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ADDITIONS TO THE FLORA OF GINN WOODS, DELAWARE COUNTY, INDIANA

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ABSTRACT. Ginn Woods, a typical flatwoods of the Bluffton Till Plain Section of the Central Till Plain Natural Region, is a 65 ha tract of woodland owned by Ball State University. The woods lies in the northwest corner of Delaware County, Indiana. This paper documents 69 additional vascular taxa, representing 44 genera in 23 families, within Ginn Woods. Of the 69 species, 38 are recorded for the first time in Delaware County and nine are naturalized, non-native (exotic) species. The results of this study combined with the one conducted in 1997 provided the following information. Ginn Woods contains a total of 452 taxa of vascular plants representing 267 genera in 99 families. A total of 164 species were reported for the first time from Delaware County. Of the 436 angiosperms listed, 67, or approximately 15%, were non-native or exotic species. The flora of Ginn Woods is characteristic of a typical old-growth beech-maple forest in the American Midwest. The species documented at Ginn Woods were compared to the inventories of four other forests in east-central Indiana, e.g., Botany Glen, Grant County, Fogwell Forest Nature Preserve, Allen County, Mounds State Park, Madison County, and Wilbur Wright Fish and Wildlife Area, Henry County. This comparison indicated that Ginn Woods contained 17 species not found in these other forests. Among others, this list includes *Agastache scrophulariaefolia*, *Aristolochia serpentaria*, *Carya laciniosa*, *Hamamelis virginiana*, *Hybanthus concolor*, *Ilex verticillata*, *Lobelia cardinalis*, *Huperzia lucidula*, *Lycopus virginicus*, *Triosteum aurantiacum*, *Triphora trianthophora*, and *Ulmus thomasii*.

Keywords: County records—vascular plants, Delaware County flora, Indiana vascular plant records, flatwood forest

Ginn Woods is a 65 ha tract of woodland owned by Ball State University and managed by the Field Center and Environmental Education Center. The site is located approximately 25 km north of Muncie, Indiana (SW 1/4 Sec. 18, and NW 1/4, Sec. 19, T22N, R10E: Wheeling Quadrangle 7.5 Minute Series Topographic Map). Ginn Woods is a typical flatwoods of the Bluffton Till Plain Section of the Central Till Plain Natural Region, an area formerly covered by an extensive beech-maple forest (Homoya et al. 1985). The soils in Ginn Woods are derived from glacial parent material and vary from somewhat poorly to very poorly drained soils (Huffman 1972). The poor internal drainage of these soils, combined with the seasonally high water table less than 40 cm below the surface for most of the study area, results in ponding on the low-lying portions of the woods through early to mid-summer (McClain 1985).

The vegetation of Ginn Woods has been described previously. After analyzing the structure and composition of the woody vegetation of the woods, Badger et al. (1998) provided evidence that Ginn Woods was an old-growth forest and ranked as the second largest old-growth forest in Indiana. In addition to describing the vegetational communities, Ruch et al. (1998) published a list of the vascular flora of Ginn Woods. The flora consisted of 384 species of vascular plants, representing 244 genera and 94 families. Of the total number of species, 127 were Delaware County records and 58 were exotic, non-native species. Careful examination of the list of vascular plants from the study area reveals that, although the woody plants, vines, and forbs were adequately documented, records for members of the Poaceae, Cyperaceae, and Juncaceae are minimal. Only 13 grass species, 22 sedge species, 19 from the genus *Carex*, and one *Juncus* species were reported. Although this study was undertaken primarily to

augment our information concerning the occurrence and distribution of grasses, sedges, and rushes in Ginn Woods, other additions to the flora were recorded.

METHODS

The initial study by Ruch et al. (1998) was completed in 1997. From 1998–2001, periodic, non-systematic forays were made into the woods and plant species not reported previously were collected. During the growing season of 2002, biweekly forays were made to all areas of Ginn Woods. Notes on vegetation consisted of species lists with visual estimates of their abundance (see catalog of vascular plants). Voucher specimens for each new species were deposited in the Ball State University Herbarium (BSUH). Nomenclature of pteridophytes follows the *Flora of North America*, Volume 2 (Flora of North America Editorial Committee 1993). Except for the Cyperaceae and Poaceae, nomenclature of the Magnoliophyta follows Gleason & Cronquist (1991). The Cyperaceae and Poaceae follow the nomenclature of Swink & Wilhelm (1994). Species were deemed unreported for Delaware County if they did not appear in the computer database of Keller et al. (1984). (This is the same list of plants for Delaware County as the one at the Indiana Natural Heritage Data Center, IDNR.) Within the catalog of vascular flora, each species is followed by appropriate synonyms, common name(s) based primarily on Gleason & Cronquist (1991), a visual estimate of its relative abundance, its typical habitat in the study area, and the Ball State University herbarium (BSUH) number(s). In addition, all naturalized (exotic), non-native species are indicated, as are county records for Delaware County, Indiana. The relative abundance for species is defined as follows: rare = < 3 sites although species may be abundant at one site; infrequent = occasional, not widespread throughout its potential habitats and may be locally abundant at one or more site; frequent = common throughout its potential habitats and may be locally abundant at one or more sites; and abundant = common and numerous throughout it potential habitats.

