A Vascular Plant Inventory and Vegetation Analysis

of the

Johnson County Heritage Trust's

Turkey Creek Preserve

in Johnson County, Iowa

Prepared for the Johnson County Heritage Trust

By

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EXECUTIVE SUMMARY

- 337 species of vascular plants have been documented from the Preserve and a high percentage (86%) is native.

- Eleven uncommon species have been documented on the Preserve, and an additional 3 uncommon species have been documented on adjacent lands. Three additional uncommon species have been historically documented in the vicinity of the Preserve.

- Three natural plant communities, Rock Outcrop, Woodland, and Floodplain, are present on the Preserve. The Rock Outcrop is particularly interesting, supporting a number of plants uncommon in Johnson County. Two man-made plant communities, Old Field and Reconstructed Prairie, are also present.

- The open woodland, savanna and prairie described in General Land Office Surveys has largely been replaced by Old Field communities on the Preserve. However, in spite of widespread historical disturbances, there are patches of vegetation that appear to have been altered little since at least 1937.

- The most significant feature on the Preserve, the Rock Outcrop and its associated community of uncommon plant species, is shared by adjacent federal holdings. Cooperative protection on both properties will be necessary to assure the continued integrity of this unique feature.

- The primary management concern is the presence of the invasive alien species, autumn olive (*Elaeagnus umbellata*), in the Old Field communities along both sides of Turkey Creek. Management efforts during the 2005 growing season have greatly reduced this species, and should be continued.

INTRODUCTION

The Johnson County Heritage Trust's Turkey Creek Preserve is a 105-acre site located in sections 11 and 14, township 80N, range 6W (Fig.1). It was acquired by the Johnson County Heritage Trust in 1981. At its northern extent, the Preserve is bordered by Sugar Bottom Road, and its southern boundary lies three-quarters of a mile to the south. Encompassing the meandering course of Turkey Creek through rolling terrain, the Preserve contains an interesting variety of habitat and topographic diversity.

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 Turkey Creek Preserve. Child passed through the Preserve along the section line between sections 11 and 14 of township 83N, range 6W. Field notes pertaining to this section line are noted as being the same as those associated with the section line between sections 22 and 23, located a short distance south of the Preserve (Fig. 3).

The field notes describe the land as "first rate" and “very broken”, probably reflecting the dissected terrain along Turkey Creek and its tributaries. Several tree species are noted, including white and red oak, elm, basswood (“lynn”), and walnut. An identical description was also applied to section lines immediately west and south of the Preserve, between sections 14 and 15, and 14 and 23, respectively.

While tree composition of the area is emphasized, recorded trees were relatively small and encountered in low density. Along other section lines immediately surrounding the Preserve, such as between sections 10 and 11, and 13 and 14, Child notes the "open" character of the land (Figs. 3, 5), as well as a distinction between the relatively open uplands and wooded ravines (Fig. 5). A significant area of prairie is noted in section 11, approximately one-half mile to the northeast of the Preserve (Fig. 6). The region

surrounding the Preserve appears to have been characterized largely by open woodland, savanna, and prairie, with heavier woodland cover localized on some ravines. Child also notes the "beautiful" character of the creek and surrounding land, as well as the limestone ledges and bluffs (Figs. 4, 5).

Figure 3. General Land Office survey notes, line between sections 13 & 14, and 11 & 12

Figure 4. General Land Office survey notes, line between sections 14 & 23, and 14 & 15

Figure 5. General Land Office survey notes, line between sections 11 & 14, and 10 & 11

Figure 6. General Land Office survey township map

Figure 7. Topographic map, showing Preserve and surrounding sections

Aerial Photographs

By 1937, most of the present-day Preserve was actively farmed. However, small remnants of woodland, probably never plowed, have survived since at least 1937 at two localities on the Preserve. A triangular remnant of approximately six acres in size on the southeastern corner of the Preserve and a curvilinear remnant associated with the Rock Outcrop community are both visible on the 1937 photograph (Fig. 8) and subsequent photographs (Fig. 9-14). Woodland succession has increased on an adjacent 6 acre area of uncultivated land since 1937 (Fig. 8-14) and on an adjacent old field, occupying the southwestern corner of the Preserve, since 1983 (Fig. 12-14).

In 1937, discontinuous growth of trees was present along Turkey Creek and its tributaries, indicating that minor portions of the floodplain and adjacent slopes were not actively farmed (Fig. 8). Tree cover on these areas subsequently increased, though the adjacent fields continued to be utilized for agricultural purposes (Fig. 8-11). The geographic extent of farming remained nearly constant until the establishment of the Preserve in 1981 (Fig. 8-14). Woodland succession on the fields is largely a recent phenomenon, having progressed mainly since the establishment of the Preserve (Fig. 12-14). Most of the fields appear to have been actively utilized until that time. An exception is the western unit of zone 2 (see Vegetation Analysis for discussion of zones); though apparently utilized as recently as 1951 (Fig. 8-9), woodland succession on this area has progressed rapidly, particularly since 1970 (Fig. 11-14).

Figure 8. 1937 Aerial Photograph

Figure 9. 1951 Aerial Photograph

Figure 10. 1963 Aerial Photograph

Figure 11. 1970 Aerial Photograph

Figure 12. 1983 Aerial Photograph

Figure 13. 1990 Aerial Photograph

Figure 14. 2002 Aerial Photograph

Soil Survey

Floodplain on the Preserve is covered by Nodaway silt loam, with 0 to 2 percent slopes (1220) (Fig. 15). The rest of the Preserve is covered entirely by Fayette silt loam, with 5 to 40 percent slopes (163C2, 163D2, 163E2, 163F2, 163G). Several of the soil map units found on the Preserve (163C2, 163D2, 163E2, 163F2) are characterized as moderately eroded as a result of past cultivation.

Figure 15. Soil Survey Map

Historical Botanical Investigations

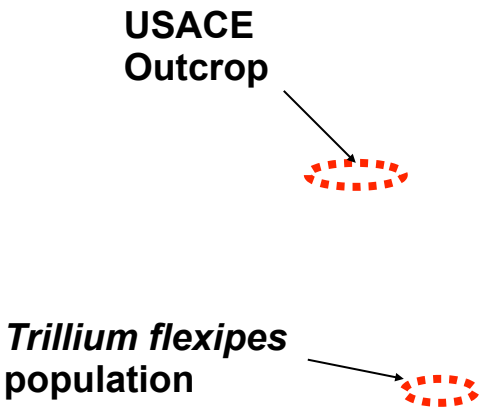
The vegetation in the vicinity of Turkey Creek has attracted the attention of Iowa botanists for more than a century. Dr. Bohumil Shimek, esteemed professor of Botany at the University of Iowa and former Curator of the UI Herbarium, began documenting the flora of Turkey Creek as early as 1892, and returned repeatedly during the ensuing three decades. Following in Shimek's footsteps, Dr. William A. Anderson returned to Turkey Creek during the 1930's, as in turn did Dr. Robert F. Thorne during the 1950's. The plant specimens resulting from their collective research at Turkey Creek are deposited in the UI Herbarium collection, now located at Iowa State University. A number of these records, particularly of the uncommon species, are noted in *The Flora of Johnson County* (Thorne, 1955).

In the early 1960's, Dr. Paul D. Sørensen, then a graduate student in the UI Botany Department, completed an extensive floristic inventory of what was then known as the "Turkey Creek Scientific Area", along with adjacent privately-owned properties (Fig. 16). Though not including any Preserve land, Sørensen's study area borders the western and southern Preserve boundaries. The study area spanned over 200 acres, occupying portions of sections 14, 15 and 23 of township 80N, range 6W. Sørensen documented 399 plant species, 82% of which are native (Appendix 3).

The purpose of the present research project was to conduct a comprehensive plant diversity inventory and vegetation analysis of the Turkey Creek Preserve. Two small tracts of land adjacent to the Preserve also were included. One of these, owned by the U.S. Army Corps of Engineers (USACE), supports a portion of the Rock Outcrop community. The other, a portion of the Turkey Creek Development (Fig. 17), supports a population of nodding trillium (*Trillium flexipes*), an uncommon species.

Figure 16. Turkey Creek Preserve (green) and Sørensen study area (red)

Figure 17. Adjacent lands



METHODS

Study Site

Iowa. Johnson County: Johnson County Heritage Trust's Turkey Creek Preserve, south of Sugar Bottom Road, approx. 1.5 mi. NW of intersection with Newport Road

Legal Description

Township 80N, Range 6W
SE ¼, SW ¼, Sec. 11
NE ¼, NW ¼, Sec. 14
SE ¼, NW ¼, Sec. 14

Latitude/Longitude

41° 44' 51"N, 91° 30' 53"W to 41° 44' 14"N, 91° 30' 53"W

Field Research

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

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
September 31, 2005

Field visits to the study site 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 vegetation zone (see Vegetation Analysis) 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 uncommon 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 the 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, 1983 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 map and index were obtained from the University of Iowa Geoscience Library.

RESULTS AND DISCUSSION

Species Diversity

A total of 337 species of vascular plants, representing 227 genera and 77 families, were recorded from Turkey Creek Preserve (Table 2, Appendix 1). Eighty-six percent (292) of these species are native.

Table 2. Vascular plant species diversity of the Turkey Creek Preserve.

Study site	# of species	# of native species	% native	# of genera	# of families
Turkey Creek Preserve	337	292	86	227	77

Tables 3 and 4 identify uncommon species on the Turkey Creek Preserve. Current protection status of state-listed species is indicated. Table 5 identifies uncommon species adjacent to the Preserve.

Table 3. State-listed plant species on the Preserve.

State-listed species:	**Status:**
Spring avens (*Geum vernum*)	Special Concern
Oak fern (*Gymnocarpium dryopteris*)*	Threatened

*****not observed during current survey, precise locality uncertain

Table 4. Uncommon plant species on the Preserve.

Uncommon species:
Walking fern (*Asplenium rhizophyllum*)**
Great Indian plantain (*Cacalia muhlenbergii*)
Harebell (*Campanula rotundifolia*)*
Short's sedge (*Carex shortiana*)
American Beakgrass (*Diarrhena americana var. obovata*)
Leatherwood (*Dirca palustris*)***
Bishop's cap (*Mitella diphylla*)***
Sandwort (*Moehringia lateriflora*)
Golden ragwort (*Senecio aureus*)
Snow Trillium (*Trillium nivale*)**
Downy arrowwood (*Viburnum rafinesquianum*)***

*not observed during current survey, precise locality uncertain
**not observed during current survey, but probably extant
*** also present on adjacent USACE property

Table 5. Uncommon plant species adjacent to the Preserve.

Uncommon species:	**Locality:**

Bare-stemmed tick-trefoil (*Desmodium nudiflorum*)	USACE land bordering western Preserve boundary
Black-seeded rice-grass (*Oryzopsis racemosa*)	USACE land bordering western Preserve boundary
Nodding Trillium (*Trillium flexipes*)	Turkey Creek Development, bordering southern Preserve boundary

Vegetation Analysis

The Preserve was subdivided into five zones as a result of the current inventory (Figs. 18, 19). These zones reflect vegetation, ecological factors (substrate, elevation, and

Figure 18. Vegetation zone topographic map

Figure 19. Vegetation zone aerial photograph

topography) and historical land use, and are identified by the plant communities within them. Three natural plant communities, Rock Outcrop (Zone 1), Woodland (Zone 2), and Floodplain (Zone 3), are present on the Preserve. Two man-made plant communities, Old Field (Zone 4) and Reconstructed Prairie (Zone 5), are also present.

