The Vascular Flora of an Ozark Plateau Site, Ottawa County, Oklahoma

Bruce W. Hoagland[1,*] and Amy K. Buthod[2]

Abstract - This paper reports the results of an inventory of the vascular plants from an Ozark Plateau Site in Ottawa County, northeastern Oklahoma. A total of 318 taxa in 219 genera and 81 families were collected. The families with the greatest number of species were the Asteraceae (with 37 taxa), Poaceae (36), and Fabaceae (31). Ninety-one species were annuals, three were biennials, and 224 were perennials. Fifty-eight species of woody plants were present. Thirty-three non-native species, representing 10.4% of the flora, were collected. Three species tracked by the Oklahoma Natural Heritage Inventory were found.

Introduction

The Ozark Plateau of Oklahoma possesses habitats and floristic elements unique within the state and has long been the subject of study. Active collecting in the region began in 1909 when Robert Bebb, namesake of the University of Oklahoma Herbarium (OKL), collected a specimen of *Solanum rostratum* Dunal (Buffalobur). A comprehensive survey of the Ozark flora was later conducted by Charles S. Wallis. From 1940 to 1969, Wallis collected 14,048 specimens representing 1674 taxa (Hoagland et al. 2006). Wallis' work is summarized in several publications (Wallis 1953, 1957, 1959; Wallis and Waterfall 1953; Waterfall and Wallis 1962, 1963). Southern Ottawa County is located on the northwestern edge of the Oklahoma Ozarks. At present, 2744 specimens, representing 966 taxa, have been collected from the county (Hoagland et al. 2006). The first collections in Ottawa County were made by G.W. Stevens in August 1913. Over a four-day period, Stevens collected 478 specimens representing 290 taxa. There is a 16-year gap in collection activity in the county that ended when Elbert Little collected *Antennaria neglecta* Greene (Field Pussytoes), *Draba brachycarpa* Nutt. ex Torr. & A. Gray (Short-pod Whitlowgrass), *Sibara virginica* (L.) Rollins (Virginia Winged Rockcress), and *Stellaria media* (L.) Vill. (Common Chickweed) in 1929. Little returned to Ottawa County in 1986 and collected an additional 140 specimens, representing 56 taxa. Wallis collected 1565 specimens from Ottawa County, representing 627 taxa (Hoagland et al. 2006). The objective of this study was to conduct an intensive inventory of a specific locale to enhance our knowledge of the flora of the Ozark Plateau. Although much research has been conducted in the region, collections from

[1]Oklahoma Biological Survey and Department of Geography, University of Oklahoma, Norman, OK 73019. [2]Oklahoma Biological Survey, University of Oklahoma, Norman, OK 73019. [*]Corresponding author - bhoagland@ou.edu.

Ottawa County are dated, and contemporary information is required for research and conservation purposes.

Study Area

The study site (abbreviated as OTT) was located in Ottawa County (94.7155ºW–94.7327ºW, 36.6826ºN–36.6957ºN), OK (Fig. 1). The climate is Subtropical Humid (Trewartha 1968). Summers are warm (mean July temperature = 21.1 ºC) and humid, and winters are relatively short and mild (mean January temperature = 8.3 ºC). Mean annual precipitation is 114 cm (Oklahoma Climatological Survey 2006).

The study area is located on the Ozark Plateau (Hunt 1974), a region of deeply dissected terrain (Curtis and Ham 1979). Elevation ranges from 363 m to 227 m. The geology is predominantly Mississippian limestone and chert (Branson and Johnson 1979). The Boone Formation predominates the surface geology at OTT, with a limited extent of Quaternary alluvium along the small streams at the site. The Boone Formation is described by Reed et al. (1955) as Mississippian white chert atop light gray limestone of the same age. The limestone component is oolitic, sandy, shaly, and crystalline, and the chert is noticeably fossiliferous.

The Bodine soils series predominate at the site (Newland et al. 1964). This series is described as a stony silt loam soils, formed from cherty limestone, on nearly level to steep upland soils. The surface organic-mineral

