2005. Proceedings of the Indiana Academy of Science 114(1):26–32

A VASCULAR PLANT INVENTORY OF HOWELL WETLANDS, A NATURE PRESERVE WITHIN THE CITY OF EVANSVILLE, INDIANA

Jennifer Keller, **Edith Hardcastle** and **Scott A. Gordon**: 8600 University Boulevard, Department of Biology, University of Southern Indiana, Evansville, Indiana 47712 USA

ABSTRACT. Howell Wetlands is a 9.3 hectare park located in the city of Evansville, Indiana. The park includes an oxbow lake and a bottomland hardwood plant community that is at the northern-most edge of its distribution. This study describes an inventory of flowering plant species collected during the growing season of 2004, as well as a list of plants collected in previous years. A total of 129 species was documented in this study. GPS coordinates were collected for each plant during the growing season of 2004 in order to facilitate continuing restoration efforts and are included on the voucher specimens. Despite the presence of invasive plants like *Phragmites australis* and *Lonicera japonica*, Howell Wetlands contains three species that merit special concern: *Rubus enslenii* (state endangered), *Taxodium distichium* (state threatened), and *Passiflora incarnata* (state rare).

Keywords: Howell Wetlands, Indiana, flora, rare plants

Indiana once had 2.3 million hectares of wetlands. Today, only 15% of the original wetlands remains, the rest having been cleared for agriculture and urban development (Myers 1997). Indiana ranks 4th among the 50 states in the proportion of wetlands lost (Dahl 1990). Preservation of remaining wetland habitats is a top priority of state and federal agencies because they provide essential ecosystem services including flood control, water purification, and wildlife habitat (Myers 1997). The city of Evansville, Indiana, located in Vanderburgh County, is situated on the banks of the Ohio River and still contains many acres of wetland habitat.

Howell Wetlands, a 9.3 hectare wetland park was added to the City of Evansville Parks and Recreation Department in 1999 and is managed by Wesselman Nature Society. Howell Wetlands is one of only five urban wetland parks that exist in Indiana (City of Evansville 2005). This wetland community was much abused and various areas had been used as a dump before it became protected. Howell Wetlands now has walking trails and a park manager who provides educational programs and tours. The park has become a resource for the city of Evansville providing environmental education and habitat for a variety of wetland plants and animals (Fig. 1). In addition, it serves as a component of the "ecological internet" in that it is part of the greenspace in Evansville that provides corridors for plant and animal migration (Jackson 1997). Howell Wetlands now consists of an original core habitat that was left intact as well as a section of newly "restored" wetlands (Fig. 2).

In 1978 work began to clean up significant amounts of garbage, household sewage and oil from area homes and businesses. The Army Corps of Engineers contributed $485,000 to the project, which the City of Evansville matched. The original wetlands still in existence include an oxbow lake formed from the nearby Ohio River and associated bottomland hardwood forest. The reconstructed wetlands habitat was constructed on old farmland adjacent to the oxbow lake and consists of two lakes (created by the Army Corps of Engineers) as well as a wildflower meadow that was intended to display native Indiana prairie vegetation. Part of the intent of this study is to document plants in the original oxbow lake and bottomland hardwood forest section of the wetlands (Fig. 2). The list of plants and their precise locations compiled in this study will be used as a guide in the restoration of original vegetation in degraded areas of the park.

Conservation of any nature preserve is aid-

Figure 1.—Habitat of Howell Wetlands.

Figure 2.—Aerial photograph of Howell Wetlands. A = oxbow lake, B = original wetland community surrounding oxbow, C = "new" reclaimed wetlands.

ed by a comprehensive survey of biodiversity to provide baseline data on species present in order for managers to recognize decline of indigenous species as well as the spread of exotic invasive species. For the past 10 years, botany students from the University of Southern Indiana (USI) have inventoried the plant species of Howell Wetlands and deposited these specimens in the herbarium at USI. Until now, these collection records have only been maintained as an internal list, and no effort has been made to make them into a formal publication. The purpose of this study was to systematically sample, identify and publish vascular plant species at Howell Wetlands through the growing season of 2004. In addition, we wanted to make available the list of plants collected during previous surveys at this same site and vouchered in the USI herbarium (USIH).

