inhabiting this area include spikenard (*Aralia racemosa*), tall bellflower (*Campanula americana*), water smartweed (*Polygonum punctatum*), tall

coneflower (*Rudbeckia laciniata*), brown-eyed susan (*R. triloba*), bloodroot (*Sanguinaria canadensis*), and wingstem (*Verbesina alternifolia*). Brown-eyed susan (*Rudbeckia triloba*) and pale-leaved sunflower (*Helianthus strumosus*) are found along the main footpath near the northern end of the West Ridge. An aggressive alien species, oriental bittersweet (*Celastrus orbiculatus*), was observed on the West Ridge as a single individual.

Woodland on the East Ridge is characterized by small trees and a relatively open canopy. A thicket of smooth sumac (*Rhus glabra*), partially supplanted by forest trees, is located near the northern end of the East Ridge. A number of species typical of young successional woodlands are present, including oblique grape fern (*Botrychium dissectum* f. *obliquum*), Pennsylvania sedge (*Carex pensylvanica*), thistle (*Cirsium* sp.), scaldweed (*Cuscuta gronovii*), tapered rosette grass (*Dichanthelium acuminatum*), broad-leaved panic grass (*D. latifolium*), licorice bedstraw (*Galium circaezans*), blue lettuce (*Lactuca floridana*), indian tobacco (*Lobelia inflata*), and common cinquefoil (*Potentilla simplex*).

Hog peanut (*Amphicarpea bracteata*) and several Muhly grasses are present in great abundance, including nodding muhly (*Muhlenbergia bushii*), rock muhly (*M. schreberi*), and forest muhly (*M. sylvatica*). Several orchids are present, including showy orchid (*Galearis spectabilis*), fall coralroot orchid (*Corallorhiza odontorhiza*), and nodding pogonia (*Triphora trianthophora*). The latter two species, though relatively abundant, do not emerge until late summer and early fall, and their diminutive stature makes them inconspicuous even when in flower.

Zone 3, Old Field

As a result of relatively recent cultivation, the old field is relatively open compared with the remainder of the Preserve. Several alien grasses are present, including smooth brome (*Bromus inermis*), orchard grass (*Dactylis glomerata*), meadow fescue (*Festuca pratensis*), timothy (*Phleum pratense*), and Kentucky bluegrass (*Poa pratensis*). Blackberry (*Rubus allegheniensis*) is very abundant over a large area of the Old Field.

Herbaceous plants are represented by a rather weedy mixture of native and alien species, including yarrow (*Achillea millefolium* ssp. *lanulosa*), common ragweed (*Ambrosia artemisiifolia*), common milkweed (*Asclepias syriaca*), yellow rocket (*Barbarea vulgaris*), shepherd's purse (*Capsella bursa-pastoris*), wild carrot (*Daucus carota*), annual fleabane (*Erigeron annuus*), daisy fleabane (*Erigeron strigosus*), wild bergamot (*Monarda fistulosa*), sulphur cinquefoil (*Potentilla recta*), tall goldenrod (*Solidago canadensis*), and dandelion (*Taraxacum officinale*). Several diminutive species are found in association with the mowed footpath, including wild strawberry (*Fragaria virginiana*), prairie ragwort (*Senecio plattensis*), self heal (*Prunella vulgaris*), blue-eyed grass, (*Sisyrinchium campestre*), white clover (*Trifolium repens*), and alsike clover (*T. hybridum*). In addition, several species are localized at the Parking lot, including shepherd's purse (*Capsella bursa-pastoris*), horseweed (*Conyza canadensis*),

lamb's quarters (*Chenopodium album*), peppergrass (*Lepidium densiflorum*), perennial rye grass (*Lolium perenne*), ground cherry (*Physalis heterophylla*), yellow foxtail (*Setaria glauca*), and horse nettle (*Solanum carolinense*).

Spring avens (*Geum vernum*), a Special Concern species, occurs along the path near the southern margin of the Old Field. Once considered rare, this species has recently been discovered at several new localities in Johnson County, and at numerous new localities in eastern Iowa (Horton & Cady, pers. comm., Madsen, unpublished data).