RESULTS

This floristic survey of Ginn Woods yielded 69 additional species of vascular plants representing 44 genera in 23 families (see Appendix). Of the 69 additional species, 38 are recorded for the first time in Delaware County, and nine are naturalized, non-native (exotic) species. The list includes six species of ferns, 16 sedges (including 13 *Carex* spp.), three willows, and 24 grasses. The largest number of the additional species were collected in the Wesley Wet Area, in Farmer's Field, around Southern Pond, and in the mesic woods especially along the seasonal creeks (see Fig. 3 of Ruch et al. 1998). The one colony of *Huperzia lucidula* (Michx.) Trevis. [Syn. *Lycopodium lucidulum* Michx.] is still present but does not appear to be expanding.

DISCUSSION

Combining the species reported during this study with those reported earlier (Ruch et al. 1998) yielded the following information. Ginn Woods contained a total of 452 species and varieties of vascular plants representing 267 genera in 99 families. From both studies a total of 164 species was reported for the first time from Delaware County. Of the 436 angiosperms listed, 67, or approximately 15%, were non-native or exotic species. The six families with the highest number of species were the Asteraceae (52 species), Cyperaceae (38 species), Poaceae (37 species), Rosaceae (23 species), Lamiaceae (18 species), and the Liliaceae (13 species). Only one of the species reported from Ginn Woods, *Veronica anagallis-aquatica* L. [Syn. *Veronica catenata* Pennell] is noted on the 10 April 1996 list of endangered, threatened, and rare vascular plants maintained by Division of Nature Preserves, Indiana Department of Natural Resources (1996). It is listed as threatened in Indiana.

The vascular flora of Ginn Woods is characteristic of a typical old-growth beech-maple forest in the American Midwest. Levenson and Jackson (1980) sampled the ground layer of 21 old-growth beech-maple forests in Indiana, Michigan, and western Ohio and found a total of 174 species. Ginn Woods contains nearly 125 of these species, including 47 of the 50 most important species.

The species documented at Ginn Woods are comparable to inventories of other forests in east-central Indiana (Rothrock et al. 1993; Rothrock 1997; Ruch et al. 2002; Stonehouse et al. 2002). Table 1 compares total area, number of native species, number of exotic species, and number of ferns and their allies at

Table 1.—A comparison of five east-central Indiana natural areas with respect to size, number of native plants, number of exotic plants, and number of ferns and their allies. Area is in hectares. *Note*: the 15 species of ferns and allies collected at Wilbur Wright Fish and Wildlife Area include *Ophioglossum vulgatum* L. (BSUH 11548), which was collected after the publication of the inventory at that site (Ruch et al. 2002).

Site	Area (ha)	Native species	Exotic species	Number of ferns and allies
Botany Glen	18	301	69	13
Fogwell Forest Nature Preserve	11	213	30	11
Ginn Woods	61	385	67	16
Mounds State Park	105	388	67	7
Wilbur Wright Fish and Wildlife Area	416	472	133	15

the five study sites. In fact, at all sites the three families with the highest number of species (most being common to all sites) were the Asteraceae, Cyperaceae, and Poaceae. Although the order varied from site to site, the next three most abundant families were the Rosaceae, Lamiaceae, and the Liliaceae. Among these five study sites, 17 species were unique to Ginn Woods. These included the woodland species *Agastache scrophulariaefolia* (Willd.) Kuntze, *Aristolochia serpentaria* L., *Carya laciniosa* (Michx. f.) Loudon, *Hamamelis virginiana* L., *Hybanthus concolor* (T.F. Forst.) Spreng., *Ilex verticillata* (L.) A. Gray, *Lobelia cardinalis* L., *Huperzia lucidula* (Michx.) Trevis., *Triosteum aurantiacum* Bickn., *Triphora trianthophora* (Sw.) Rydb., *Ulmus thomasii* Sarg.; the wetland and aquatic species *Cephalanthus occidentalis* L., *Lycopus virginicus* L., *Nuphar advena* (Aiton) W.T. Aiton, *Spirodela polyrhiza* (L.) Schleid., and *Wolffia punctata* Griseb.; and an exotic species *Leonurus marrubiastrum* L., which occurred in the field.