METHODS

During the 2004 growing season, vascular plants were collected to document species in the original oxbow lake habitat of Howell Wetlands. Collections were made on a weekly basis beginning in April and ending in September. The specimens were pressed, identified, and mounted on herbarium paper. The primary reference books used for identification include Steyermark (1963), Deam (1940), Yatskievych (2000), and Radford et al. (1968). The current scientific name for each species was found using the USDA plants database. The voucher specimens are stored in the USIH. A GPS unit was used to document the specific location of each specimen collected. GPS coordinates were included on the voucher specimens in the USIH. The USDA plants database was used to determine which species were native or introduced and if they were threatened, rare, or endangered. A publication from the Indiana Native Plant and Wildflower Society was used to verify which exotic species were particularly invasive in Indiana.

RESULTS AND DISCUSSION

The herbaceous plants that were collected and identified from Howell Wetlands during the years 1995, 1997, and 2004 are listed in the appendix. The list includes 129 species representing 105 genera and 58 families. Species that were collected previously, for which multiple herbarium specimens were found, are indicated with an asterisk (*). Species collected and identified by James Sanders in 1995 are indicated with the initials "JS" in the herbarium number. Species collected and identified by Jeremy Meuth in 1997 are indicated with the initials "JM" in the herbarium number.

Howell Wetlands is a component of the Southern Bottomlands Natural Region (Homoya et al. 1985). This region is comprised of bottomland forest, swamps, ponds, and sloughs. These natural communities, while widespread in the southern United States,

reach their northern most range in southern Indiana, and as such, contain flora components more closely associated with the lower Mississippi Valley and Gulf Coastal Plain of the southern United States.

Significant species collected from this study that are threatened, rare, or endangered are *Taxodium distichum* L., (S2) threatened in Indiana; *Passiflora incarnata* L., (S1) rare in Indiana; and *Rubus flagellaris* Willd., (S1) endangered in Indiana. These three species, while rare in the state, still have a widespread distribution south of Indiana. Even so, species at the edges of their range merit conservation concern because populations of these species may be genetically distinct from populations in the center of their ranges and may therefore hold a unique component of genetic diversity (Lesica & Allendorf 1995). In addition, when a species undergoes decline, many times it occurs from the center of the range outwards leaving only edge populations as reservoirs to provide for recovery (Furlow 1995).

Invasive species in a natural area are always of concern, particularly if the area is located in an urban setting where adjacent properties provide many exotic species opportunity for invasion. Invasive species collected at Howell Wetlands include, *Cirsium arvense* L., *Lonicera japonica* Thunb., *Melilotus officinalis* L., *Glechoma hederacea* L., *Phragmites australis* Cav. Steud., *Lysimachia nummularia* L., and *Rosa multiflora* Thunb. The invasive species most abundant at Howell Wetlands were *Lonicera japonica* Thunb. and *Rosa multiflora* Thunb. The presence of exotic species is not surprising considering the history of disturbance at Howell Wetlands. However, there is still a diverse native flora present at Howell Wetlands despite the presence of these exotic invaders.

ACKNOWLEDGMENT

We would like to acknowledge and express our gratitude to Paul Bouseman, Botanical Curator at Mesker Park Zoo & Botanic Garden for including us in his conservation efforts. We would like to thank Tommy Donahue, Project Manager of Howell Wetlands for allowing us to do this study and for taking us by canoe to collect specimens located on an island. We would also like to extend our thanks to Eric Knox, Director of the Indiana University Herbarium for his time and assistance in identifying difficult species. We would like to acknowledge former USI students Jeremy Mueth and James Sanders, for their earlier research at Howell Wetlands.