MANAGEMENT CONCERNS

Multiflora rose (*Rosa multiflora*) is locally abundant on the West Ridge in the southwestern quarter of the Preserve, and should be controlled. A few individuals of autumn olive (*Elaeagnus umbellata*) are also present, but their capacity to reproduce has been dramatically reduced by woodland succession. The primary management concern is the presence of garlic mustard (*Alliaria petiolata*) in scattered populations on wooded slopes throughout the Preserve. Given the presence of garlic mustard as a number of relatively small, isolated populations, this species has the potential to increase significantly without being detected. Efforts to eliminate this species must be coupled with careful monitoring in order to ensure that it does not increase in abundance in the future. Similarly, oriental bittersweet (*Celastrus orbiculatus*), present in small numbers, should be monitored to prevent its expansion on the Preserve.

CONCLUSIONS

While of moderate size, the 40-acre Big Grove Preserve encompasses a diverse woodland community. Previous land use in this area has been divided almost equally between little or no use and long-term farming. Woodland cover has rapidly regenerated in areas that suffered past deforestation, particularly in recent years. With 200 species, the plant diversity on the Preserve is high, and 90 percent are native species. Included among them are four uncommon species, one of which is known nowhere else in Johnson County.

The long-term existence of woodlands on the study area is documented in the photographic record, with several woodland remnants dating back to at least 1937. Associated with these remnants are three uncommon species. While the wooded character of the Preserve is consistent with General Land Office descriptions, the open woodland and savanna characterizing the uplands has largely been replaced by young successional woodland.

The photographic record also documents a long history of agricultural use on the upland portion of the study area. The maximum extent of farming was reached by 1937, and farming continued until approximately 1970. Woodland coverage on the formerly farmed uplands has increased rapidly through succession, particularly in the last three decades, such that most the Preserve is presently wooded.

While relatively few alien species are present, the aggressive garlic mustard (*Alliaria petiolata*) is found on scattered localities throughout the Woodland. Vigilant monitoring will be necessary to maintain control of this species.

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Appendix - Big Grove Preserve Plant List

This list includes all vascular plant species recorded in the inventory of the Preserve. Associated information is provided for each species, including species name, family name, common name, origin (whether the species is native or alien), location (according to the area numbers in Fig. 1), and additional comments.

**Appendix - Plant List for the Johnson County Heritage Trust's Big Grove
Preserve, Johnson County, Iowa**

Species Name	Family	Common Name	Origin	Zone	Comments
<i>Acer negundo</i> L.	Aceraceae	Box elder	Native	Zone 1	Woodland
<i>Acer saccharum</i> L.	Aceraceae	Sugar maple	Native	Zone 1	Woodland
<i>Achillea millefolium</i> L. ssp. <i>lanulosa</i> (Nutt.) Piper	Asteraceae	Yarrow	Native	Zone 3	Old field
<i>Actaea pachypoda</i> Ell.	Ranunculaceae	White baneberry	Native	Zone 1	Scattered plants throughout woods.
<i>Adiantum pedatum</i> L.	Adiantaceae	Maidenhair fern	Native	Zone 1	Woodland
<i>Agastache nepetoides</i> (L.) Kuntze	Lamiaceae	Yellow giant-hyssop	Native	Zone 1	Along path
<i>Agastache scrophulariifolia</i> (Willd.) Kuntze	Lamiaceae	Purple giant-hyssop	Native	Zone 1	A few plants near N margin
<i>Agrimonia gryposepala</i> Wallr.	Rosaceae	Tall agrimony	Native	Zone 1	Woodland
<i>Alliaria petiolata</i> (Bieb.) Cavara & Grande	Brassicaceae	Garlic mustard	Alien	Zone 1	Scattered populations throughout woodland.
<i>Allium tricoccum</i> Aiton	Liliaceae	Wild leek	Native	Zone 1	Woodland
<i>Ambrosia artemisiifolia</i> L.	Asteraceae	Common ragweed	Native	Zone 3	Along path
<i>Amphicarpaea bracteata</i> (L.) Fern.	Fabaceae	Hog peanut	Native	Zone 2	Along path, and abundant on E ridge
<i>Aplectrum hyemale</i> (Nutt.) Torrey	Orchidaceae	Puttyroot orchid	Native	Zone 1	One flowering individual observed.
<i>Aralia racemosa</i> L.	Araliaceae	Spikenard	Native	Zone 2	One plant observed on uplands.
<i>Arctium minus</i> Bernh.	Asteraceae	Burdock	Alien	Zone 2	One plant on E ridge