Finally, we need to report some corrections concerning the original list of plants reported for Ginn Woods (Ruch et al. 1998). For four species, we did not report the variety occurring in Ginn Woods. The variety of American germander is *Teucrium canadense* var. *virginicum* (L.) Eaton, the variety of wild leek is *Allium tricoccum* Aiton var. *burdickii* Hanes, the variety of stinging nettle is *Urtica dioica* L. var. *procera* (Muhl.) Wedd., and the variety of common poison ivy is *Toxicodendron radicans* (L.) Kuntze var. *negundo* (Greene) Reveal. Additionally, we reported collecting blue buttons, *Knautia arvensis* (L.) Duby [Dipsacaceae]. This plant was misidentified and should be withdrawn form the flora of Ginn Woods. (Calculations of total flora, county records, and number of exotics reported in this paper are based on the removal of this species from the list.)

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APPENDIX
CATALOG OF THE ADDITIONAL VASCULAR PLANTS IN GINN WOODS
(arranged alphabetically by family)

Following each species is information specific to its occurrence in Ginn Woods. This information includes the following: The symbols in parentheses immediately following each species refer to the following: ★ = naturalized (exotic), non-native species; + = county record. BSUH numbers represent voucher specimens deposited in the Ball State University Herbarium.

Relative abundance: rare = < 3 sites although species may be abundant at one site; infrequent = occasional, not widespread throughout its potential habitats and may be locally abundant at one or more site; frequent = common throughout its potential habitats and may be locally abundant at one or more sites; and abundant = common and numerous throughout it potential habitats.

PHYLUM POLYPODIOPHYTA
(Ferns)

Aspleniaceae (Spleenwort Family)

Asplenium platyneuron (L.) Oakes; (+); Ebony Spleenwort; infrequent; mesic woods; BSUH 11447.

Dryopteridaceae (Wood Fern Family)

Athyrium filix-femina (L.) Roth. var. *angustum* (Willd.) Lawson; Northern Lady Fern; rare; mesic woods; BSUH 10600.

Deparia acrostichoides (Sw.) M. Kato; (+); Synonym: *Athyrium thelypterioides* (Michx.) Desv.; Silvery Glade Fern or Silvery Spleenwort; rare; mesic woods; BSUH 10597.

Ophioglossaceae (Adder's Tongue Family)

Botrychium dissectum Spreng. var. *dissectum*.; Lace-frond Grapefern or Dissected Grapefern; common; mesic woods; BSUH 11039.

Botrychium dissectum Spreng. var. *obliquum* (Muhl.) Clute; Lace-frond Grapefern; infrequent; mesic woods; BSUH 10356.

Thelypteridaceae (March Fern Family)

Phegopteris hexagonoptera (Michx.) Fee; Synonym: *Thelypteris hexagonoptera* (Michx.) Weatherly; Broad Beech or Southern Beech Fern; rare; mesic woods; BSUH 10583.

PHYLUM MAGNOLIOPHYTA
(Flowering Plants)

Amaranthaceae (Amaranth Family)

Amaranthus arenicola I.M. Johnst.; (+); Sandhill Amaranth; rare; dry upper rim of Pond in Farmer's Field; BSUH 10932.

Apiaceae (Carrot Family)

Sanicula trifoliata E.P. Bicknell; (+); Beaked Sanicle; common; mesic woods; BSUH 11041.

Aristolochiaceae (Birthwort Family)

Aristolochia serpentaria L.; (+); Virginia Snakeroot; rare; in ditch at edge of woods along Eaton-Wheeling Pike; BSUH 10461.

Caprifoliaceae (Honeysuckle Family)

Lonicera prolifera (Kirchn.) Booth *ex* Rehder; (+); Grape Honeysuckle; rare; mesic woods; BSUH 10510.

Viburnum lentago L.; Nannyberry; infrequent; mesic woods; BSUH 10591.

Caryophyllaceae (Pink Family)

Silene antirrhina L.; Sleepy Catchfly; common; Farmer's Field next to plowed area; BSUH 10607.