APPENDIX

CATALOG OF VASCULAR PLANTS OF HOWELL WETLANDS

Vascular plants collected from 1995 to 2004 by Jennifer J. Keller, James Sanders, and Jeremy Meuth, and not previously published are listed here. Each species report contains the following information: (1) scientific name; (2) common name; (3) the designation of native or exotic; (4) a designation of rare, threatened, or endangered if appropriate; (5) date of flowering; and (6) the USIH herbarium number. A "JS" number indicates the specimen was collected by James Sanders in 1995. A "JM" number indicates the specimen was collected by Jeremy Meuth in 1997. All other herbarium numbers indicate a specimen collected in 2004 by Jennifer Keller. Species collected by Jennifer Keller that were previously collected by Sanders or Meuth have a herbarium number preceded by an asterisk (*). Species are listed following the taxonomic scheme in the USDA plants database.

DIVISION EQUISETOPHYTA

Equisetaceae (Horsetail Family)

Equisetum arvense L.: Field horsetail; native; April; M1.

DIVISION PTERIDOPHYTA

Aspleniaceae (Spleenwort Family)

Asplenium platyneuron (L.) B.S.P.: Ebony spleenwort; native; JS21.

DIVISION PINOPHYTA

Cupressaceae (Cypress Family)

Juniperus virginiana L.: Red cedar; native; JM15.

Taxodiaceae (Redwood Family)

Taxodium distichum (L.) L.C. Rich.: Bald cypress; native; threatened; T11.

DIVISION MAGNOLIOPHYTA

Aceraceae (Maple Family)

Acer negundo L.: Boxelder; native; JS1.
Acer saccharinum L.: Silver maple; native; JM1.
Acer saccharum Marsh.: Sugar maple; native; JS2.
Acer rubrum L.: Red maple; native; JM2.

Alismataceae (Water-plantain Family)

Sagittaria latifolia Willd.: Common arrowhead; native; marshy area; August; F56.

Anacardiaceae (Sumac Family)

Rhus copallinum L.: Shining sumac; native; JM12.
Rhus glabra L.: Smooth sumac; native; growing along bank; June; *T10.

Annonaceae (Custard-apple Family)

Asimina triloba (L.) Dunal: Pawpaw; native; JM7.

Apiaceae (Carrot Family)

Chaerophyllum procumbens (L.) Crantz: Wild chervil; native; April–May; F18.
Cicuta maculata L.: Water hemlock; native; JM13.
Daucus carota L.: Queen Anne's lace; introduced; May–June; F30.
Heracleum maximum Bartr.: Cow parsnip; native; April; location; F13.
Osmorhiza longistylis (Torr.) DC.: Anise root; native; April–May; F17.
Sanicula canadensis L.: Black snakeroot; native; May; F22.

Aquifoliaceae (Holly Family)

Ilex opaca Ait.: American holly; native; JS8.

Asclepiadaceae (Milkweed Family)

Asclepias incarnata L.: Swamp milkweed; native; marshy area; July; *F42.
Asclepias syriaca L.: Common milkweed; native; June; F32.

Asteraceae (Aster Family)

Ageratina altissima (L.) King & H.E. Robins.: White snakeroot; native; JM3.
Ambrosia artemisiifolia L.: Common ragweed; native; JM4.
Bidens connata Muhl. *ex* Willd.: Beggar ticks; native; September–October; growing in marshy area; F68.
Cirsium arvense (L.) Scop.: Canada thistle; introduced; invasive; JS9.
Erigeron annuus (L.) Pers.: Daisy fleabane; native; May; F25.
Erigeron pulchellus Michx.: Robin's plantain; native; April; F14.
Eupatorium perfoliatum L.: Thoroughwort; native; August; *F50.
Euthamia graminifolia (L.) Nutt.: Flat-topped goldenrod; native; August–September; *F58.
Lactuca floridana (L.) Gaertn.: Blue lettuce; native; August; sparse; F60.
Packera glabella (Poir) C. Jeffrey: Butterweed; native; April; F15.
Solidago canadensis L.: Tall goldenrod; native; September; F63.
Solidago nemoralis Ait.: Field goldenrod; native; JS10.
Sonchus asper (L.) Hill: Spiny-leaved sow; introduced; July; F37.
Symphyotrichum ericoides (L.) Nesom: Wreath aster; native; September; F65.
Symphyotrichum lateriflorum (L.) A. & D. Love: White woodland aster; native; August; F52.
Verbesina alternifolia (L.) Britt. *ex* Kearney: Yellow ironweed; native; August–September; F57.
Vernonia gigantea (Walt.) Trel.: Ironweed; native; August; growing in marshy area; *F55.
Xanthium strumarium L.: Cocklebur; native; JS12.