<i>Arisaema triphyllum</i> (L.) Schott	Araceae	Jack-in-the-pulpit	Native	Zone 1	Woodland
<i>Asclepias syriaca</i> L.	Asclepiadaceae	Common milkweed	Native	Zone 3	Old field
<i>Aster drummondii</i> Lindley	Asteraceae	Drummond's aster	Native	Zone 1	Woodland
<i>Aster lateriflorus</i> (L.) Britton	Asteraceae	Side-flowered aster	Native	Zone 1	Woodland
<i>Aster ontarionis</i> Wieg.	Asteraceae	Ontario aster	Native	Zone 1	Woodland
<i>Athyrium filix-femina</i> (L.) Roth var. <i>angustum</i> (Willd.) Moore	Aspleniaceae	Lady fern	Native	Zone 1	Woodland
<i>Barbarea vulgaris</i> R. Br.	Brassicaceae	Yellow rocket	Alien	Zone 3	Old field
<i>Belphilia hirsuta</i> (Pursh) Benth	Lamiaceae	Wood mint	Native	Zone 1	Scattered plants throughout woods.
<i>Berberis thunbergii</i> DC.	Berberidaceae	Barberry	Alien	Zone 1	Woodland
<i>Betula nigra</i> L.	Betulaceae	River birch	Native	Zone 1	Several trees on moist wooded slope
<i>Botrychium dissectum</i> Sprengel f. <i>obliquum</i> (Muhl.) Fern.	Ophioglossaceae	Oblique grape fern	Native	Zone 2	Young woods on E ridge
<i>Botrychium virginianum</i> (L.) Sw.	Ophioglossaceae	Rattlesnake fern	Native	Zone 1	Woodland
<i>Bromus inermis</i> Leysser	Poaceae	Smooth brome	Alien	Zone 3	Old field
<i>Campanula americana</i> L.	Campanulaceae	Tall bellflower	Native	Zone 2	Upland
<i>Capsella bursa-pastoris</i> (L.) Medicus	Brassicaceae	Shepherd's purse	Alien	Zone 3	Disturbed ground next to parking lot
<i>Carex amphibola</i> Steudel var. <i>turgida</i> Fern.	Cyperaceae	Eastern narrowleaf sedge	Native	Zone 1	Woodland
<i>Carex blanda</i> Dewey	Cyperaceae	Eastern woodland sedge	Native	Zone 1	Woodland
<i>Carex cephaloidea</i> (Dewey) Dewey	Cyperaceae	Thinleaf sedge	Native	Zone 1	Woodland
<i>Carex cephalophora</i> Willd.	Cyperaceae	Oval-leaf sedge	Native	Zone 1	Woodland
<i>Carex davisii</i> Schwein. & Torrey	Cyperaceae	Davis' sedge	Native	Zone 1	Woodland
<i>Carex granularis</i> Muhl. ex Willd.	Cyperaceae	Limestone meadow sedge	Native	Zone 2	Open woods, woodland margins
<i>Carex gravida</i> Bailey	Cyperaceae	Heavy sedge	Native	Zone 2	Upland
<i>Carex hirtifolia</i> Mack.	Cyperaceae	Pubescent sedge	Native	Zone 1	Woodland
<i>Carex jamesii</i> Schwein	Cyperaceae	James' sedge	Native	Zone 1	A few localized populations near SE corner of property
<i>Carex normalis</i> Mack.	Cyperaceae	Greater straw sedge	Native	Zone 1	Woodland