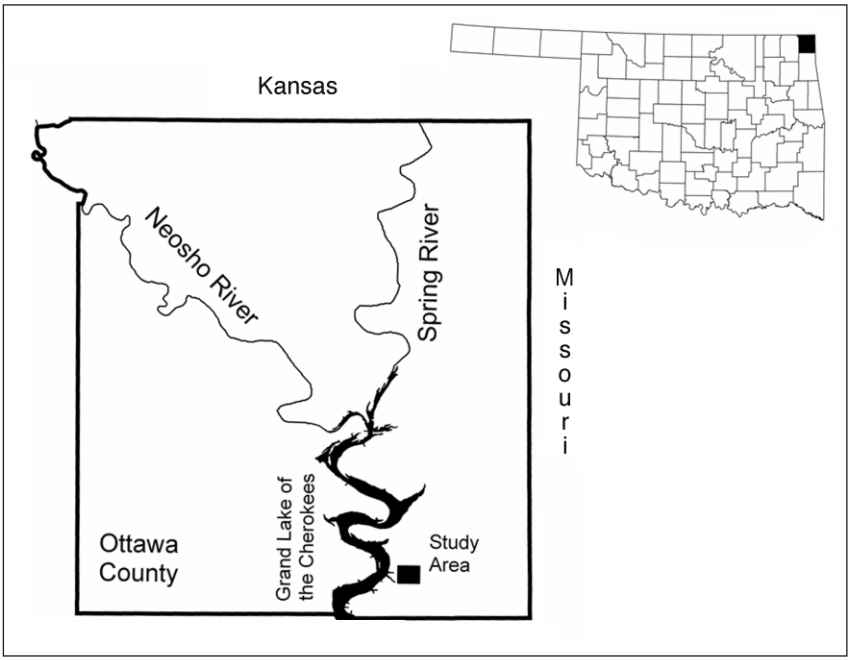

Figure 1. Location of the Ottawa County study site, Ozark Plateau, OK.

layer is thin, with scattered to complete coverage of chert, ranging in size from small pebles to stones 15 cm in diameter.

The site is located on the east-shore of Grand Lake of the Cherokees, an 18,817.88-h impoundment that spans three Oklahoma counties (Oklahoma Water Resources Board 1990). Two unnamed, second-order streams flow through OTT into Grand Lake of the Cherokees. Duck and Fletcher (1943) mapped the vegetation of the areas as oak-hickory forest, but *Pinus echinata* Mill. (Shortleaf Pine) is a co-dominant. These forests are predominantly second growth, although no data is available regarding past forest clearing and land-use practices. The OTT is a currently a youth recreational facility, with recreation-related disturbance limited to its central portion.

Methods

Five locations within the study area were visited during every field trip, and specimens were intensively collected. Sites were chosen to represent a range of habitat types (i.e., wetlands, dry forest, disturbed areas, etc.) in order to maximize the number of species encountered during a visit. Collections were also made randomly throughout the site. Collecting began in March 2003 and continued through September 2004. The predominant vegetation association at these sites was classified according to Hoagland (2000). Vouchers for non-native species were made from naturalized populations only, thus excluding cultivated and ornamental plants. Specimens were processed at the Robert Bebb Herbarium of the University of Oklahoma (OKL) following standard procedures. Manuals used for specimen identification included Waterfall (1973) and Yatsievych (1999). Origin, either native or introduced, was determined using USDA-NRCS (2006). Nomenclature follows the United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS 2006). Voucher specimens were deposited at the Robert Bebb Herbarium (OKL) at the University of Oklahoma. The final species list was compared with the rare plants species tracking list of the Oklahoma Natural Heritage Inventory and species conservation rank reported (ONHI 2006). Species are ranked by degree of imperilment at the state (S) and global (G) levels on a scale of 1–5; 1 represents a species that is imperiled and 5 indicates one that is secure (Groves et al. 1995).

Results and Discussion

The annotated list is based solely upon the voucher specimens collected during this study (Appendix 1). All species encountered were collected. The vast majority of specimens were collected when in flower or fruit, although some woody plant specimens were sterile. A total of 318 taxa of vascular plants in 81 families and 219 genera were collected (Table 1). There were two infraspecific taxa of *Brickellia eupatorioides* (L.) Shinners (False Boneset). Among the angiosperms, 58 were monocots and 250 were dicots. There were eight ferns and two gymnosperms. The Asteraceae (37), Poaceae (36),

and Fabaceae (31) had the greatest number of species. The genera *Quercus* and *Plantago* had the greatest number of species, with seven each. Ninety-one species were annuals, three were biennials, and 224 were perennials. Fifty-eight woody plant species were collected.

Thirty-nine species were collected that had not been previously reported from Ottawa County (Hoagland et al. 2006). Eight of these species were non-native to North America. *Cladrastis kentukea* (Dum. Cours.) Rudd (Yellowwood) is known from ten northeast Oklahoma counties, but had not been previously report from Ottawa County. It is tracked by the ONHI (2006) and has a conservation rank of G4 S2S3. Numerous saplings and small trees were scattered along a limestone bluff and adjacent chert slopes. The largest individual measured approximately 40 cm in diameter. *Dicentra cucullaria* (L.) Bernh. (Dutchman's Breeches) is another species tracked (G5 S1S2) by the ONHI that was not previously reported from Ottawa County. Numerous individuals were found growing on streambanks. *Galium arkansanum* A. Gray (Arkansas Bedstraw) is also tracked by the ONHI (G5 S1S2), but was previously reported from the county by Wallis (1959).