Zone 1, Rock Outcrop

The most unique feature of the Preserve is the prominent limestone outcrop flanking Turkey Creek. West-facing in orientation at its northern extent, the outcrop gradually turns northward as it reaches the western Preserve boundary, at the same time becoming progressively rockier and more precipitous. The outcrop continues past the Preserve boundary, on USACE land, by which time it attains a north-northeast orientation and nearly vertical topography.

Much of the diversity associated with the outcrop community is concentrated at the southern extent, where it has a northern exposure. The area supports a particularly charming spring flora, with an abundance of such species as wild ginger (*Asarum canadense*), hepatica (*Hepatica nobilis* var. *acuta*), and rue anemone (*Thalictrum thalictroides*). Large populations of wild leek (*Allium tricoccum*), display dense growth of luxuriant, hosta-like foliage before they senesce and flower in early summer. Near the western boundary of the Preserve, the precipitous slope supports a number of additional herbaceous species typical of wooded, rocky habitats. Clinging to thin soil over steeply sloping terrain and limestone ledges are such herbaceous species as spikenard (*Aralia racemosa*), graceful sedge (*Carex gracillima*), burr reed sedge (*C. sparganioides*), bulblet fern (*Cystopteris bulbifera*), zig-zag goldenrod (*Solidago flexicaulis*), and bellwort (*Uvularia grandiflora*),.

Several shrubs also characterize the steep, rocky terrain, including pagoda dogwood (*Cornus alternifolia*), silky dogwood (*C. amomum* ssp. *obliqua*), and prickly gooseberry (*Ribes cynosbati*).

Many plant species restricted to rock outcrops occur in the area. While such species are relatively common in northeastern Iowa, where outcrops are plentiful, they are uncommon in Johnson County, due to the lack of suitable habitats. One such species, bishop's cap (*Mitella diphylla*), is present in abundance, displaying spidery, white flowers in spring. A distinguishing feature of this species is its tendency to remain at least partially evergreen through the winter. Almost always found in association with limestone outcrops, this species may now be extant at only one other site in Johnson County (Madsen, unpublished data). The second population is located on USACE land approximately one mile north of Sandy Beach, on north-facing limestone outcrops along West Hoosier Creek.

Walking fern (*Asplenium rhizophyllum*), an uncommon species restricted to rock outcrops, is present on vertical faces of several of the larger limestone ledges. This species may now be extant at only one other locality in Johnson County (Madsen, unpublished data), and the Preserve population is far larger. A small colony of walking fern, restricted to a single limestone ledge, occurs at an isolated locality along Coralville Lake.

A localized population of black-seeded rice-grass (*Oryzopsis racemosa*), an uncommon species, is present about halfway up the outcrop on USACE land immediately west of the Preserve boundary. This species, restricted to rock outcrops and rarely occurring in the state outside of northeastern Iowa, is known from only one other locality in Johnson

County, according to UI Herbarium records. Black-seeded rice-grass was documented on Lake Macbride State Park by Thorne in the 1950's, and is still extant at this locality, on a north-facing limestone outcrop east of the spillway (Madsen, unpublished data).

Downy arrowwood (*Viburnum rafinesquianum*), an uncommon species, occurs along the crest of the outcrop. Numbering about 15 individuals, approximately half of the population occurs on the Preserve, with the other half on USACE land. While the status of other Johnson County populations is unknown to the author, there are probably very few extant localities that could support this species.

The most noteworthy species of the outcrop community is leatherwood (*Dirca palustris*). A large population, including at least several dozen individuals, occurs at this locality. The leatherwood population is shared between Preserve and USACE land, with approximately two thirds of the population occurring on the Preserve. This uncommon species is most abundant along the crest of the outcrop, although several individuals are distributed nearer the base of the slope, and a very few along the ridgeline above the outcrop. Surprisingly, a few individuals also occur just south of the ridgeline, on a gently south-facing slope, within relatively young, second-growth woodland (Zone 2). Like several other species found at this locality, leatherwood requires a relatively cool, moist microclimate more typical of outcrops in northeastern Iowa. No other extant populations of leatherwood are known in Johnson County. Historically, this species was recorded by Shimek along Sanders Creek (Thorne, 1955), approximately 2 miles south-southwest of the Preserve (Fig. 7). Unfortunately, this population has not been relocated since 1899, and given the extensive quarrying that has taken place along Sanders Creek, the population has almost certainly been extirpated.

Crowning the crest of the slope is an interesting assemblage of herbaceous plants, including wood anemone (*Anemone quinquefolia*), pellitory (*Parietaria pensylvanica*), and culver's root (*Veronicastrum virginicum*). Sandwort (*Moehringia lateriflora*), an uncommon species more typical of northeastern Iowa, is present here. Along the western margin, and on adjacent USACE land, wild sarsaparilla (*Aralia nudicalis*) and shooting star (*Dodecatheon meadia*) are particularly luxuriant.

The relatively dry, open woodland near the ridgetop supports a number of diminutive plants not observed elsewhere on the Preserve, including bastard toadflax (*Comandra umbellata*), woodland goosefoot (*Chenopodium standleyanum*), fall coralroot orchid (*Corallorhiza odontorhiza*), and showy orchid (*Galearis spectabilis*).

i. Historical Records

Several uncommon species recorded historically from the vicinity of Turkey Creek were not observed during the current inventory. Snow trillium (*Trillium nivale*), was documented on the Rock Outcrop in the 1960's by Dr. Paul Sørensen (Appendix 3). While not noted in the current inventory, the small stature and very early blooming habit of this species allow it to be easily overlooked, especially if present in small numbers. Given its inconspicuous nature, the relatively recent date of Dr. Sørensen's discovery,

and the current abundance of this species along Turkey Creek approximately one mile south of the Preserve (Madsen, unpublished data), this species is most likely still extant on the Preserve or adjacent USACE land.

Oak fern (*Gymnocarpium dryopteris*), a Threatened species, was documented from Turkey Creek in 1892 by Shimek. While no precise locality was given, it was most likely collected from the Rock Outcrop, given its strict requirement for cool, moist conditions. A boreal species, oak fern is considered a Pleistocene relict in Iowa, persisting only where a suitable microclimate exists on steep, north-facing slopes. The historical presence of this species at Turkey Creek is particularly interesting, as it was the southernmost recorded population in Iowa, and considerably disjunct from the closest extant populations in northern Delaware and Dubuque counties. Unfortunately, this species was not observed during the present inventory. Not having been relocated since 1892, the oak fern has probably been extirpated.

Harebell (*Campanula rotundifolia*) was recorded from Turkey Creek by William A. Anderson in 1931. A boreal species, it was also most likely found on the Rock Outcrop, although no precise locality was given. This species was also not observed during the current inventory, nor by any others since 1931, and may well be extirpated.

Zone 2, Woodland

Woodland communities on the Preserve are characterized by such tree species as white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), sugar maple (*Acer saccharum*), black walnut (*Juglans nigra*), basswood (*Tilia americana*), hackberry (*Celtis occidentalis*), Ironwood (*Ostrya virginiana*), and black cherry (*Prunus virginiana*). Characteristic shrubs include rough-leaved dogwood (*Cornus drummondii*), gooseberry (*Ribes missouriense*), and prickly ash (*Zanthoxylum americanum*). Several native vines, including bittersweet (*Celastrus scandens*), wild yam (*Dioscorea villosa*), wild honeysuckle (*Lonicera prolifera*), Canada moonseed (*Menispermum canadense*), and greenbriar (*Smilax hispida*) are present as well. Alien shrubs, including Tartarian honeysuckle (*Lonicera tartarica*), buckthorn (*Rhamnus cathartica*), and highbush cranberry (*Viburnum opulus*), are also present, though they are localized and small in number.

A number of showy spring wildflowers are present, including such species as jack-in-the-pulpit (*Arisaema triphyllum*), spring beauty (*Claytonia virginica*), dutchman's breeches (*Dicentra cucullaria*), trout lily (*Erythronium albidum*), wild geranium (*Geranium maculatum*), blue phlox (*Phlox divaricata*), Jacob's ladder (*Polemonium reptans*), Solomon's seal (*Polygonatum biflorum*), bloodroot (*Sanguinaria canadensis*), swamp buttercup (*Ranunculus septentrionalis*), false Solomon's seal (*Smilacena racemosa*), common blue violet (*Viola pratincola*), and downy yellow violet (*Viola pubescens*). Showy wildflowers of the late summer and fall include Ontario aster (*Aster ontarionis*), side-flowered aster (*Aster lateriflorus*), tall agrimony (*Agrimonia gryposepala*), tall bellflower (*Campanula americana*), purple Joe-pye-weed (*Eupatorium purpureum*), and heartleaf scullcap (*Scutellaria ovata*).

Other less showy herbaceous plants include enchanter's nightshade (*Circaea lutetiana* ssp. *canadensis*), white avens (*Geum canadense*), stickseed (*Hackelia virginiana*), sweet cicely (*Osmorhiza claytonii*), anise root (*Osmorhiza longistylis*), and jumpseed (*Polygonum virginianum*). Also present are several members of the bedstraw family, including cleavers (*Galium aparine*), shining bedstraw (*Galium concinnum*), and sweet-scented bedstraw (*Galium triflorum*. A number of grasses and sedges are present as well, including Canada brome (*Bromus pubescens*), nodding fescue (*Festuca obtusa*), bottlebrush grass (*Hystrix patula*), wedge grass (*Sphenopholis obtusata* var. *major*), pubescent sedge (*Carex hirtifolia*) and rosy sedge (*C. rosea*). Several ferns, including maidenhair fern (*Adiantum pedatum*), lady fern (*Athyrium filix-femina* var. *angustum*), and rattlesnake fern (*Botrychium virginianum*) are found in small numbers.

As shown on figures 18 and 19, the Woodland communities on the Preserve have been divided into two segments, one on the west side of Turkey Creek and the second on the east side. These will herein be referred to as "West Woodland" and "East Woodland", respectively.

i. West Woodland

While smaller than the East Woodland, the West Woodland supports an assemblage of plants not found elsewhere on the Preserve. Among these are several sedges, including eastern narrowleaf sedge (*Carex amphibola* var. *turgida*), eastern woodland sedge (*C. blanda*), limestone meadow sedge (*C. granularis*), and James' sedge (*C. jamesii*), all of which occur in relatively open areas near the base of a prominent east-facing slope. Young individuals of American elm (*Ulmus americana*) and slippery elm (*Ulmus rubra*) are relatively abundant along the base of the slope. Wingstem (*Verbesina alternifolia*), wild onion (*Allium canadense*), and great Indian plantain (*Cacalia muhlenbergii*) are also locally abundant here. The latter, an uncommon species, is unusually striking with its large leaves and robust growth habit. This luxuriant population of great Indian plantain is one of the few documented in Johnson county, and is certainly the largest. Most abundant along the base of the slope, scattered individuals also occur towards the crest of the slope, although the elevated individuals appear largely non-flowering.