<i>Carex oligocarpa</i> Willd.	Cyperaceae	Richwoods sedge	Native	Zone 1	Localized population near S margin of property.
<i>Carex pensylvanica</i> Lam.	Cyperaceae	Pennsylvania sedge	Native	Zone 2	E ridge
<i>Carex rosea</i> Schkuhr ex Willd.	Cyperaceae	Rosy sedge	Native	Zone 1	Woodland
<i>Carex sparganioides</i> Muhl. ex Willd.	Cyperaceae	Burr reed sedge	Native	Zone 1	Wooded slope on E 1/2
<i>Carya cordiformis</i> (Wang.) K. Koch	Juglandaceae	Bitternut hickory	Native	Zone 2	Upland
<i>Carya ovata</i> (P. Miller) K. Koch	Juglandaceae	Shagbark hickory	Native	Zone 1	Woodland
<i>Caulophyllum thalictroides</i> (L.) Michx.	Berberidaceae	Blue cohosh	Native	Zone 1	Woodland
<i>Celastrus orbiculatus</i> Thunb.	Celastraceae	Oriental bittersweet	Alien	Zone 2	One plant on W upland
<i>Celastrus scandens</i> L.	Celastraceae	Bittersweet	Native	Zone 1	Woodland
<i>Celtis occidentalis</i> L.	Ulmaceae	Hackberry	Native	Zone 1	Woodland
<i>Chenopodium album</i> L.	Chenopodiaceae	Lamb's quarters	Alien	Zone 3	Margin of parking lot
<i>Circaea lutetiana</i> L. ssp. <i>canadensis</i> (L.) Ascherson & Magnus	Onagraceae	Enchanter's nightshade	Native	Zone 1	Woodland
<i>Cirsium</i> sp.	Asteraceae	Thistle	Native	Zone 2	E ridge
<i>Claytonia virginica</i> L.	Portulacaceae	Spring beauty	Native	Zone 1	Woodland
<i>Conyza canadensis</i> (L.) Cronq.	Asteraceae	Horseweed	Native	Zone 3	Margin of parking lot and path
<i>Corallorhiza odontorhiza</i> (Willd.) Nutt.	Orchidaceae	Fall coralroot orchid	Native	Zone 2	20+ plants in E ridge
<i>Cornus alternifolia</i> L. f.	Cornaceae	Pagoda dogwood	Native	Zone 1	Woodland
<i>Cornus drummondii</i> C. A. Meyer	Cornaceae	Rough-leaved dogwood	Native	Zone 2	Upland woods
<i>Cornus foemina</i> P. Miller ssp. <i>racemosa</i> (Lam.) J. S. Wilson	Cornaceae	Gray dogwood	Native	Zone 1	Woodland
<i>Corylus americana</i> Walter	Betulaceae	Hazel	Native	Zone 1	Woodland
<i>Crataegus</i> sp.	Rosaceae	Hawthorn	Native	Zone 1	Woodland
<i>Cryptotaenia canadensis</i> (L.) DC.	Apiaceae	Honewort	Native	Zone 1	Woodland
<i>Cuscuta gronovii</i> Willd.	Convolvulaceae	Scaldweed	Native	Zone 2	Along path on E ridge
<i>Cystopteris protrusa</i> (Weath.) Blasdell	Aspleniaceae	Creeping fragile fern	Native	Zone 1	Woodland
<i>Dactylis glomerata</i> L.	Poaceae	Orchard grass	Alien	Zone 3	Old field
<i>Daucus carota</i> L.	Apiaceae	Wild carrot	Alien	Zone 3	Old field
<i>Dentaria laciniata</i> Muhl. ex Willd.	Brassicaceae	Toothwort	Native	Zone 1	Woodland