Thirty-three (10.4% of the flora) species from 15 families were non-native. The Fabaceae (9) and Poaceae (8) and the genus *Lespedeza* had the greatest number of non-native species. Floristic surveys from other areas of Oklahoma report that non-native species constitute 9–15% of the flora (Hoagland and Johnson 2001, 2004a, 2004b, 2005; Hoagland and Buthod 2003, 2004, 2005a, 2005b; Hoagland and Wallick 2003, Hoagland et al. 2004, 2004b., with the exception of two sites in McCurtain County, where 6.6% of the flora consisted of non-native species (Hoagland and Johnson 2004c).

Plant specimens were collected from five vegetation associations, but the majority of the site was forested. A brief description of each vegetation association follows:

1. *Pinus echinata* - *Quercus stellata* Wangenh. (Post Oak) - *Quercus marilandica* Münchh. (Blackjack Oak) forest association

This association was the predominant upland forest type, occurring on xeric, cherty slopes. *Pinus echinata* maybe absent in some stands, in which case *Quercus velutina* Lam. (Black Oak) was a co-dominant. Canopy cover was closed for the most part, but small patches of open woodland did exist. Associated species included *Antennaria parlinii* Fern. (Parlin's Pussytoes),

Table 1. Summary of floristic collections from an Ozark Plateau site, Ottawa County, OK. Format follows Palmer et al. (1995).

Taxonomic group	Species	Native	Non-native
Pteridophyta	8	8	0
Coniferophyta	2	2	0
Magnoliophyta	308	275	33
Magnoliopsdia	250	225	25
Liliopsida	58	50	8
Total	318	285	33

Carya texana Buckley (Black Hickory), *Clitoria mariana* L. (Butterfly Pea), *Helianthus hirsutus* Raf. (Hairy Sunflower), *Hypericum hypericoides* (L.) Crantz (St. Andrew's Cross), *Juniperus virginiana* L. (Eastern Redcedar), *Quercus velutina*, *Tephrosia virginiana* (L.) Pers. (Virginia Tephrosia), *Vaccinium arboreum* Marsh. (Farkleberry), and *V. pallidum* Aiton (Blueberry).

2. *Acer saccharum* Marsh. (Sugar Maple) - *Quercus alba* L. (White Oak) forest association

This forest association is best represented along the margins of the two streams draining the site and on north-facing slopes. *Pinus echinata* and other xeric tree species were often canopy components, but not dominants. *Quercus rubra* L. (Northern Red Oak) and *Nyssa sylvatica* Marsh. (Blackgum) were locally abundant. Associated species included *Agrimonia pubescens* Wallr. (Soft Agrimony), *Aquilegia canadensis* L. (Red Columbine), *Asclepias quadrifolia* Jacq. (Fourleaf Milkweed), *Carya cordiformis* (Wangenh.) K. Koch (Bitternut Hickory), *Delphinium tricorne* Michx. (Dwarf Larkspur), *Desmodium glutinosum* (Muhl. ex Willd.) Alph. Wood (Pointedleaf Ticktrefoil), *Frangula caroliniana* (Walter) A. Gray (Carolina Buckthorn), *Fraxinus americana* L. (White Ash), *Galium aparine* L. (Sticky Willy), *Geranium maculatum* L. (Spotted Geranium), *Geum canadense* Jacq. (White Avens), *Hydrangea arborescens* L. (Wild Hydrangea), *Morus rubra* L. (Red Mulberry), *Ostrya virginiana* (Mill.) K. Koch (Hophornbeam), *Phlox pilosa* L. (Downy Phlox), *Polygonatum biflorum* (Walter) Elliot (Smooth Solomon's Seal), *Polystichum acrostichoides* (Michx.) Schott (Christmas Fern), and *Zizia aurea* (L.) W.D.J. Koch (Golden Alexander). The three species tracked by ONHI (*Cladrastis kentukea, Dicentra cucullaria*, and *Galium arkansanum)* occurred in this habitat.

3. *Bouteloua curtipendula* (Michx.) Torr. (Sideoats Grama) herbaceous association

This vegetation type occurred as small openings at the crest of southwest facing slopes. Soils were typically shallow and cobbly. Occurrences were usually less than 500 m^2 in area. Patches were typically surrounded by *Juniperus virginiana, Pinus echinata,* and *Quercus stellata*. Associated species included *Andropogon gerardii* Vitman (Big Bluestem), *Asclepias tuberosa* L. (Butterfly Milkweed), *A. verticillata* L. (Whorled Milkweed), *Dalea purpurea* Vent. (purple prairie clover), *Dodecatheon meadia* L. (Shooting Star), *Plantago virginica* L. (Virginia Plantain), *Scutellaria ovata* Hill (Heartleaf Skullcap), *Sedum pulchellum* Michx. (Widowscross), *Tragia betonicifolia* Nutt. (BetonyLeaf Noseburn), and *Vulpia octoflora* (Walter) Rydb. (Sixweeks Fescue).