A large area of the slope is dominated by an unusually luxuriant population of Virginia bluebells (*Mertensia virginica*), the extent of which is unlikely to be paralleled anywhere else in Johnson county, and perhaps not even in eastern Iowa. On the rocky outcrops associated with this slope, columbine (*Aquilegia canadensis*) is frequently encountered. The south end of the slope is dominated by a relatively dense growth of bladdernut (*Staphylea trifolia*), a shrub not observed elsewhere on the Preserve. The upland above the slope supports an unusually large population of golden ragwort (*Senecio aureus*), an uncommon species that provides a striking display of golden color in the early spring. Interestingly, this species was first documented along Turkey Creek by Shimek in 1911 (see Thorne, 1955).

ii. East Woodland

Considerably larger than the West Woodland, the East Woodland supports a greater diversity of plant species. A remnant in the southeastern corner (Fig. 20), having survived since at least 1937 (Fig. 8), supports a number of species not found elsewhere on the Preserve. Notable tree species found here include red oak (*Quercus borealis* var. *maxima*) and big-tooth aspen (*Populus grandidentata*), the latter a clonal species occurring in two large stands. Several herbaceous species restricted to this area include poke milkweed (*Asclepias exaltata*), creeping fragile fern (*Cystopteris protrusa*), Licorice bedstraw (*Galium circaezans*), and elm-leaved goldenrod (*Solidago ulmifolia*). Several grasses not observed elsewhere on the Preserve are also present here, including slender wild rye (*Elymus villosus*), bearded shorthusk (*Brachyelytrum erectum*), and American beakgrass (*Diarrehena americana* var. *obovata*). The latter, an uncommon species, is present as two localized populations within this area. A single individual of garlic mustard (*Alliaria petiolata*), removed upon its discovery, was found along the southern boundary of the Preserve.

To the west, a south-facing slope supports relatively young successional woodland, including such species as Deertongue grass (*Dichanthelium clandestinum*) and great lobelia (*Lobelia siphilitica*), and in moist depressions, beggar-ticks (*Bidens sp.*), blister sedge (*Carex vesicaria*), and water hemlock (*Cicuta maculata*). A few individuals of leatherwood (*Dirca palustris*), an uncommon species, are present at the top of the slope, as described in the analysis of Zone 1.

At the northern extent of the East Woodland, along the east branch of Turkey Creek, a few notable sedges are present, including graceful sedge (*Carex gracillima*) and Short's sedge (*C. shortiana*), an uncommon species. Golden ragwort (*Senecio aureus*), another uncommon species, is also present here, though in lesser abundance than on the West Woodland. A large population of blue cohosh (*Caulophyllum thalictroides*) occurs here as well. A single individual of oriental bittersweet (*Celastrus orbiculatus*), removed upon its discovery, was also discovered at this locality.

Immediately south of the Preserve, a population of nodding trillium (*Trillium flexipes*) occurs at the base of a north-facing wooded slope on the northern margin of the Turkey Creek Development. No other extant populations of this showy wildflower have are known in Johnson County (Thorne, 1955, and UI Herbarium records). Interestingly, this species has persisted along Turkey Creek for over a century, having been first documented by Shimek in 1895 (Thorne, 1955).

Zone 3, Floodplain

Spanning the length of the Preserve, the floodplain of Turkey Creek meanders through a patchwork of wooded and open environments. Forested areas are characterized by such woody species as box elder (*Acer negundo*), black ash (*Fraxinus nigra*), black walnut (*Juglans nigra*), black willow (*Salix nigra*), and elderberry (*Sambucus*

canadensis). Associated herbaceous plant species include purple giant-hyssop (*Agastache scrophulariifolia*), groundnut (*Apios americana*), chervil (*Chaerophyllum procumbens*), waterpod (*Ellisia nyctelea*), Virginia waterleaf (*Hydrophyllum virginianum*), clearweed (*Pilea pumila*), tall coneflower (*Rudbeckia laciniata*), brown-eyed susan (*R. triloba*), carrion flower (*Smilax ecirrhata*), purple meadow-rue (*Thalictrum dasycarpum*), and wingstem (*Verbesina alternifolia*). Among them are several grasses, including wood reed (*Cinna arundinacea*), fowl manna grass (*Glyceria striata*), and wirestem muhly (*Muhlenbergia frondosa*). While not particularly diverse, the wooded areas are comprised largely of native species.

In contrast, the more open areas, while diverse, are dominated by a few aggressive species, and contain a larger percentage of alien species. Particularly abundant are such species as reed canary grass (*Phalaris arundinacea*), and stinging nettle (*Urtica dioica*). In relatively dry areas, and especially on steep, eroded creek banks near the northern end of the Preserve, a weedy mixture of native and alien species is present, including Virginia three-seeded mercury (*Acalypha virginica*), giant ragweed (*Ambrosia trifida*), common milkweed (*Asclepias syriaca*), bindweed (*Calystegia sepium*), Canada thistle (*Cirsium arvense*), field thistle (*C. discolor*), poison hemlock (*Conium maculatum*), horsetail (*Equisetum arvense*), fleabane (*Erigeron annuus*), hops (*Humulus lupulus*), motherwort (*Leonurus cardiaca*), wild parsnip (*Pastinaca sativa*), garden phlox (*Phlox paniculata*), curly dock (*Rumex crispus*), and mullein (*Verbascum thapsus*). Several grasses are present, including redtop (*Agrostis gigantea*), barnyard grass (*Echinocloa muricata*), meadow fescue (*Festuca pratensis*), witchgrass (*Panicum capillare*), and yellow foxtail (*Setaria glauca*). Several representatives of the carnation family are present as well, including nodding chickweed (*Cerastium nutans*), giant chickweed (*Myosoton aquaticum*), snowy campion (*Silene nivea*), and common chickweed (*Stellaria media*). The mustard family is particularly prominent, including such species as yellow rocket (*Barbarea vulgaris*), black mustard (*Brassica nigra*), shepherd's purse (*Capsella bursa-pastoris*), dame's rocket (*Hesperis matronalis*), field cress (*Lepidium campestre*), tumble mustard (*Sisymbrium loeselii*), and penny cress (*Thlaspi arvense*).

In wet areas directly bordering the creek, a number of native wetland species are present, including Indigo bush (*Amorpha fruticosa*), swamp milkweed (*Asclepias incarnata*), willow aster (*Aster praealtus*), crooked stem aster (*A. prenanthoides*), nodding bur marigold (*Bidens cernua*), purplestem beggarticks (*B. connata*), pony grass (*Eragrostis hypnoides*), spring cress (*Cardamine bulbosa*), cinnamon willowherb (*Epilobium coloratum*), boneset (*Eupatorium perfoliatum*), sneezeweed (*Helenium autumnale*), pale touch-me-not (*Impatiens pallida*), spotted touch-me-not (*I. capensis*), Virginia water horehound (*Lycopus virginicus*), wild mint (*Mentha arvensis*), monkey flower (*Mimulus ringens*), ditch stonecrop (*Penthorum sedoides*), yellow cress (*Rorripa sessiliflora*), pale dock (*Rumex altissimus*), hedge nettle (*Stachys tenuifolia var. hispida*), and neckweed (*Veronica peregrina*).

Members of the smartweed family are well-represented, including curlytop knotweed (*Polygonum lapathifolium*), Pennsylvania smartweed (*P. pensylvanicum*), lady's thumb

(*P. persicaria*), water smartweed (*P. punctatum*), and tearthumb (*P. sagittatum*). Several members of the sedge family are also present, including dark green bulrush (*Scirpus atrovirens*), soft-stemmed bulrush (*S. validus*), owlfruit sedge (*Carex stipata*), and blister sedge (*C. vesicaria*). However, given the aggressive nature of a few dominant species, as previously mentioned, most of the native wetland species are present only in small numbers.

In addition, a small number of aquatic species are found in direct association with the creek. Arrowhead (*Sagittaria latifolia*), an emergent species, occurs along the waters' edge in a few widely separated populations on the southern half of the Preserve. Leafy pondweed (*Potamogeton foliosus*), a submerged species, is found in stretches of slow moving water. Greater duckweed (*Spirodela polyrhiza*), a floating species, is found on pools and wet mud, particularly in late summer.

Zone 4, Old Field

Old field communities on the Preserve occur discontinuously along both sides of the creek. One large segment is located along the west side, and two large segments are located along the east side. These segments are referred to as "West Old Field" and "East Old Fields", respectively. A much smaller segment occurring along the northern boundary of the Preserve was found to be similar in general composition to the larger segments and is not treated separately.

Collectively, the old fields are characterized by an abundance of shrubs and young trees, including such species as blackberry (*Rubus allegheniensis*), black raspberry (*R. occidentalis*), wild plum (*Prunus americana*), black cherry (*P. serotina*), gray dogwood (*Cornus foemina* ssp. *racemosa*), poison ivy (*Toxicodendron radicans*), smooth sumac (*Rhus glabra*), eastern red cedar (*Juniperus virginiana*), bitternut hickory (*Carya cordiformis*), and shagbark hickory (*C. ovata*). Two alien shrubs, multiflora rose (*Rosa multiflora*) and autumn olive (*Elaeagnus umbellata*), are also abundant. The latter is particularly aggressive, although its abundance was markedly reduced during the growing season as a result of intensive management efforts.

The dense, shrubby thickets and copses of young trees are interrupted by a patchwork of openings dominated by herbaceous plants. Several common prairie species are present, including tall anemone (*Anemone virginiana*), Davis' sedge (*Carex davisii*), pale gentian (*Gentiana alba*), wild bergamot (*Monarda fistulosa*), American germander (*Teucrium canadense* var. *virginicum*), and culver's root (*Veronicastrum virginicum*). Areas of relatively dry, exposed soil are characterized by low herbs, including such species as yarrow (*Achillea millefolium ssp. lanulosa*), wild strawberry (*Fragaria virginiana*), Indian tobacco (*Lobelia inflata*), prairie ragwort (*Senecio plattensis*), horse nettle (*Solanum carolinense*), and Venus' looking-glass (*Triodanis perfoliata*). A few alien species, including sulphur cinquefoil (*Potentilla recta*), and Deptford pink (*Dianthus armeria*), are also widespread, though not abundant.

At the north end of the West Old Field is a semi-wooded ravine, supporting such species as hazel (*Corylus americana*), Canada wild rye (*Elymus canadensis*), Virginia wild rye (*E. virginicus*), climbing false buckwheat (*Polygonum scandens*), and tall goldenrod (*Solidago canadensis*). Several species not observed elsewhere on the Preserve are present, including hawthorn (*Crataegus* sp.), sensitive fern (*Onoclea sensibilis*), trembling aspen (*Populus tremuloides*), meadow parsnip (*Thaspium barbinode*), white vervain (*Verbena urticifolia*), and nannyberry (*Viburnum lentago*). A few alien species are also present, including burdock (*Arctium minus*), and ground ivy (*Glechoma hederacea*).