<i>Desmodium glabellum</i>	Fabaceae	Dillenius' tick-trefoil	Native	Zone 3	A few plants in blackberry patch
<i>Desmodium glutinosum</i> (Muhl. ex Willd) Wood	Fabaceae	Pointed tick-trefoil	Native	Zone 1	Woodland
<i>Desmodium paniculatum</i> (L.) DC.	Fabaceae	Panicled tick-trefoil	Native	Zone 2	Several plants with abundant <i>Amphicarpaea bracteata</i> in E ridge
<i>Dicentra cucullaria</i> (L.) Bernh.	Papaveraceae	Dutchman's breeches	Native	Zone 1	Woodland
<i>Dichanthelium acuminatum</i> (Sw.) Gould & Clark	Poaceae	Tapered rosette grass	Native	Zone 2	Young open woods on E ridge
<i>Dichanthelium latifolium</i> (L.) Gould & Clark	Poaceae	Broad-leaved panic grass	Native	Zone 2	Young woods on E ridge
<i>Dioscorea villosa</i> L.	Dioscoreaceae	Wild yam	Native	Zone 1	Woodland
<i>Dryopteris carthusiana</i> (Vill.) H. P. Fuchs	Aspleniaceae	Spinulose wood fern	Native	Zone 1	Woodland
<i>Elaeagnus umbellata</i> Thunb.	Elaeagnaceae	Autumn olive	Alien	Zone 2	A few individuals along W ridge
<i>Ellisia nyctelea</i> L.	Hydrophyllaceae	Waterpod	Native	Zone 1	Woodland
<i>Elymus canadensis</i> L.	Poaceae	Canada wild rye	Native	Zone 1	Woodland
<i>Elymus villosus</i> Muhl. ex Willd.	Poaceae	Slender wild rye	Native	Zone 1	Woodland
<i>Elymus virginicus</i> L.	Poaceae	Virginia wild rye	Native	Zone 1	Woodland
<i>Erigeron annuus</i> (L.) Pers.	Asteraceae	Annual fleabane	Native	Zone 3	Old field
<i>Erigeron philadelphicus</i> L.	Asteraceae	Fleabane	Native	Zone 1	Woodland
<i>Erigeron strigosus</i> Muhl. ex Willd.	Asteraceae	Daisy fleabane	Native	Zone 3	Old field
<i>Erythronium albidum</i> Nutt.	Liliaceae	Trout lily	Native	Zone 1	Woodland
<i>Eupatorium purpureum</i> L.	Asteraceae	Purple Joe-pye-weed	Native	Zone 1	Woodland
<i>Eupatorium rugosum</i> Houtt.	Asteraceae	White snakeroot	Native	Zone 1	Woodland
<i>Festuca obtusa</i> Biehler	Poaceae	Nodding fescue	Native	Zone 1	Woodland
<i>Festuca pratensis</i> Hudson	Poaceae	Meadow fescue	Alien	Zone 3	Old field
<i>Fragaria virginiana</i> Duchesne	Rosaceae	Wild strawberry	Native	Zone 3	Old field
<i>Fraxinus americana</i> L.	Oleaceae	White ash	Native	Zone 1	Woodland
<i>Fraxinus nigra</i> Marsh.	Oleaceae	Black ash	Native	Zone 1	Scattered small groups and individuals on SW 1/4
<i>Galearis spectabilis</i> (L.) Raf.	Orchidaceae	Showy orchid	Native	Zone 2	Scattered plants on E ridge.
<i>Galium aparine</i> L.	Rubiaceae	Cleavers	Native	Zone 1	Woodland