Balsaminaceae (Touch-me-not Family)

Impatiens capensis Meerb.: Spotted touch-me-not; native; May–June; *F31.

Berberidaceae (Barberry Family)

Berberis thunbergii DC.: Japanese barberry; introduced; JM8.
Podophyllum peltatum L.: Mayapple; native; JS18.

Betulaceae (Birch Family)

Carpinus caroliniana Walt.: American hornbeam; native; JM14.

Bignoniaceae (Trumpet-creeper Family)

Bignonia capreolata L.: Cross vine; native; JM6.
Campsis radicans (L.) Seem. *ex* Bureau: Trumpet vine; native; May–June; *M3.

Boraginaceae (Borage Family)

Myosotis macrosperma Engelm.: Largeseed forget-me-not; native; April; F12.

Brassicaceae (Mustard Family)

Cardamine hirsuta L.: Bittercress; introduced; April; F4.

Campanulaceae (Bellflower Family)

Lobelia cardinalis L.: Cardinal flower; native; August; growing near water; *F44.
Lobelia inflata L.: Indian tobacco; native; JM5.
Triodanis perfoliata (L.) Nieuwl.: Venus looking-glass; native; May; F26.

Caprifoliceae (Honeysuckle Family)

Lonicera japonica Thunb.: Japanese honeysuckle; introduced; invasive; May; very abundant; V5.
Lonicera sempervirens L.: Trumpet honeysuckle; native; April; V2.
Sambucus canadensis (L.) R. Bolli: Common elderberry; native; June; T8.

Caryophyllaceae (Pink Family)

Cerastium fontanum Baumg.: Common mouse-ear chickweed; introduced; April; F6.
Dianthus armeria L.: Deptford pink; introduced; May; *F27.
Stellaria pubera Michx.: Great chickweed; native; April–May; *F20.

Commelinaceae (Spiderwort Family)

Commelina communis L.: Dayflower; introduced; September; location; F62.

Tradescantia virginiana L.: Spiderwort; native; JM16.

Convolvulaceae (Morning-glory Family)

Ipomoea pandurata (L.) G.F.W. Mey.: Wild potato vine; native; July; V9.

Cornaceae (Dogwood Family)

Cornus florida L.: Dogwood; native; April; T1, T7.

Cyperaceae (Sedge Family)

Cyperus sp. L.: Sedge; native; September–October; growing in marshy area; F69.

Dioscoreaceae (Yam Family)

Dioscorea villosa L.: Wild yamroot; native; JM17.

Fabaceae (Pea Family)

Apios americana Medik.: Groundnut; native; August; F51.
Cercis canadensis L.: Redbud; native; April; T5.
Desmodium obtusum (Muhl. *ex* Willd.) DC.: Stiff ticktrefoil; native; August; F53.
Desmodium paniculatum (L.) DC.: White-flowered ticktrefoil; native; August; *F61.
Melilotus officinalis (L.) Lam.: Yellow sweet clover; introduced; invasive; May–June; F23, F28.
Senna marilandica (L.) Link: Wild senna; native; August; F46.
Strophostyles helvula (L.) Ell.: Trailing fuzzybean; native; August; V10.
Trifolium campestre Schreb.: Large hop clover; introduced; April–May; F19.