On the more open portions of the West Old Field, an abundance of showy blue asters are present, including Short's aster (*Aster shortii*) and Drummond's aster (*A. drummondii*). Such prairie species as tall tickseed (*Coreopsis tripteris*) and ground cherry (*Physalis virginiana*) are also found here. A few wetland species, including swamp agrimony (*Agrimonia parviflora*) and water hemlock (*Cicuta maculata*), are present in moist depressions. At the south end of the West Old Field, bordering a woodland community, a relatively large population of lily-leaved twayblade orchid (*Liparis liliifolia*) is present. Spring avens (*Geum vernum*), a Special Concern species, occurs in abundance here. 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).

A greater diversity of plants is supported by the East Old Fields, including such prairie species as slender false foxglove (*Agalinus tenuifolia*), pussytoes (*Antennaria neglecta*), ladies'-tobacco (*A. plantaginifolia*), Indian hemp (*Apocynum cannabinum*), whorled milkweed (*Asclepias verticillata*), tick-trefoil (*Desmodium sp.*), everlasting (*Gnaphalium obtusifolium*), hairy mountain mint (*Pycnanthemum pilosum*), blue-eyed grass (*Sisyrinchium campestre*), and nodding ladies'-tresses orchid (*Spiranthes cernua*). Several species characteristic of young successional woodland on old fields are present, particularly on the northern East Old Field, including green ash (*Fraxinus pennsylvanica var. lanceolata*), dodder (*Cuscuta cuspidata*), ebony spleenwort (*Asplenium platyneuron*), dissected grape fern (*Botrychium dissectum* f. *dissectum*), oblique grape fern (*Botrychium dissectum* f. *obliquum*), spinulose wood fern (*Dryopteris carthusiana*). Among these are 4 species of ferns not observed elsewhere on the Preserve. Several alien species are also present in small numbers, including asparagus (*Asparagus officinalis*), bird's-foot trefoil (*Lotus corniculatus*), hedge apple (*Maclura pomifera*), timothy (*Phleum pratense*), and self heal (*Prunella vulgaris*).

Zone 5, Reconstructed Prairie

The original seeding on this area occurred in 1985, and included a mixture of 35 native species (Fallon, 2005) (Appendix 2). Of these species, about one-half are extant. Several additional prairie species, probably originating from a subsequent 1997 sowing, are also present.

Beginning at the north end of this zone, the vegetation appears largely a result of natural succession, rather than actively managed Reconstructed Prairie. Several large clones of blister sedge (*Carex vesicaria*) are present in moist depressions along the northern margin. On the adjacent north-facing slope, such species as poison ivy (*Toxicodendron radicans*) and Davis' sedge (*Carex davisii*) are abundant. A few dry, relatively exposed areas support an abundance of pussytoes (*Antennaria neglecta*) and other low herbs. Trees and shrubs are largely absent, except for a few isolated eastern red cedars (*Juniperus virginiana*). Alien pasture grasses, including such species as Canadian bluegrass (*Poa compressa*), Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*) are dominant.

On the ridge to the south, alien pasture grasses give way to a dense growth of native prairie grasses, including such species as big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*). A few other species are present here in small numbers, including Indian hemp (*Apocynum cannabinum*), crested sedge (*Carex cristatella*), yellow-fruited sedge (*C. annectens*), showy tick-trefoil (*Desmodium canadense*), flowering spurge (*Euphorbia corollata*), and wild lettuce (*Lactuca canadensis*). The east and south-facing prairie slopes are less dominated by grasses, and support an abundance of forbs, including such species as yarrow (*Achillea millefolium* ssp. *lanulosa*), smooth blue aster (*Aster laevis*), heavy sedge (*Carex gravida*), partridge pea (*Chamaecrista fasciculata*), daisy fleabane (*Erigeron strigosus*), wild strawberry (*Fragaria virginiana*), ox-eye (*Heliopsis helianthoides*), spotted St. John's wort (*Hypericum punctatum*), wild bergamot (*Monarda fistulosa*), gray-headed coneflower (*Ratibida pinnata*), and golden alexanders (*Zizia aurea*). Particularly noteworthy is an exceptionally large population of the showy pale gentian (*Gentiana alba*).

The south-facing slope supports a number of additional species, including wild indigo (*Baptisia sp.*), Side-oats gramma (*Bouteloua curtipendula*), hairy panicgrass (*Dichanthelium acuminatum*), round-headed bush clover (*Lespedeza capitata*), blazing star (*Liatris pycnostachya*), evening primrose (*Oenothera villosa*), switchgrass (*Panicum virgatum*), foxglove penstemon (*Penstemon digitalis*), Virginia mountain mint (*Pycnanthemum virginianum*), and black-eyed susan (*Rudbeckia hirta*). While the plant diversity on this slope is relatively high, many of the species are present only in small numbers.

Several additional species are localized on or near the base of the slope, including wild onion (*Allium canadense*), false boneset (*Brickellia eupatoriodes*), fox sedge (*Carex vulpinoidea*), rattlesnake master (*Eryngium yuccifolium*), saw-tooth sunflower (*Helianthus grosseratus*), rosinweed (*Silphium integrifolium*), compass plant (*S. laciniatum*), cup plant (*S. perfoliatum*), and stiff goldenrod (*Solidago rigida*). Short's sedge (*Carex shortiana*), a species more typical of far southeastern Iowa and uncommon in Johnson county, is locally abundant near the western boundary of the Preserve.

MANAGEMENT CONCERNS

The north-facing portion of the Rock Outcrop, along with a host of unusual plant species, is shared almost equally between the Preserve and adjacent USACE holdings. The USACE-owned portion of the outcrop is currently in good condition, and it is vital to the future integrity of this unique community for the area to remain undisturbed. Populations of several uncommon species, such as leatherwood (*Dirca palustris*), are shared between Trust and USACE land. By reducing the population size of such species, disturbance to the outcrop outside of the Preserve would threaten the survival of these species on the Preserve, itself. In addition, a few uncommon species are limited entirely to USACE property. Perhaps most importantly, a disturbance on the USACE land could diminish its capacity as a buffer to the Preserve, potentially altering the cool, moist microclimate, and threatening the entire outcrop community. For the long-term preservation of this irreplaceable natural resource, a cooperative effort between the Johnson County Heritage Trust and the U.S. Army Corps of Engineers is desirable.

Having invaded old field communities along both sides of Turkey Creek with alarming aggression, autumn olive (*Elaeagnus umbellata*) was dramatically reduced in number during the 2005 growing season through intensive cutting and stump herbicide treatment. While this species has been decimated in relatively accessible areas, numerous isolated individuals still exist amid dense, impenetrable thickets on the East Old Fields. These individuals will likely succumb to natural woodland succession within several years. Within that time, however, they may continue to produce an abundance of seeds, which, being bird-dispersed, are highly mobile. To the extent possible, removal of the remaining autumn olives should continue, and young seedlings eliminated as they appear.

Dame's rocket (*Hesperis matronalis*), an aggressive alien species increasing in abundance in Johnson County, was found along the creek near the northern margin of the Preserve. While only a single plant was observed, a very large population occurs on private land immediately north of the Preserve. Fortunately, dame's rocket is particularly showy when in flower, and any increase of this species on the Preserve should be quickly recognized.

While no established populations of garlic mustard (*Alliaria petiolata*) were found on the Preserve, a single individual was discovered along the southern boundary. The source of the introduction is most likely the wooded housing development immediately to the south, which is known to harbor this species (Connie Mutel, pers. comm.). A vigilant watch for garlic mustard, and its prompt removal wherever found, is vital to prevent this species from becoming established on the Preserve. Similarly, the presence of oriental bittersweet (*Celastrus orientalis*), having been found as an individual plant, should also be carefully monitored in the future.

CONCLUSIONS

While of moderate size, the 105-acre Turkey Creek Preserve encompasses a diversity of vegetation and topography. Previous land use in this area has primarily been long-term farming, though small woodland remnants have survived since at least 1937. Areas that suffered past disturbance have regained a diversity of native species, though accompanied by a significant increase in alien species in the Floodplain community. With 337 species, the plant diversity on the Preserve is high, and 86 percent are native species. Species diversity on the Preserve compares favorably with previously recorded diversity on the Turkey Creek Scientific Area and adjacent properties. Though the Preserve is approximately one half the size, recorded plant species diversity is 84% as large as that recorded by Dr. Sørensen on adjacent properties, and a higher percentage is native. A number of uncommon species have been recorded on the Preserve, several of which are found at few or no other localities in Johnson County.

The current species composition of the woodlands includes all tree species noted in the General Land Office Survey. While GLO survey notes emphasize the tree composition of the area, recorded trees were relatively small and encountered in low density. The site was probably characterized originally by relatively open woodland and savanna. However, isolated areas of closed woodland are likely to have existed on favorable localities, such as the outcrop. Furthermore, the long-term existence of woodlands on the study area is documented in the photographic record, with two woodland remnants dating back to at least 1937. Associated with these remnants are a number of uncommon species.

The photographic record also documents a long history of agricultural use on the study area, resulting in a significant decrease in natural vegetation. The maximum extent of farming had been reached in 1937, by which time most of the area was cultivated. Subsequently, tree cover increased along drainage-ways, though the surrounding fields continued to be utilized for agricultural purposes. Woodland succession on the old fields is a relatively recent phenomenon, having occurred largely since the establishment of the Preserve. An interesting exception is the West Woodland; though formerly disturbed, it was abandoned for a considerable length of time, and now supports two uncommon species in great abundance.

While prairie is not strongly emphasized in the GLO Survey notes, the open woodlands and savannas that likely occurred on the area would have contained a significant component of prairie species. The Reconstructed Prairie, and to a lesser extent, the old fields, support a number of prairie species not found in the remnant communities.

While significant progress has been made toward the elimination of autumn olive on the Preserve, such efforts should continue to be directed toward the individuals that remain. In addition, continued efforts to monitor the potential presence of such alien species as garlic mustard (*Alliaria petiolata*), Dame's rocket (*Hesperis matronalis*) and oriental bittersweet (*Celastrus orbiculatus*) are advisable in order to prevent their establishment on the Preserve.

The most significant feature on the Preserve, the Rock Outcrop and its associated community of uncommon plant species, is shared by adjacent federal holdings. Cooperative protection on both properties will be necessary to assure the continued integrity of this unique feature.

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List of Appendices

Appendix 1. Turkey Creek Preserve Plant List

This list includes all vascular plant species recorded in the inventory of the Preserve. It also includes additional vascular plant species documented on adjacent federal and privately-owned lands, and uncommon species historically documented from the vicinity of Turkey Creek. 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 zone numbers in Fig. 18), and additional comments.

Appendix 2. Reconstructed Prairie seed list, 1985

This list includes all vascular plant species seeded on the Reconstructed Prairie in 1985, including species name, family name, common name, and current status (presence or absence) on the Reconstructed Prairie.

Appendix 3. Plants of the Turkey Creek Scientific Area, by Dr. Paul D. Sørensen

This list includes all vascular plant species documented by Dr. Sørensen on the Turkey Creek Scientific Area and adjacent private property. While this inventory included no Preserve lands (see Fig. 14), it is of considerable interest as a record of the plant species diversity immediately surrounding the Preserve.