<i>Galium circaezans</i> Michx.	Rubiaceae	Licorice bedstraw	Native	Zone 2	E ridge
<i>Galium concinnum</i> T. & G.	Rubiaceae	Shining bedstraw	Native	Zone 1	Woodland
<i>Galium triflorum</i> Michx.	Rubiaceae	Sweet-scented bedstraw	Native	Zone 1	Woodland
<i>Geranium maculatum</i> L.	Geraniaceae	Wild geranium	Native	Zone 1	Woodland
<i>Geum canadense</i> Jacq.	Rosaceae	White avens	Native	Zone 1	Woodland
<i>Geum vernum</i> (Raf.) T. & G.	Rosaceae	Spring avens	Native	Zone 3	Locally abundant along path near edge of woods
<i>Gleditsia triacanthos</i> L.	Fabaceae	Honey locust	Native	Zone 1	Woodland
<i>Glyceria striata</i> (Lam.) A. S. Hitchc.	Poaceae	Fowl manna grass	Native	Zone 1	Wooded slope
<i>Hackelia virginiana</i> (L.) I. M. Johnston	Boraginaceae	Stickseed	Native	Zone 1	Woodland
<i>Helianthus strumosus</i> L.	Asteraceae	Pale-leaved sunflower	Native	Zone 2	Along main path on ridge
<i>Hepatica nobilis</i> P. Miller var. <i>acuta</i> (Pursh) Steyererm.	Ranunculaceae	Hepatica	Native	Zone 1	Woodland
<i>Humulus lupulus</i> L.	Moraceae	Hops	Native	Zone 2	N margin of woodland
<i>Hystrix patula</i> Moench	Poaceae	Bottlebrush grass	Native	Zone 2	Upland
<i>Impatiens</i> sp.	Balsaminaceae	Touch-me-not	Native	Zone 1	Woodland
<i>Juglans nigra</i> L.	Juglandaceae	Black walnut	Native	Zone 1	Woodland
<i>Juniperus virginiana</i> L.	Cupressaceae	Eastern red cedar	Native	Zone 1	Woodland
<i>Lactuca floridana</i> (L.) Gaertner	Asteraceae	Blue lettuce	Native	Zone 2	E ridge
<i>Laportea canadensis</i> (L.) Wedd.	Urticaceae	Wood nettle	Native	Zone 1	Abundant.
<i>Leersia virginica</i> Willd.	Poaceae	Whitegrass	Native	Zone 1	Woodland
<i>Leonurus cardiaca</i> (L.)	Lamiaceae	Motherwort	Alien	Zone 1	Woodland
<i>Lepidium densiflorum</i> Schrader	Brassicaceae	Peppergrass	Native	Zone 3	Margin of parking lot
<i>Lobelia inflata</i> L.	Campanulaceae	Indian tobacco	Native	Zone 2	A few scattered plants on E ridge
<i>Lobelia siphilitica</i> L.	Campanulaceae	Great lobelia	Native	Zone 1	One plant in open woods on NE 1/4 of property
<i>Lolium perenne</i> L.	Poaceae	Perennial rye grass	Alien	Zone 3	Margin of parking lot
<i>Lonicera prolifera</i> (Kirchner) Rehder	Caprifoliaceae	Wild honeysuckle	Native	Zone 1	One plant along wooded ravine west of parking lot
<i>Menispermum canadense</i> L.	Menispermaceae	Canada moonseed	Native	Zone 1	Woodland
<i>Monarda fistulosa</i> L.	Lamiaceae	Wild bergamot	Native	Zone 3	Old field

<i>Morus alba</i> L.	Moraceae	White mulberry	Alien	Zone 2	A few trees present on upland.
<i>Muhlenbergia bushii</i> Pohl	Poaceae	Nodding muhly	Native	Zone 2	E ridge
<i>Muhlenbergia schreberi</i> J. F. Gmelin	Poaceae	Nimblewill	Native	Zone 2	E ridge
<i>Muhlenbergia sobolifera</i> (Muhl. ex Willd) Trin.	Poaceae	Rock muhly	Native	Zone 2	E ridge
<i>Muhlenbergia sylvatica</i> (Torrey) Torrey ex Gray	Poaceae	Forest muhly	Native	Zone 2	E ridge
<i>Osmorhiza claytonii</i> (Michx.) C. B. Clarke	Apiaceae	Sweet cicely	Native	Zone 1	Less abundant than <i>O. longistylis</i>
<i>Osmorhiza longistylis</i> (Torrey) DC.	Apiaceae	Anise root	Native	Zone 1	Abundant throughout woods.
<i>Osmunda claytoniana</i> L.	Aspleniaceae	Interrupted fern	Native	Zone 1	Small, localized population on SW quarter of property
<i>Ostrya virginiana</i> (P. Miller) K. Koch	Betulaceae	Ironwood	Native	Zone 1	Woodland
<i>Oxalis stricta</i> L.	Oxalidaceae	Yellow wood sorrel	Native	Zone 1	Scattered on woodland
<i>Panax quinquefolius</i> L.	Araliaceae	Ginseng	Native	Zone 1	Woodland
<i>Parthenocissus quinquefolia</i> (L.) Planchon	Vitaceae	Virginia creeper	Native	Zone 1	Woodland
<i>Phleum pratense</i> L.	Poaceae	Timothy	Alien	Zone 3	Old field
<i>Phlox divaricata</i> L.	Polemoniaceae	Blue phlox	Native	Zone 1	Woodland
<i>Phryma leptostachya</i> L.	Phrymaceae	Lopseed	Native	Zone 1	Woodland
<i>Physalis heterophylla</i> Nees	Solanaceae	Ground cherry	Native	Zone 3	Margin of parking lot
<i>Pilea pumila</i> (L.) Gray	Urticaceae	Clearweed	Native	Zone 1	Woodland
<i>Plantago rugelii</i> Dcne.	Plantaginaceae	Common plantain	Native	Zone 1	Woodland
<i>Poa pratensis</i> L.	Poaceae	Kentucky bluegrass	Alien	Zone 3	Old field
<i>Podophyllum peltatum</i> L.	Berberidaceae	Mayapple	Native	Zone 1	Woodland
<i>Polemonium reptans</i> L.	Polemoniaceae	Jacob's ladder	Native	Zone 1	Woodland
<i>Polygonum punctatum</i> Eil.	Polygonaceae	Water smartweed	Native	Zone 2	Moist upland woods
<i>Polygonum virginianum</i> L.	Polygonaceae	Jumpseed	Native	Zone 1	Woodland
<i>Polymnia canadensis</i> L.	Asteraceae	Leafcup	Native	Zone 1	Large, localized population near NE corner, the first recorded occurrence of this species in Johnson County.
<i>Populus grandidentata</i> Michx.	Salicaceae	Big-tooth aspen	Native	Zone 1, Zone 2	Large grove.