Fagaceae (Beech Family)

Quercus coccinea Muenchh.: Scarlet oak; native; JS6.
Quercus imbricaria Michx.: Shingle oak; native; JS5.
Quercus velutina Lam.: Black oak; native; JS3.
Quercus primus L.: Chestnut oak; native; JS4.

Fumariaceae (Fumitory Family)

Corydalis flavula (Raf.) DC.: Pale corydalis; native; April; F7.

Gentianaceae (Gentian Family)

Sabatia angularis (L.) Pursh: Rosepink; native; JS20.

Geraniaceae (Geranium Family)

Geranium carolinianum L.: Cranesbill; native; May; F29.

Hamamelidiaceae (Witch-hazel Family)

Liquidambar styraciflua L.: Sweet gum; native; JM10.

Iridaceae (Iris Family)

Sisyrinchium atlanticum Bickn.: Blue-eyed grass; native; April–May; F16.

Lamiaceae (Mint Family)

Glechoma hederacea L.: Ground ivy; introduced; invasive; April; F2.
Lamium purpureum L.: Dead nettle; introduced; April; F5.
Prunella vulgaris L.: Heal-all; native; July; growing in wooded area; *F39.
Scutellaria lateriflora L.: Mad-dog skullcap; native; August, growing in marshy area; F48.

Lauraceae (Laurel Family)

Sassafras albidum (Nutt.) Nees: Sassafras; native; April; *T4.

Lemnaceae (Duckweed Family)

Lemna minor L.: Lesser duckweed; native; F70.

Malvaceae (Mallow Family)

Hibiscus moscheutos L.: Rose mallow; native; June–July; *F38.

Menispermaceae (Moonseed Family)

Menispermum canadense L.: Common moonseed; native; JM9.

Oleaceae (Olive Family)

Fraxinus americana L.: White ash; native; JS23.

Onagraceae (Evening primrose Family)

Calylophus serrulatus (Nutt.) Raven: Yellow sundrops; native; August; F59.
Ludwigia alternifolia L.: Seedbox; native; JM20.
Ludwigia peploides (Kunth) Raven: Floating primrose willow; native; September; growing in marshy area; F64.

Oxalidaceae (Wood-sorrel Family)

Oxalis stricta L.: Common yellow oxalis; native; April–May; *F21.

Passifloraceae (Passionflower Family)

Passiflora incarnata L.: Purple passionflower; native; rare; June; *F34.
Passiflora lutea L.: Yellow passionflower; native; JM19.

Phytolaccaceae (Pokeweed Family)

Phytolacca americana L.: Pokeweed; native; July; F41.

Poaceae (Grass Family)

Dichanthelium clandestinum (L.) Gould: Deer-tongue; native; May; M2.
Hordeum jubatum L.: Foxtail; native; JS25.
Phragmites australis (Cav.) Trin. *ex* Steud.: Reed; native; invasive; JS22.

Polygonaceae (Buckwheat Family)

Polygonum hydropiperoides Michx.: Water pepper; native; JM11.

Polygonum pensylvanicum L.: Pinkweed; native; September; *F67.
Polygonum punctatum Ell.: Water smartweed; native; July; growing in marshy area; F43.
Polygonum scandens L.: Climbing buckwheat; native; September; *F66.

Portulacaceae (Purslane Family)

Claytonia virginica L.: Spring beauty; native; April; F1.

Primulaceae (Primrose Family)

Lysimachia nummularia L.: Moneywort; introduced; invasive; May; F24.

Ranunculaceae (Buttercup Family)

Clematis terniflora DC.: Autumn clematis; introduced; August; F54.
Ranunculus abortivus L.: Small-flowered crowfoot; native; April; *F8.