Appendix 1. Plant List for the Johnson County Heritage Trust's Turkey Creek Preserve, Johnson County, Iowa

Species Name	Family	Common Name	Origin	Locality	Comments
Acalypha virginica L.	Euphorbiaceae	Virginia three-seeded mercury	Native	Zone 3	Along creek bank
Acer negundo L.	Aceraceae	Box elder	Native	Zone 3	Along creek
Acer saccharum L.	Aceraceae	Sugar maple	Native	Zone 3, Zone 4	Wooded slopes along creek, southeastern quarter of East Woodland
Achillea millefolium L. ssp. *lanulosa* (Nutt.) Piper	Asteraceae	Yarrow	Native	Zone 1, Zone 2	Prairie, old fields
Actaea sp.	Ranunculaceae	Baneberry	Native	N/A	USACE
Adiantum pedatum L.	Adiantaceae	Maidenhair fern	Native	Zone 4	Southeastern quarter of East Woodland
Agalinus tenuifolia (Vahl.) Raf.	Scrophulariaceae	Slender false foxglove	Native	Zone 2	East Old Fields
Agastache scrophulariifolia (Willd.) Kuntze	Lamiaceae	Purple giant-hyssop	Native	Zone 3	A few plants in low woods along creek
Agrimonia gryposepala Wallr.	Rosaceae	Tall agrimony	Native	Zone 4	Woodland
Agrimonia parviflora Aiton	Rosaceae	Swamp agrimony	Native	Zone 2	West Old Field
Agrostis gigantea Roth	Poaceae	Redtop	Alien	Zone 3	Creek bank

Alliaria petiolata (Bieb.) Cavara & Grande	Brassicaceae	Garlic mustard	Alien	Zone 4	One plant in woodland near southeast corner of Preserve
Allium canadense L.	Liliaceae	Wild onion	Native	Zone 1, Zone 4	Prairie and open woodland
Allium tricoccum Aiton	Liliaceae	Wild leek	Native	Zone 4	Locally abundant on Rock Outcrop
Ambrosia artemisiifolia L.	Asteraceae	Common ragweed	Native	Zone 1	Along path
Ambrosia trifida L.	Asteraceae	Giant ragweed	Native	Zone 3	Along creek
Amorpha fruticosa L.	Fabaceae	Indigo bush	Native	Zone 3	Two plants along creek
Amphicarpaea bracteata (L.) Fern.	Fabaceae	Hog peanut	Native	Zone 4	Abundant in woodland
Andropogon gerardii Vitman	Poaceae	Big bluestem	Native	Zone 1	Prairie
Anemone quinquefolia L.	Ranunculaceae	Wood anemone	Native	Zone 4	At the crest of Rock Outcrop.
Anemone virginiana L.	Ranunculaceae	Tall anemone	Native	Zone 4, Zone 2	Open woodland & thickets
Antennaria neglecta Greene	Asteraceae	Pussytoes	Native	Zone 2	East Old Fields
Antennaria plantaginifolia (L.) Richardson	Asteraceae	Ladies'-tobacco	Native	Zone 2, Zone 4	East Old Fields and above south end of Rock Outcrop
Apios americana Medicus	Fabaceae	Groundnut	Native	Zone 3	Moist lowland along creek
Apocynum cannabinum L.	Apocynaceae	Indian hemp	Native	Zone 2	Dry upland thicket on East Old Fields, and on prairie ridge
Aquilegia canadensis L.	Ranunculaceae	Columbine	Native	Zone 4	Rocky ledges on outcrops
Aralia nudicalis L.	Araliaceae	Wild sarsaparilla	Native	Zone 4	Upper crest of Rock Outcrop
Aralia racemosa L.	Araliaceae	Spikenard	Native	Zone 4	Lower 1/2 of Rock Outcrop
Arctium minus Bernh.	Asteraceae	Burdock	Alien	Zone 2	Semi-wooded ravine on West Old Field
Arisaema triphyllum (L.) Schott	Araceae	Jack-in-the-pulpit	Native	Zone 4	Woodland
Asarum canadense L.	Aristolochiaceae	Wild ginger	Native	Zone 4	Abundant on Rock Outcrop
Asclepias exaltata L.	Asclepiadaceae	Poke milkweed	Native	Zone 4	Scattered plants on East Woodland
Asclepias incarnata L.	Asclepiadaceae	Swamp milkweed	Native	Zone 3	Localized population along creek
Asclepias syriaca L.	Asclepiadaceae	Common milkweed	Native	Zone 3	Along creek
Asclepias verticillata L.	Asclepiadaceae	Whorled milkweed	Native	Zone 2	Dry upland on East Old Fields

Asparagus officinalis L.	Liliaceae	Asparagus	Alien	Zone 2	One plant on northern East Old Field
Asplenium platyneuron (L.) Oakes ex D. C.	Aspleniaceae	Ebony spleenwort	Native	Zone 2	Several plants on East Old Fields
Asplenium rhizophyllum L.	Aspleniaceae	Walking fern	Native	Zone 4	Several colonies on Rock Outcrop
Aster drummondii Lindley	Asteraceae	Drummond's aster	Native	Zone 2	West Old Field
Aster laevis L.	Asteraceae	Smooth blue aster	Native	Zone 1	Prairie
Aster lateriflorus (L.) Britton	Asteraceae	Side-flowered aster	Native	Zone 4	Woodland
Aster novae-angliae L.	Asteraceae	New England aster	Native	Zone 1	N end of prairie
Aster ontarionis Wieg.	Asteraceae	Ontario aster	Native	Zone 4	Woodland
Aster praealtus Poiret	Asteraceae	Willow aster	Native	Zone 3	Along creek
Aster prenanthoides Muhl. ex Willd.	Asteraceae	Crooked stem aster	Native	Zone 3	Along creek
Aster shortii Lindley	Asteraceae	Short's aster	Native	Zone 2	West Old Field
Athyrium filix-femina (L.) Roth var. *angustum* (Willd.) Moore	Aspleniaceae	Lady fern	Native	Zone 4	Woodland
Baptisia sp.	Fabaceae	Wild indigo	Native	Zone 1	One juvenile plant on S-facing prairie slope
Barbarea vulgaris R. Br.	Brassicaceae	Yellow rocket	Alien	Zone 3	Along creek
Berberis thunbergii DC.	Berberidaceae	Barberry	Alien	Zone 4	Disturbed margin of East Woodland
Bidens cernua L.	Asteraceae	Nodding bur marigold	Native	Zone 3	Along creek
Bidens connata Muhl. ex Willd.	Asteraceae	Purplestem beggar-ticks	Native	Zone 3	Along creek
Botrychium dissectum Sprengel f. *dissectum*	Ophioglossaceae	Dissected grape fern	Native	Zone 2	Northern boundary of northern East Old Field
Botrychium dissectum Sprengel f. *obliquum* (Muhl.) Fern.	Ophioglossaceae	Oblique grape fern	Native	Zone 2	Northern boundary of northern East Old Field
Botrychium virginianum (L.) Sw.	Ophioglossaceae	Rattlesnake fern	Native	Zone 4	Woodland
Bouteloua curtipendula (Michx.) Torrey	Poaceae	Side-oats gramma	Native	Zone 1	Top of S-facing prairie slope
Brachyelytrum erectum (Schreber) Beauv.	Poaceae	Bearded shorthusk	Native	Zone 4	Upland woodland
Brassica nigra (L.) W. D. J. Koch	Brassicaceae	Black mustard	Alien	Zone 3	Along creek
Brickellia eupatorioides L. *var. corymbulosa* (T. & G.) Shinners	Asteraceae	False bonset	Native	Zone 4	Near base of south-facing prairie slope
Bromus inermis Leysser	Poaceae	Smooth brome	Alien	Zone 1	Ridge on Prairie
Bromus pubescens Muhl. ex Willd.	Poaceae	Canada brome	Native	Zone 4	Woodland

Cacalia muhlenbergii (Sch.-Bip.) Fern.	Asteraceae	Great Indian plantain	Native	Zone 4	Locally abundant near base of slope on West Woodland, occasional plants higher on slope
Calystegia sepium (L.) R. Br.	Convolvulaceae	Bindweed	Native	Zone 3	Along creek
Campanula americana L.	Campanulaceae	Tall bellflower	Native	Zone 4	Widespread in woodland
Campanula rotundifolia L.	Campanulaceae	Harebell	Native	N/A	Documented by Dr. Bohumil Shimek in 1982. Precise location is unknown, but most likely Rock Outcrop. Not observed during current survey
Capsella bursa-pastoris (L.) Medicus	Brassicaceae	Shepherd's purse	Alien	Zone 3	Along creek
Cardamine bulbosa (Schreber) BSP.	Brassicaceae	Spring cress	Native	Zone 3	Along creek
Cardamine pensylvanica Muhl. ex Willd.	Brassicaceae	Bitter cress	Native	N/A	USACE
Carex amphibola Steudel var. *turgida* Fern.	Cyperaceae	Eastern narrowleaf sedge	Native	Zone 4	West Woodland
Carex annectens	Cyperaceae	Yellowfruit sedge	Native	Zone 1	Ridge on Prairie
Carex blanda Dewey	Cyperaceae	Eastern woodland sedge	Native	Zone 4	West Woodland
Carex cephaloidea (Dewey) Dewey	Cyperaceae	Thinleaf sedge	Native	Zone 4	West Woodland
Carex cephalophora Willd.	Cyperaceae	Oval-leaf sedge	Native	Zone 4	Woodland
Carex cristatella Britton	Cyperaceae	Crested sedge	Native	Zone 1	One plant observed on prairie ridge
Carex davisii Schwein. & Torrey	Cyperaceae	Davis' sedge	Native	Zone 1, Zone 2	Abundant on prairie, old fields
Carex gracillima Schwein.	Cyperaceae	Graceful sedge	Native	Zone 4	Localized populations on crest of steep, north-facing limestone outcrop and in low, moist woodland
Carex granularis Muhl. ex Willd.	Cyperaceae	Limestone meadow sedge	Native	Zone 4	Base of wooded slopes bordering west side of creek
Carex gravida Bailey	Cyperaceae	Heavy sedge	Native	Zone 1, Zone 4	Prairie & woodland
Carex hirtifolia Mack.	Cyperaceae	Pubescent sedge	Native	Zone 4	Woodland
Carex jamesii Schwein	Cyperaceae	James' sedge	Native	Zone 4	Localized population at the base of slope on West Woodland
Carex normalis Mack.	Cyperaceae	Greater straw sedge	Native	Zone 4	Woodland