<i>Potentilla recta</i> L.	Rosaceae	Sulphur cinquefoil	Alien	Zone 3	Old field
<i>Potentilla simplex</i> Michx.	Rosaceae	Common cinquefoil	Native	Zone 2	E ridge
<i>Prunella vulgaris</i> L.	Lamiaceae	Self heal	Alien	Zone 3	Path
<i>Prunus serotina</i> Ehrh.	Rosaceae	Black cherry	Native	Zone 1	Woodland
<i>Prunus virginiana</i> L.	Rosaceae	Choke cherry	Native	Zone 1	Woodland
<i>Quercus alba</i> L.	Fagaceae	White oak	Native	Zone 1	Woodland
<i>Quercus borealis</i> Michx. var. <i>maxima</i> (Marsh.) Ashe	Fagaceae	Red oak	Native	Zone 1	Woodland
<i>Quercus velutina</i> Lam.	Fagaceae	Black oak	Native	Zone 2	Edge of Successional Woodland along E side of parking lot
<i>Ranunculus abortivus</i> L.	Ranunculaceae	Small-flowered crowfoot	Native	Zone 1	Woodland
<i>Ranunculus septentrionalis</i> Poiret	Ranunculaceae	Swamp buttercup	Native	Zone 1	Woodland
<i>Rhus glabra</i> L.	Anacardiaceae	Smooth sumac	Native	Zone 3, Zone 2	Old field and E ridge
<i>Ribes cynosbati</i> L.	Saxifragaceae	Prickly gooseberry	Native	Zone 2	Much less abundant than <i>R. missouriense</i>
<i>Ribes missouriense</i> Nutt. ex T. & G.	Saxifragaceae	Gooseberry	Native	Zone 1	Woodland
<i>Rosa multiflora</i> Thunb. ex Murray	Rosaceae	Multiflora rose	Alien	Zone 2	W ridge
<i>Rubus allegheniensis</i> Porter ex Bailey	Rosaceae	Blackberry	Native	Zone 3	Old field
<i>Rubus occidentalis</i> L.	Rosaceae	Black raspberry	Native	Zone 1	Woodland
<i>Rudbeckia laciniata</i> L.	Asteraceae	Tall coneflower	Native	Zone 2	Upland
<i>Rudbeckia triloba</i> L.	Asteraceae	Brown-eyed susan	Native	Zone 2	Several plants along upland path
<i>Sanguinaria canadensis</i> L.	Papaveraceae	Bloodroot	Native	Zone 2	Upland
<i>Sanicula gregaria</i> Bickn.	Apiaceae	Common snakeroot	Native	Zone 1	Woodland
<i>Scrophularia marilandica</i> L.	Scrophulariaceae	Figwort	Native	Zone 1	Woodland
<i>Scutellaria ovata</i> Hill	Lamiaceae	Heartleaf scullcap	Native	Zone 1	Woodland
<i>Senecio plattensis</i> Nutt.	Asteraceae	Prairie ragwort	Native	Zone 3	Old field
<i>Setaria glauca</i> (L.) Beauv.	Poaceae	Yellow foxtail	Alien	Zone 3	Open area near parking lot
<i>Sisyrinchium campestre</i> Bickn.	Iridaceae	Blue-eyed grass	Native	Zone 3	On and along mowed path
<i>Smilacena racemosa</i> (L.) Desf.	Liliaceae	False solomon's seal	Native	Zone 1	Woodland
<i>Smilax herbacea</i> L.	Liliaceae	Carrion flower	Native	Zone 1	Woodland