Rosaceae (Rose Family)

Agrimonia parviflora Ait.: Agrimony; native; August; *F49.
Amelanclier arborea (Michx. f.) Fern.: Shadbush; native; April; *V1.
Geum canadense Jacq.: White avens; native; JM22.
Geum virginianum L.: Cream-colored avens; native; June–July; F35.
Prunus sp. L.: Plum; April; T3.
Prunus americana Marsh.: Wild plum; native; April; T2.
Prunus virginiana L.: Chokecherry; native; April; T6.
Rosa multiflora Thunb. *ex* Murr.: Multiflora rose; introduced; invasive; May; abundant; *V7.
Rosa setigera Michx.: Prairie rose; native; May–June; V8.
Rubus allegheniensis Porter: Blackberry; native; JM21.
Rubus argutus Link: High-bush blackberry; native; May; V6.
Rubus flagellaris Willd.: Dewberry; native; endangered; April; V3.
Rubus occidentalis L.: Black raspberry; native; April–May; V4.

Rubiaceae (Madder Family)

Cephalanthus occidentalis L.: Buttonbush; native; July; *T9.
Diodia virginiana L.: Buttonweed; native; June; *F33.
Galium concinnum Torr. & Gray: Shining bedstraw; native; April; F11.

Salicaceae (Willow Family)

Populus deltoides Bartr. *ex* Marsh.: Eastern cottonwood; native; JS29.
Salix nigra Marsh.: Black willow; native; JS30.

Scrophulariaceae (Figwort Family)

Mimulus alatus Ait.: Monkey flower; native; August; F47.

Solanaceae (Potato Family)

Solanum carolinense L.: Horsenettle; native; June–July; *F36.

Smilacaceae (Catbrier Family)

Smilax glauca Walt.: Sawbrier; native; JM18.

Urticaceae (Nettle Family)

Boehmeria cylindrica (L.) Sw.: False nettle; native; July; *F40.

Verbenaceae (Verbena Family)

Phyla lanceolata (Michx.) Greene: Fogfruit; native; August; F45.

Violaceae (Violet Family)

Viola bicolor Pursh: Johnny-jump-up; native; April; F9.
Viola sororia Willd.: Common blue violet; native; April; *F3.

Vitaceae (Grape Family)

Parthenocissus quinquefolia (L.) Planch.: Virginia creeper; native; JS28.

LITERATURE CITED

City of Evansville Parks and Recreation Department. 2005. http://www.vanderburghgov.org/home/index.asp?page=578. Evansville, Indiana.

Dahl, T.E. 1990. Wetland losses in the United States, 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 13 pp.

Deam, C. 1940. Flora of Indiana. Dept. of Conserv., Wm. B. Burford Co. Indianapolis, Indiana. 1236 pp.

Furlow, F.B. 1995. Life in the margins: Emphasis on local species diversity has over-shadowed an important aspect of reserve design. The American Naturalist 124:255–279.

Homoya, M.A., D.B. Abrell, J.R. Aldrich & T.W. Post. 1985 The natural regions of Indiana. Proceedings of the Indiana Academy of Science 94: 245–268.

Indiana Wetlands Conservation Plan. 1996. Indiana Department of Natural Resources. Indianapolis, Indiana. 75 pp.

Jackson, M.T. 1997. The future of natural Indiana: Can we imagine it? Guide it? *In* The Natural Heritage of Indiana (M.T. Jackson, ed.). Indiana University Press. Bloomington, Indiana. 482 pp.

Lesica, P. & F.W. Alendorf. 1995. When are peripheral populations valuable for conservation? Conservation Biology 9:753–760.

Myers, E. 1997. An endangered natural resource: Wetlands. *In* The Natural Heritage of Indiana

(M.T. Jackson, ed.). Indiana University Press. Bloomington, Indiana. 482pp.

Radford, A.E., H.E. Ahles & C.R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. The University of North Carolina Press. Chapel Hill, North Carolina. 1183 pp.

Steyermark, J.A. 1963. Flora of Missouri. Iowa State University Press. Ames, Iowa. 1728 pp.

USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Louisiana. 70874-4490 USA.

Yatskievych, K. 2000. Field Guide to Indiana Wildflowers. Indiana University Press. Bloomington, Indiana. 357 pp.

Manuscript received 5 February 2005, revised 25 March 2005.