Carex pensylvanica Lam.	Cyperaceae	Pennsylvania sedge	Native	Zone 4	Ridge in Southeastern quarter of East Woodland
Carex rosea Schkuhr ex Willd.	Cyperaceae	Rosy sedge	Native	Zone 4	Woodland
Carex shortiana Dewey	Cyperaceae	Short's sedge	Native	Zone 2, Zone 4	Locally abundant in two areas along both branches of Turkey Creek
Carex sparganioides Muhl. ex Willd.	Cyperaceae	Burr reed sedge	Native	Zone 4	Rock Outcrop
Carex stipata Muhl. ex Willd.	Cyperaceae	Owlfruit sedge	Native	Zone 3	Along creek
Carex vesicaria L.	Cyperaceae	Blister sedge	Native	Zone 3	Along creek
Carex vulpinoidea Michx.	Cyperaceae	Fox sedge	Native	Zone 1	Low prairie
Carya cordiformis (Wang.) K. Koch	Juglandaceae	Bitternut hickory	Native	Zone 2	Old fields
*Carya ovat*a (P. Miller) K. Koch	Juglandaceae	Shagbark hickory	Native	Zone 2	Old fields
Caulophyllum thalictroides (L.) Michx.	Berberidaceae	Blue cohosh	Native	Zone 4	Scattered populations in woodland
Celastrus orbiculatus Thunb.	Celastraceae	Oriental bittersweet	Alien	Zone 4	One plant in woodland along east branch of Turkey Creek
Celastrus scandens L.	Celastraceae	Bittersweet	Native	Zone 4	Woodland
Celtis occidentalis L.	Ulmaceae	Hackberry	Native	Zone 4	Woodland
Cerastium nutans Raf.	Caryophyllaceae	Nodding chickweed	Native	Zone 3	Along creek
Cerastium semidecandrum L.	Caryophyllaceae	Five-stamen chickweed	Alien	Zone 1	Mowed path
Chaerophyllum procumbens (L.) Crantz	Apiaceae	Chervil	Native	Zone 3	Shaded areas along creek
Chamaecrista fasciculata (Michx.) Greene	Fabaceae	Partridge pea	Native	Zone 1	Prairie
Chenopodium standleyanum Aellen	Chenopodiaceae	Woodland goosefoot	Native	Zone 4	Woodland above Rock Outcrop
Cicuta maculata L.	Apiaceae	Water hemlock	Native	Zone 2, Zone 3, Zone 4	Localized populations on West Old Field, along Turkey Creek near north end, and on East Woodland
Cinna arundinacea L.	Poaceae	Wood reed	Native	Zone 3, Zone 4	Open low woods along creek, and woodland south of Rock Outcrop
Circaea lutetiana L. ssp. *canadensis* (L.) Ascherson & Magnus	Onagraceae	Enchanter's nightshade	Native	Zone 4	Woodland
Cirsium arvense (L.) Scop.	Asteraceae	Canada thistle	Alien	Zone 3	Localized population on open area on east side of creek
Cirsium discolor (Muhl. ex Willd) Sprengel	Asteraceae	Field thistle	Native	Zone 3	Creek bank

Claytonia virginica L.	Portulacaceae	Spring beauty	Native	Zone 4	Woodland
Comandra umbellata (L.) Nutt.	Santalaceae	Bastard toadflax	Native	Zone 4	Several plants in young open woodland above Rock Outcrop
Conium maculatum L.	Apiaceae	Poison hemlock	Alien	Zone 3	Localized population along creek
Corallorhiza odontorhiza (Willd.) Nutt.	Orchidaceae	Fall coralroot	Native	Zone 4	A few plants above south end of Rock Outcrop
Coreopsis tripteris (L.)	Asteraceae	Tall tickseed	Native	Zone 2	West Old Field
Cornus alternifolia L. f.	Cornaceae	Pagoda dogwood	Native	Zone 4	Scattered individuals in woodland
Cornus amomum P. Millller *ssp. obliqua* (Raf.) J. S. Wilson	Cornaceae	Silky dogwood	Native	Zone 4	Rock Outcrop and USACE
Cornus drummondii C. A. Meyer	Cornaceae	Rough-leaved dogwood	Native	Zone 4	Woodland
Cornus foemina P. Miller ssp. *racemosa* (Lam.) J. S. Wilson	Cornaceae	Gray dogwood	Native	Zone 4, Zone 2	Woodland, old fields
Corylus americana Walter	Betulaceae	Hazel	Native	Zone 2	Semi-wooded ravine on West Old Field
Crataegus sp.	Rosaceae	Hawthorn	Native	Zone 2	West Old Field
Cryptotaenia canadensis (L.) DC.	Apiaceae	Honewort	Native	Zone 4	Woodland
Cuscuta cuspidata Engelm.	Convolvulaceae	Dodder	Native	Zone 2	Northern East Old Field, along fence
Cystopteris bulbifera (L.) Bernh.	Aspleniaceae	Bulblet fern	Native	Zone 4	Abundant on Rock Outcrop
Cystopteris protrusa (Weath.) Blasdell	Aspleniaceae	Creeping fragile fern	Native	Zone 4	Southeastern quarter of East Woodland
Dactylis glomerata L.	Poaceae	Orchard grass	Alien	Zone 2	Old fields
Dentaria laciniata Muhl. ex Willd.	Brassicaceae	Toothwort	Native	N/A	USACE
Desmodium canadense (L.) DC.	Fabaceae	Canada tick-trefoil	Native	Zone 1	Ridge on Prairie
Desmodium nudiflorum (L.) DC.	Fabaceae	Bare-stemmed tick-trefoil	Native	N/A	About 3 plants on top of USACE outcrop
Desmodium sp.	Fabaceae	Tick trefoil	Native	Zone 2	Dry upland on East Old Fields
Dianthus armeria L.	Caryophyllaceae	Deptford pink	Alien	Zone 2	Dry upland on East and West Old Fields
Diarrehena americana Beauv. var. *obovata* Gl.	Poaceae	American beakgrass	Native	Zone 4	Two localized, widely-separated populations on southeastern quarter of East Woodland
Dicentra cucullaria (L.) Bernh.	Papaveraceae	Dutchman's breeches	Native	Zone 4	Woodland
Dichanthelium acuminatum (Sw.) Gould & Clark	Poaceae	Tapered rosette grass	Native	Zone 1	Prairie

Dichanthelium clandestinum (L.) Gould	Poaceae	Deertongue grass	Native	Zone 4	Locally abundant on south-facing slope near southern boundary of preserve
Dioscorea villosa L.	Dioscoreaceae	Wild yam	Native	Zone 4	Scattered throughout woodland
Dirca palustris L.	Thymelaeaceae	Leatherwood	Native	Zone 4	Abundant along crest of Rock Outcrop, with a few additional plants toward the base of the slope, as well as the ridgetop. Also abundant on adjacent USACE property.
Dodecatheon meadia L.	Primulaceae	Shooting star	Native	Zone 4	On Rock Outcrop along west margin of property, and abundant on contigous USACE property.
Dryopteris carthusiana (Vill.) H. P. Fuchs	Aspleniaceae	Spinulose wood fern	Native	Zone 2	East Old Fields
Echinocloa muricata (Beauv.) Fern.	Poaceae	Barnyard grass	Native	Zone 3	Along creek
Elaeagnus umbellata Thunb.	Elaeagnaceae	Autumn olive	Alien	Zone 2	Abundant on old fields.
Ellisia nyctelea L.	Hydrophyllaceae	Waterpod	Native	Zone 3	Shaded areas along creek
Elymus canadensis L.	Poaceae	Canada wild rye	Native	Zone 3, Zone 2	Along creek and west branch
Elymus villosus Muhl. ex Willd.	Poaceae	Slender wild rye	Native	Zone 4	East Woodland
Elymus virginicus L.	Poaceae	Virginia wild rye	Native	Zone 2	Along west branch of creek
Epilobium coloratum Biehler	Onagraceae	Cinnamon willowherb	Native	Zone 3	East branch of Turkey Creek
Equisetum arvense L.	Equisetaceae	Common horsetail	Native	Zone 3	Along creek
Eragrostis hypnoides (Lam.) BSP	Poaceae	Pony grass	Native	Zone 3	Muddy ground along creek
Erigeron annuus (L.) Pers.	Asteraceae	Fleabane	Native	Zone 3	Near entrance
Erigeron strigosus Muhl. ex Willd.	Asteraceae	Daisy fleabane	Native	Zone 1	Prairie
Eryngium yuccifolium Michx.	Apiaceae	Rattlesnake master	Native	Zone 1	Two plants on prairie, near base of south-facing slope
Erythronium albidum Nutt.	Liliaceae	Trout lily	Native	Zone 4	Woodland
Eupatorium perfoliatum L.	Asteraceae	Boneset	Native	Zone 3	Along creek
Eupatorium purpureum L.	Asteraceae	Purple Joe-pye-weed	Native	Zone 4	Woodland
Eupatorium rugosum Houtt.	Asteraceae	White snakeroot	Native	Zone 4	Woodland
Euphorbia corollata L.	Euphorbiaceae	Flowering spurge	Native	Zone 1	Ridge on Prairie

Festuca obtusa Biehler	Poaceae	Nodding fescue	Native	Zone 4	Woodland
Festuca pratensis Hudson	Poaceae	Meadow fescue	Alien	Zone 3	Disturbed ground along creek bank
Fragaria virginiana Duchesne	Rosaceae	Wild strawberry	Native	Zone 1, Zone 2	Prairie, old fields
Fraxinus nigra Marsh.	Oleaceae	Black ash	Native	Zone 3	Along creek and east branch, and on USACE outcrop
Fraxinus pennsylvanica Marsh var. *lanceolata* (Borkh.) Sarg.	Oleaceae	Green ash	Native	Zone 2	East Old Fields
Galearis spectabilis (L.) Raf.	Orchidaceae	Showy Orchid	Native	Zone 4	Two plants in dense thickets above Rock Outcrop
Galium aparine L.	Rubiaceae	Cleavers	Native	Zone 4	Woodland
Galium circaezans Michx.	Rubiaceae	Licorice bedstraw	Native	Zone 4	Open woodland near south end of Preserve
Galium concinnum T. & G.	Rubiaceae	Shining bedstraw	Native	Zone 4	Woodland
Galium triflorum Michx.	Rubiaceae	Sweet-scented bedstraw	Native	Zone 4	Woodland
Gentiana alba Muhl.	Gentianaceae	Pale gentian	Native	Zone 1, Zone 2	Abundant on prairie, scattered plants on old fields
Geranium maculatum L.	Geraniaceae	Wild geranium	Native	Zone 4	Woodland
Geum canadense Jacq.	Rosaceae	White avens	Native	Zone 4	Woodland
Geum vernum (Raf.) T. & G.	Rosaceae	Spring avens	Native	Zone 2	Locally abundant along southern margin of West Old Field
Glechoma hederacea L.	Lamiaceae	Ground ivy	Alien	Zone 3	Along creek bank and west branch
Gleditsia triacanthos L.	Fabaceae	Honey locust	Native	Zone 2	West Old Field, near western margin of property
Glyceria striata (Lam.) A. S. Hitchc.	Poaceae	Fowl manna grass	Native	Zone 3	Along creek, in woodland
Gnaphalium obtusifolium L.	Asteraceae	Everlasting	Native	Zone 2	East Old Fields
Gymnocarpium dryopteris (L.) Newman	Aspleniaceae	Oak fern	Native	N/A	Documented by Dr. William A. Anderson in 1931. Precise location is unknown, but most likely Rock Outcrop. Not observed during current survey
Hackelia virginiana (L.) I. M. Johnston	Boraginaceae	Stickseed	Native	Zone 4	Woodland
Helenium autumnale L.	Asteraceae	Sneezeweed	Native	Zone 3	Along creek bank
Helianthus grosseratus Martens	Asteraceae	Saw-tooth sunflower	Native	Zone 1	On prairie, at base of south-facing slope