<i>Smilax hispida</i> Muhl.	Liliaceae	Greenbriar	Native	Zone 1	Woodland
<i>Solanum carolinense</i> L.	Solanaceae	Horse nettle	Native	Zone 3	Edge of woods adjacent to parking lot
<i>Solidago canadensis</i> L.	Asteraceae	Tall goldenrod	Native	Zone 3	Old field
<i>Solidago flexicaulis</i> L.	Asteraceae	Zig-zag goldenrod	Native	Zone 1	Woodland
<i>Solidago ulmifolia</i> Muhl. ex Willd.	Asteraceae	Elm-leaved goldenrod	Native	Zone 1	Wooded slope
<i>Sphenopholis obtusata</i> (Michx.) Scribner var. <i>major</i> (Torrey) K. S. Erdman	Poaceae	Wedge grass	Native	Zone 1	Woodland
<i>Spiranthes ovalis</i> Lindley	Orchidaceae	Oval ladies'-tresses	Native	Zone 1	One plant on S ravine, a Threatened species.
<i>Taraxacum officinale</i> Weber	Asteraceae	Dandelion	Alien	Zone 3	Old field
<i>Teucrium canadense</i> L. var. <i>virginicum</i> (L.) Eaton	Lamiaceae	American germander	Native	Zone 1	Woodland
<i>Thalictrum thalictroides</i> (L.) Eames & Boivin	Ranunculaceae	Rue anemone	Native	Zone 1	Woodland
<i>Thaspium barbinode</i> (Michx.) Nutt.	Apiaceae	Meadow parsnip	Native	Zone 1	Woodland
<i>Tilia americana</i> L.	Tiliaceae	Basswood	Native	Zone 1	Woodland
<i>Toxicodendron radicans</i> P. Miller	Anacardiaceae	Poison ivy	Native	Zone 1	Woodland
<i>Trifolium hybridum</i> L.	Fabaceae	Alsike clover	Alien	Zone 3	Mowed path near parking lot.
<i>Trifolium repens</i> L.	Fabaceae	White clover	Alien	Zone 3	Path near parking lot
<i>Triosteum</i> sp.	Caprifoliaceae	Horse gentian	Native	Zone 1	Woodland
<i>Triphora trianthophora</i> (Sw.) Rydb.	Orchidaceae	Nodding pogonia	Native	Zone 2	At least 50 stems observed on E ridge, in old Rhus thicket and young successional woods
<i>Ulmus americana</i> L.	Ulmaceae	American elm	Native	Zone 1	Woodland
<i>Ulmus rubra</i> Muhl.	Ulmaceae	Slippery elm	Native	Zone 1	Woodland
<i>Urtica dioica</i> L.	Urticaceae	Stinging nettle	Native	Zone 1	Wooded slope
<i>Uvularia grandiflora</i> Small	Liliaceae	Bellwort	Native	Zone 1	Woodland
<i>Verbena urticifolia</i> L.	Verbenaceae	White vervain	Native	Zone 2	Open woods, woodland margins
<i>Verbesina alternifolia</i> (L.) Britton	Asteraceae	Wingstem	Native	Zone 2	Upland
<i>Veronicastrum virginicum</i> (L.) Farw.	Scrophulariaceae	Culver's root	Native	Zone 1	Woodland
<i>Viola pratincola</i> Greene	Violaceae	Common blue violet	Native	Zone 1	Woodland
<i>Viola pubescens</i> Aiton	Violaceae	Downy yellow violet	Native	Zone 1	Woodland

<i>Vitis riparia</i> Michx.	Vitaceae	Wild grape	Native	Zone 1	Woodland
<i>Zanthoxylum americanum</i> P. Miller	Rutaceae	Prickly ash	Native	Zone 1	Woodland