Celastraceae (Staff-tree Family)

Celastrus scandens L.; American Bittersweet; infrequent; edge of wood along Eaton-Wheeling Pike; BSUH 10508.

Cyperaceae (Sedge Family)

Carex conjuncta Boott; (+); Green-headed Fox Sedge; infrequent; Farmer's Field near pond; BSUH 10979.

Carex cristatella Britton; Crested Oval Sedge; infrequent (but locally common); north, moist end of Farmer's Field; BSUH 11020.

Carex frankii Kunth.; Bristly Cattail Sedge; abundant; north end of Farmer's Field; BSUH 11007.

Carex gracillima Schwein.; Purple-sheathed Graceful Sedge; frequent; South Woods; BSUH 10711.

Carex lacustris Willd.; Common Lake Sedge; abundant; pond in Farmer's Field; BSUH 11013.

Carex lurida Wahlenb.; Bottlebrush Sedge; abundant; pond in Farmer's Field; BSUH 11009.

Carex molesta Mack. *ex* Bright; Field Oval Sedge; abundant; Farmer's Field (especially the moist north end); BSUH 11011.

Carex muskingumensis Schwein.; (+); Swamp Oval Sedge; infrequent; vernal pools and woods; BSUH 10977, 11037.

Carex normalis Mack.; Spreading Oval Sedge; rare (one site); in ditch (roadside) along CR 300W; BSUH 10964.

Carex pellita Willd.; (+); Broad-leaved Woolly Sedge; infrequent; north end of Farmer's Field; BSUH 11004.

Carex shortiana Dewey; Short's Sedge; rare (one site); in ditch (roadside) along CR 300W; BSUH 10960.

Carex tribuloides Wahlenb.; Awl-fruited Oval Sedge; abundant; north end of Farmer's Field and in vernal pools in woods; BSUH 11018.

Carex vulpinoidea Michx.; Brown Fox Sedge; abundant; seasonal pond in Wesley Wet Area near CR 300W; BSUH 11000.

Eleocharis obtusa (Willd.) Schult.; Blunt Spike Rush; abundant; seasonal pond in Wesley Wet Area near CR 300W; BSUH 11022.

Scirpus pendulus Muhl.; (+); Red Bulrush; abundant; seasonal pond in Wesley Wet Area near CR 300W; BSUH 10677.

Scirpus validus Vahl; (+); Synonym: *Schoenoplectus tabernaemontani* (C.C. Gmel.) Palla; Great or Softstem Bulrush; abundant around the edge of pond in Farmer's Field; BSUH 10642.

Fagaceae (Beech Family)

Quercus shumardii Buckley; Shumard Oak; common (these were grouped with *Quercus rubra* in the original study); mesic woods; BSUH 10640.

Hamamelidaceae (Witch Hazel Family)

Hamamelis virginiana L.; (+); Witch Hazel; rare (one site with 3 plants); mesic woods (border of South and Nixon Woods); BSUH 10630.

Juncaceae (Rush Family)

Juncus tenuis Willd.; Path Rush; abundant; seasonal pond in Wesley Wet Area near CR 300W; BSUH 10972.

Lemnaceae (Duckweed Family)

Spirodela polyrhiza (L.) Schleid.; (+); Greater Duckweed; abundant; pond; BSUH 11379.

Wolffia punctata Griseb.; (+); Water-meal; [= *W. borealis* (Hegelm.) Landolt]; common; ponds, creeks, swampy area; BSUH 11378.

Oxalidaceae (Wood Sorrel Family)

Oxalis dillenii Jacq.; (+); Southern Yellow Wood Sorrel; infrequent; Wesley Wet Area and Farmer's Field; BSUH 10515.

Poaceae (Grass Family)

Alopecurus carolinianus Walter.; (+); Carolina or Annual Foxtail; infrequent; wet, muddy soil along southern border of Wesley Wet Area; BSUH 10900.

Brachyelytrum erectum (Schreb.) P. Beauv.; Long Awl Wood Grass; infrequent; mesic woods; BSUH 11386.

Bromus inermis Leyss.; (★, +); Smooth or Hungarian Brome; rare; east end of Wesley Wet Area; BSUH 10680.

Bromus pubescens Willd.; (+); Woodland Brome; infrequent; mesic woods; BSUH 10829.

Bromus racemosus L.; (★, +); Smooth Chess; rare; west end of Wesley Wet Area near seasonal pond; BSUH 10891.