Heliopsis helianthoides (L.) Sweet	Asteraceae	Ox-eye	Native	Zone 1	Prairie
Hepatica nobilis P. Miller var. *acuta* (Pursh) Steyerm.	Ranunculaceae	Hepatica	Native	Zone 4	Woodland, especially along Rock Outcrop
Hesperis matronalis L.	Brassicaceae	Dame's rocket	Alien	Zone 3	One plant along creek near N margin of property. A very heavy infestation of this species is present on adjacent private property.
Humulus lupulus L.	Moraceae	Hops	Native	Zone 3	Along creek
Hydrophyllum virginianum L.	Hydrophyllaceae	Virginia waterleaf	Native	Zone 4, Zone 3	Woodland, shaded areas along creek
Hypericum punctatum Lam.	Hypericaceae	Spotted St. John's wort	Native	Zone 1, Zone 2	Prairie & old fields
Hystrix patula Moench	Poaceae	Bottlebrush grass	Native	Zone 4	Woodland
Impatiens capensis Meerb.	Balsaminaceae	Spotted touch-me-not	Native	Zone 3	Along creek
Impatiens pallida Nutt.	Balsaminaceae	Pale touch-me-not	Native	Zone 3	Along creek
Juglans nigra L.	Juglandaceae	Black Walnut	Native	Zone 4	East Woodland
Juncus interior Wieg.	Juncaceae	Inland rush	Native	Zone 1	Along path
Juniperus virginiana L.	Cupressaceae	Eastern red cedar	Native	Zone 2	Old fields
Lactuca canadensis L.	Asteraceae	Wild lettuce	Native	Zone 1	Ridge on Prairie
Laportea canadensis (L.) Wedd.	Urticaceae	Wood nettle	Native	Zone 4	East Woodland
Leersia virginica Willd.	Poaceae	Whitegrass	Native	Zone 4, Zone 3	Woodland and along creek bank
Leonurus cardiaca L.	Lamiaceae	Motherwort	Alien	Zone 3	Along creek
Lepidium campestre (L.) R. Br.	Brassicaceae	Field cress	Alien	Zone 3	Along creek
Lespedeza capitata Michx.	Fabaceae	Round-headed bushclover	Native	Zone 1	One plant on prairie, near base of south-facing slope
Liatris sp.	Asteraceae	Blazing star	Native	Zone 1	One plant on prairie, on south-facing slope
Liparis liliifolia (L.) L. C. Rich. ex Lindley	Orchidaceae	Lily-leaved twayblade	Native	Zone 2	About 4 plants observed in thicket above south end of Rock Outcrop, 20+ plants on southern margin of West Old Field
Lobelia inflata L.	Campanulaceae	Indian tobacco	Native	Zone 2	Old fields, young successional woodland

Lobelia siphilitica L.	Campanulaceae	Great lobelia	Native	Zone 4	Thicket above outcrop
Lonicera maackii (Rupr.) Herder	Caprifoliaceae	Amur honeysuckle	Alien	Zone 3	Along driveway
Lonicera prolifera (Kirchner) Rehder	Caprifoliaceae	Wild honeysuckle	Native	Zone 4, Zone 2	Woodland, East Old Fields
Lonicera tartarica L.	Caprifoliaceae	Tartarian honeysuckle	Alien	Zone 4	Woodland
Lotus corniculatus L.	Fabaceae	Bird's-foot trefoil	Alien	Zone 1	Along path through prairie, and on East Old Fields
Lycopus virginicus L.	Lamiaceae	Virginia water horehound	Native	Zone 3	Along creek
Maclura pomifera (Raf. ex Sarg.) Schneider	Moraceae	Hedge apple	Native	Zone 3	Along creek
Menispermum canadense L.	Menispermaceae	Canada moonseed	Native	Zone 4	Woodland
Mentha arvensis L.	Lamiaceae	Wild mint	Native	Zone 3	Along creek
Mertensia virginica (L.) Pers. ex Link	Boraginaceae	Virginia bluebell	Native	Zone 4	Locally abundant on slope of West Woodland
Mimulus ringens L.	Scrophulariaceae	Monkey flower	Native	Zone 3	Along creek
Mitella diphylla L.	Saxifragaceae	Bishop's cap	Native	Zone 4	Rock Outcrop
Moehringia lateriflora (L.) Fenzl.	Caryophyllaceae	Sandwort	Native	Zone 4	At the crest of Rock Outcrop.
Monarda fistulosa L.	Lamiaceae	Wild bergamot	Native	Zone 1, Zone 2	Prairie, old fields
Morus alba L.	Moraceae	White mulberry	Alien	Zone 4	One plant on East Woodland along creek
Muhlenbergia bushii Pohl	Poaceae	Nodding muhly	Native	Zone 4	Woodland
Muhlenbergia frondosa (Poiret) Fern.	Poaceae	Wirestem muhly	Native	Zone 3	Along creek
Myosoton aquaticum (L.) Moench	Caryophyllaceae	Giant chickweed	Alien	Zone 3	Along creek
Oenothera villosa Thunb.	Onagraceae	Gray evening primrose	Native	Zone 1	One plant on prairie, on south-facing slope
Onoclea sensibilis L.	Aspleniaceae	Sensitive fern	Native	Zone 2	A few plants located along western margin of property, along semi-wooded ravine
Oryzopsis racemosa (Smith) Ricker	Poaceae	Black-seeded rice-grass	Native	N/A	About 10 plants located about half way up USACE outcrop
Osmorhiza claytonii (Michx.) C. B. Clarke	Apiaceae	Sweet cicely	Native	Zone 4	Woodland
Osmorhiza longistylis (Torrey) DC.	Apiaceae	Anise root	Native	Zone 4	Woodland

Ostrya virginiana (P. Miller) K. Koch	Betulaceae	Ironwood	Native	Zone 4	Woodland
Oxalis stricta L.	Oxalidaceae	Yellow wood sorrel	Native	Zone 4	Woodland
Panax quinquefolius L.	Araliaceae	Ginseng	Native	Zone 4	Seven+ plants on southeastern quarter of East Woodland
Panicum capillare L.	Poaceae	Witchgrass	Native	Zone 3	Along creek
Panicum virgatum L.	Poaceae	Switchgrass	Native	Zone 1	One plant on prairie
Parietaria pensylvanica Muhl. ex Willd.	Urticaceae	Pellitory	Native	Zone 4	On top of Rock Outcrop
Pastinaca sativa L.	Apiaceae	Wild parsnip	Alien	Zone 3	A few plants along creek bank
Penstemon digitalis Nutt.	Scrophulariaceae	Foxglove penstemon	Native	Zone 1	A few plants on south-facing prairie slope
Penthorum sedoides L.	Saxifragaceae	Ditch stonecrop	Native	Zone 3	Localized population along creek
Phalaris arundinacea L.	Poaceae	Reed canary grass	Native	Zone 3	Abundant along creek
Phleum pratense L.	Poaceae	Timothy	Alien	Zone 2	Dry upland on East Old Fields
Phlox divaricata L.	Polemoniaceae	Blue phlox	Native	Zone 4	Woodland
Phlox paniculata L.	Polemoniaceae	Garden phlox	Alien	Zone 3	Along creek bank near entrance
Phryma leptostachya L.	Phrymaceae	Lopseed	Native	Zone 4	Woodland
Physalis heterophylla Nees	Solanaceae	Ground cherry	Native	Zone 2	Old fields
Physalis virginiana P. Miller	Solanaceae	Ground cherry	Native	Zone 2	West Old Field
Pilea pumila (L.) Gray	Urticaceae	Clearweed	Native	Zone 3	Base of slopes along creek
Plantago rugelii Dcne.	Plantaginaceae	Common plantain	Native	Zone 1	Along path
Poa compressa L.	Poaceae	Canadian bluegrass	Alien	Zone 1	Prairie
Poa pratensis L.	Poaceae	Kentucky bluegrass	Alien	Zone 1	Prairie
Podophyllum peltatum L.	Berberidaceae	Mayapple	Native	Zone 4	East Woodland
Polemonium reptans L.	Polemoniaceae	Jacob's ladder	Native	Zone 4	Woodland
Polygonatum biflorum (Walter) Ell.	Liliaceae	Solomon's seal	Native	Zone 4	Woodland
Polygonum lapathifolium L.	Polygonaceae	Curlytop knotweed	Native	Zone 3	Creek bank
Polygonum pensylvanicum L. var. *leavigatum* Fern.	Polygonaceae	Pennsylvania smartweed	Native	Zone 3	Along creek
Polygonum persicaria L.	Polygonaceae	Lady's thumb	Native	Zone 3	Along creek
Polygonum punctatum Ell.	Polygonaceae	Water smartweed	Native	Zone 3	Creek bank

Polygonum sagittatum L.	Polygonaceae	Tearthumb	Native	Zone 3	Localized population along creek bank
Polygonum scandens L.	Polygonaceae	Climbing fase buckwheat	Native	Zone 2	Semi-wooded ravine on West Old Field
Polygonum virginianum L.	Polygonaceae	Jumpseed	Native	Zone 4	Woodland
Populus grandidentata Michx.	Salicaceae	Big-tooth aspen	Native	Zone 4	Two large, localized stands on East Woodland
Populus tremuloides Michx.	Salicaceae	Trembling aspen	Native	Zone 2	West Old Field
Potamogeton foliosus Raf.	Potamogetonaceae	Leafy pondweed	Native	Zone 3	Scattered plants growing in creek, especially near S end of property
Potentilla recta L.	Rosaceae	Sulphur cinquefoil	Alien	Zone 1, Zone 2	Scattered on prairie, old fields
Potentilla simplex Michx.	Rosaceae	Common cinquefoil	Native	Zone 1, Zone 2	Scattered plants in woodland and thickets
Prunella vulgaris L.	Lamiaceae	Self heal	Alien	Zone 2	East Old Fields
Prunus americana Marsh.	Rosaceae	Wild plum	Native	Zone 2	Old fields
Prunus serotina Ehrh.	Rosaceae	Black cherry	Native	Zone 4, Zone 2	Woodland, old fields
Prunus virginiana L.	Rosaceae	Choke cherry	Native	Zone 4	Woodland
Pycnanthemum pilosum Nutt.	Lamiaceae	Hairy mountain mint	Native	Zone 2	East Old Fields
Pycnanthemum virginianum (L.) Dur. & Jackson	Lamiaceae	Virginia mountain mint	Native	Zone 1	One plant on prairie, on south-facing slope
Quercus alba L.	Fagaceae	White oak	Native	Zone 4	Woodland
Quercus borealis Michx. var. *maxima* (Marsh.) Ashe	Fagaceae	Red oak	Native	Zone 4	East Woodland
Quercus macrocarpa Michx.	Fagaceae	Bur oak	Native	Zone 4	Woodland
Ranunculus abortivus L.	Ranunculaceae	Small-flowered crowfoot	Native	Zone 4	Woodland
Ranunculus septentrionalis Poiret	Ranunculaceae	Swamp buttercup	Native	Zone 4	Woodland
Ratibida pinnata (Vent.) Barnh.	Asteraceae	Gray-headed coneflower	Native	Zone 1, Zone 2	Prairie & old fields
Rhamnus cathartica L.	Rhamnaceae	Buckthorn	Alien	Zone 4	Woodland
Rhus glabra L.	Anacardiaceae	Smooth sumac	Native	Zone 2	Thickets

Ribes cynosbati L.	Saxifragaceae	Prickly gooseberry	Native	Zone 4	On top of Rock Outcrop
Ribes missouriense Nutt. ex T. & G.	Saxifragaceae	Gooseberry	Native	Zone 4	Woodland
Rorripa sessiliflora (Nutt.) A. S. Hitchc.	Brassicaceae	Yellow cress	Native	Zone 3	Along creek
Rosa multiflora Thunb. ex Murray	Rosaceae	Multiflora rose	Alien	Zone 4, Zone 2	Woodland, old fields
Rubus allegheniensis Porter ex Bailey	Rosaceae	Blackberry	Native	Zone 2	Old fields
Rubus occidentalis L.	Rosaceae	Black raspberry	Native	Zone 2	Old fields
Rudbeckia hirta L.	Asteraceae	Black-eyed susan	Native	Zone 4	Scattered plants on prairie, on south-facing slope
Rudbeckia laciniata L.	Asteraceae	Tall coneflower	Native	Zone 3	Along creek
Rudbeckia triloba L.	Asteraceae	Brown-eyed susan	Native	Zone 3, Zone 4	Open low woods along creek and woodland south of Rock Outcrop
Rumex altissimus Wood	Polygonaceae	Pale dock	Native	Zone 3	Along creek
Rumex crispus L.	Polygonaceae	Curly dock	Alien	Zone 3	Along creek
Sagittaria latifolia Willd.	Alismataceae	Arrowhead	Native	Zone 3	Scattered populations along southern 1/2 of creek
Salix nigra Marsh.	Salicaceae	Black willow	Native	Zone 3	Along creek near entrance
Sambucus canadensis L.	Caprifoliaceae	Elderberry	Native	Zone 3	Along creek
Sanguinaria canadensis L.	Papaveraceae	Bloodroot	Native	Zone 4	Woodland
Sanicula canadensis L.	Apiaceae	Black snakeroot	Native	Zone 4	Scattered plants in young successional woodland on ridgetop above outcrop, and in woodland along creek
Sanicula gregaria Bickn.	Apiaceae	Common snakeroot	Native	Zone 4	Woodland
Schizachyrium scoparium (Michx.) Nash	Poaceae	Little bluestem		Zone 1	Ridge on Prairie
Scirpus atrovirens Willd.	Cyperaceae	Dark green bulrush	Native	Zone 3	Along creek
Scirpus validus Vahl. var. *creber* Fern.	Cyperaceae	Soft-stemmed bulrush	Native	Zone 3	Localized population along creek
Scrophularia marilandica L.	Scrophulariaceae	Figwort	Native	Zone 4	Woodland
Scutellaria lateriflora L.	Lamiaceae	Mad-dog scullcap	Native	Zone 3	Along N end of creek, and on USACE
Scutellaria ovata Hill	Lamiaceae	Heartleaf scullcap	Native	Zone 4	Woodland

Senecio aureus L.	Asteraceae	Golden ragwort	Native	Zone 4	Locally abundant in woodland, especially on upland of West Woodland and near northern margin of East Woodland
Senecio plattensis Nutt.	Asteraceae	Prairie ragwort	Native	Zone 2	Old fields
Setaria glauca (L.) Beauv.	Poaceae	Yellow foxtail	Alien	Zone 3	Along creek
Setaria verticillata (L.) Beauv.	Poaceae	Bristly foxtail	Alien	Zone 3	Along eroded creek bank
Sicyos angulatus L.	Cucurbitaceae	Bur cucumber	Native	Zone 3	Several plants along creek
Silene nivea (Nutt.) Otth	Caryophyllaceae	Snow campion	Native	Zone 3	Moist lowland along creek
Silphium integrifolium Michx.	Asteraceae	Rosinweed	Native	Zone 1	Several plants on prairie, at base of south-facing slope
Silphium laciniatum L.	Asteraceae	Compass plant	Native	Zone 1	One plant near base of S-facing prairie slope
Silphium perfoliatum L.	Asteraceae	Cup plant	Native	Zone 1	Base of prairie slope
Sisymbrium loeselii L.	Brassicaceae	Tumble mustard	Alien	Zone 3	One plant on disturbed ground along creek bank
Sisyrinchium campestre Bickn.	Iridaceae	Blue-eyed grass	Native	Zone 2	East Old Fields
Smilacena racemosa (L.) Desf.	Liliaceae	False solomon's seal	Native	Zone 4	Woodland
Smilax ecirrhata (Engelm. ex Kunth) S. Watson	Liliaceae	Carrion flower	Native	Zone 3	Along driveway
Smilax herbacea L.	Liliaceae	Carrion flower	Native	N/A	USACE
Smilax hispida Muhl.	Liliaceae	Greenbriar	Native	Zone 4	Woodland
Solanum americanum P. Miller	Solanaceae	Black nightshade	Native	Zone 1	One plant in path
Solanum carolinense L.	Solanaceae	Horse nettle	Native	Zone 3, Zone 2	Along creek and on uplands
Solidago canadensis L.	Asteraceae	Tall goldenrod	Native	Zone 2	Along west branch of creek
Solidago flexicaulis L.	Asteraceae	Zig-zag goldenrod	Native	Zone 4	Rock Outcrop
Solidago rigida L.	Asteraceae	Stiff goldenrod	Native	Zone 4	Near base of south-facing prairie slope
Solidago ulmifolia Muhl. ex Willd.	Asteraceae	Elm-leaved goldenrod	Native	Zone 4	East Woodland
Sphenopholis obtusata (Michx.) Scribner var. *major* (Torrey) K. S. Erdman	Poaceae	Wedge grass	Native	Zone 4	Woodland
Spiranthes cernua (L.) L. C. Rich	Orchidaceae	Nodding ladies'-tresses	Native	Zone 2	One plant on southern East Old Field
Spirodela polyrhiza (L.) Schleidon	Lemnaceae	Greater duckweed	Native	Zone 3	Wet mud along creek

Stachys tenuifolia Willd. var. *hispida* (Pursh) Fern.	Lamiaceae	Hedge nettle	Native	Zone 3	Along creek bank
Staphylea trifolia L.	Staphyleaceae	Bladdernut	Native	Zone 4	Locally abundant on slope of West Woodland
Stellaria media (L.) Vill.	Caryophyllaceae	Common chickweed	Alien	Zone 3	Along creek
Teucrium canadense L. var. *virginicum* (L.) Eaton	Lamiaceae	American germander	Native	Zone 4, Zone 2	Woodland, old fields
Thalictrum dasycarpum Fischer & Ave-Lall.	Ranunculaceae	Purple meadow-rue	Native	Zone 3	Bottomland along north end of Rock Outcrop
Thalictrum thalictroides (L.) Eames & Boivin	Ranunculaceae	Rue anemone	Native	Zone 4	Woodland, especially on Rock Outcrop
Thaspium barbinode (Michx.) Nutt.	Apiaceae	Meadow parsnip	Native	Zone 2	Semi-wooded ravine on West Old Field
Thlaspi arvense L.	Brassicaceae	Penny cress	Alien	Zone 3	Along creek
Tilia americana L.	Tiliaceae	Basswood	Native	Zone 4	East and West Woodlands
Toxicodendron radicans P. Miller	Anacardiaceae	Poison ivy	Native	Zone 4, Zone 2, Zone 1	Woodland, old fields, prairie
Trifolium pratense L.	Fabaceae	Red clover	Alien	Zone 1	Mowed path
Trifolium repens L.	Fabaceae	White clover	Alien	Zone 1	Mowed path
Trillium flexipes Raf.	Liliaceae	Nodding trillium	Native	N/A	Private land due south of Preserve boundary. 20+ plants at the base of north-facing wooded slope.
Trillium nivale Riddell	Liliaceae	Snow trillium	Native	N/A	Documented on Rock Outcrop by Sorensen. Not observed during the current inventory, but probably still extant.
Triodanis perfoliata (L.) Nieuw.	Campanulaceae	Venus' looking-glass	Native	Zone 2	Old fields
Triosteum perfoliatum L.	Caprifoliaceae	Horse gentian	Native	Zone 4	Scattered plants in woodland south of Rock Outcrop, East Old Fields
Ulmus americana L.	Ulmaceae	American elm	Native	Zone 4	West Woodland
Ulmus rubra Muhl.	Ulmaceae	Slippery elm	Native	Zone 4	West Woodland
Urtica dioica L.	Urticaceae	Stining nettle	Native	Zone 3	Abundant long creek
Uvularia grandiflora Small	Liliaceae	Bellwort	Native	Zone 4	Rock Outcrop
Verbascum thapsus L.	Scrophulariaceae	Mullein	Alien	Zone 3	Along eroded creek bank

Verbena urticifolia L.	Verbenaceae	White vervain	Native	Zone 2	Semi-wooded ravine on West Old Field
Verbesina alternifolia (L.) Britton	Asteraceae	Wingstem	Native	Zone 3	Abundant on lowland along creek
Veronica peregrina L.	Scrophulariaceae	Neckweed	Native	Zone 3	Along creek
Veronicastrum virginicum (L.) Farw.	Scrophulariaceae	Culver's root	Native	Zone 4, Zone 2	At the crest of Rock Outcrop, also on old field
Viburnum lentago L.	Caprifoliaceae	Nannyberry	Native	Zone 2	Along west branch of creek
Viburnum opulus L.	Caprifoliaceae	High-bush cranberry	Alien	Zone 4	Woodland
Viburnum rafinesquianum Schultes	Caprifoliaceae	Downy arrowwood	Native	Zone 4	Near the crest of Rock Outcrop. Plants occur on both the preserve and USACE land, about 15 plants in all.
Viola pratincola Greene	Violaceae	Common blue violet	Native	Zone 4	Woodland
Viola pubescens Aiton	Violaceae	Downy yellow violet	Native	Zone 4	Woodland
Vitis riparia Michx.	Vitaceae	Wild grape	Native	Zone 3	Along creek
Zanthoxylum americanum P. Miller	Rutaceae	Prickly ash	Native	Zone 4	Margin of woodland
Zizia aurea (L.) Koch	Apiaceae	Golden alexanders	Native	Zone 1	Prairie

Appendix 2. Reconstructed Prairie Seed List, 1985, for the Johnson County Heritage Trust's Turkey Creek Preserve, Johnson County, Iowa

Appendix 3. Plants of the Turkey Creek Scientific Area, Johnson County, Iowa,

by Dr. Paul D. Sørensen