Diarrhena americana P. Beauv. var. *americana*; (+); Beak Grass; rare; mesic woods; BSUH 10890.

Digitaria ischaemum (Schreb.) Muhl.; (★, +); Smooth Crabgrass; abundant; roadside; BSUH 10832.

Echinochloa muricata (P. Beauv.) Fernald var. *muricata*; (+); Barnyard Grass; rare (one site); bank of pond; BSUH 10834.

Eleusine indica (L.) Gaertn.; (★); Yardgrass, Goosegrass or Crowfoot Grass; infrequent; roadside along CR 300W; BSUH 10868.

Elymus villosus Willd.; (+); Silky or Downy Wild Rye; abundant; mesic woods; BSUH 10842.

Elymus virginicus L.; (+); Virginia Wild Rye; common; along seasonal creeks in woods; BSUH 11028.

Festuca rubra L.; (+); Red Fescue; rare (one site); dry, upper south bank of pond; BSUH 10957.

Glyceria striata (Lam.) Hitchc.; Fowl Mannagrass or Fowl Meadow Grass; abundant; mesic woods; BSUH 10699.

Hordeum jubatum L.; (+); Foxtail Barley or Squirrel-tail Grass; rare; Wesley Wet Area along CR 300W; BSUH 10851.

Leersia oryzoides (L.) Sw.; (+); Rice Cutgrass; abundant; moist north end of Farmer's Field, around pond, and in swampy area; BSUH 10859.

Leersia virginica Willd.; White Grass; common; mesic woods; BSUH 10911.

Muhlenbergia schreberi J.F. Gmel.; Nimblewill; common; roadside, especially along Eaton-Wheeling Pike; BSUH 10870.

Panicum dichotomiflorum Michx.; (+); Knee Grass; rare; southwest end of Wesley Wet Area near the season pond; BSUH 10847.

Panicum implicatum Britton; (+); Synonym: *Panicum lanuginosum* Elliott var. *implicatum* (Scribn.) Fernald; Old-field Panic Grass; Abundant; fields, especial Farmer's field; BSUH 10838.

Panicum philadelphicum Bernh. *ex* Trin.; (+); Philadelphia Panic Grass; rare; roadside along Eaton-Wheeling Pike; BSUH 10873.

Poa annua L.; (★, +); Speargrass or Annual Bluegrass; common; roadside; BSUH 11024.

Poa compressa L.; (★); Canada Bluegrass; infrequent; Farmer's field, especially around the pond; BSUH 10686.

Poa trivialis L.; (★, +); Rough Bluegrass; rare; roadside ditch along CR 300W; BSUH 10604.

Sphenopholis intermedia (Rydb.) Rydb.; Synonym: *Sphenopholis obtusata* var. *major* (Torr.) Erdman; Slender Wedge Grass; common; mesic woods; BSUH 10715.

Rosaceae (Rose Family)

Pyrus coronaria L.; Synonym: *Malus coronaria* (L.) Mill.; Sweet Crab; rare (two trees); edge of woods along Farmer's Field; BSUH 10921.

Rubus flagellaris Willd.; (+); Northern Dewberry; infrequent; fields; BSUH 10683.

Rubiaceae (Madder Family)

Galium mollugo L.; (★, +); White Bedstraw; rare; roadside along Eaton-Wheeling Pike; BSUH 10589.

Rutaceae (Rue Family)

Zanthoxylum americanum Mill.; Common Prickly Ash; open area in South Woods next to the Farmer's Field and north of the pond; BSUH 10626.

Salicaceae (Willow Family)

Salix amygdaloides Andersson; (+); Peach-leaf Willow; rare; swampy area; BSUH 10504.

Salix eriocephala Michx.; (+); Diamond Willow; rare; edge of woods along Farmer's Field near pond; BSUH 10930.

Salix exigua Nutt.; (+); Synonym: *Salix interior* Rowlee; Sandbar Willow; infrequent; Wesley Wet Area and near pond; BSUH 10953.

Scrophulariaceae (Figwort Family)

Gratiola neglecta Torr.; Clammy Hedge Hyssop; abundant; Farmer's Field and Wesley Wet Area along the plowed field; BSUH 10602.

Ulmaceae (Elm Family)

Ulmus pumila L.; (★, +); Siberian or Chinese Elm; rare; edge of woods; BSUH 10647.

Ulmus thomasii Sarg.; (+); Rock Elm; infrequent; West Vernal Pool; BSUH 11387.