4. Wetland vegetation

Wetland vegetation was restricted to the banks of two coves where the streams draining the site entered Grand Lake of the Cherokees. The

vegetation was poorly developed due to heavy shade from adjacent upland forest and the fluctuation in water level of the lake. *Amorpha fruticosa* L. (False Indigo), *Cephalanthus occidentalis* L. (Buttonbush), *Rorippa palustris* (L.) Besser (Bog Yellowcress), *Scutellaria lateriflora* L. (Blue Skullcap), and *Spermacoce glabra* Michx. (Smooth False Buttonweed) were common associates.

5. Disturbed areas and old-field vegetation

Disturbed areas were designated as mowed lawns, camp sites, roadsides, and other areas exhibiting signs of physical disruption. Common plants in disturbed areas included *Digitaria sanguinalis* (L.) Scop. (Hairy Crabgrass), *Lespedeza cuneata* (Dum. Cours.) G. Don (Sericea Lespedeza), *Kummerowia stipulacea* (Maxim.) Makino (Korean Clover), *Mollugo verticillata* L. (Carpetweed), *Rhus glabra* L. (Smooth Sumac), and *Trifolium campestre* Schreb. (Field Clover). Old-fields were characterized by *Ambrosia artemisiifolia* L. (Annual Ragweed), *A. trifida* L. (Great Ragweed), *Amaranthus rudis* (Moq.) Sauer (Roughfruit Amaranth), *Andropogon virginicus* L. (Broomsedge Bluestem), *Conyza canadensis* (L.) Cronquist (Canadian Horseweed), and *Sorghum halepense* (L.) Pers. (Johnsongrass).

Acknowledgments

We thank Christy Batterson, Kim Shannon, and Lacy Isom for field assistance.

Literature Cited

Branson, C.C., and K.S. Johnson. 1979. Generalized geologic map of Oklahoma. P. 4, *In* K.S. Johnson, C.C. Branson, N.M. Curtis, W.E. Ham, W.E. Harrison, M.V. Marcher, and J.F. Roberts (Eds.). Geology and Earth Resources of Oklahoma. Oklahoma Geological Survey, Norman, OK.

Curtis, N.M., and W.E. Ham. 1979. Geomorphic provinces of Oklahoma. P. 3, *In* K.S. Johnson, C.C. Branson, N.M. Curtis, W.E. Ham, W.E. Harrison, M.V. Marcher, and J.F. Roberts (Eds.). Geology and Earth Resources of Oklahoma. Oklahoma Geological Survey, Norman, OK.

Duck, L.G., and J.B. Fletcher. 1943. A game type map of Oklahoma. *In* A Survey of the Game and Furbearing Animals of Oklahoma. Oklahoma Department of Wildlife Conservation, Oklahoma City, OK.

Groves, C.R., M.L. Klein, and T.F. Breden. 1995. Natural Heritage Programs: Public-private partnerships for biodiversity conservation. Wildlife Society Bulletin 23:784–790.

Hoagland, B.W. 2000. The vegetation of Oklahoma: A classification of landscape mapping and conservation planning. Southwestern Naturalist 45:385–420.

Hoagland, B.W., and A.K. Buthod. 2003. Vascular flora of the Keystone Wildlife Management Area, Creek, Pawnee, and Osage Counties, Oklahoma. Oklahoma Native Plant Record 3:23–37.

Hoagland, B.W., and A.K. Buthod. 2004. Vascular flora of Hugo Lake Wildlife Management Area, Choctaw County, Oklahoma. Southeastern Naturalist 3:701–714.

Hoagland, B.W., and A.K. Buthod. 2005a. Vascular flora of a gypsum-dominated site in Major County, Oklahoma. Proceedings of the Oklahoma Academy of Science 85:1–8.

Hoagland, B.W., and A.K. Buthod. 2005b. Vascular flora of a site along the Arkansas River, Pawnee County, Oklahoma. Oklahoma Native Plant Record 5:61–72.
Hoagland, B.W., and F.L. Johnson. 2001. Vascular flora of the Chickasaw National Recreation Area, Murray County, Oklahoma. Castanea 66:383–400.
Hoagland, B.W., and F.L. Johnson. 2004a. Vascular flora of Chouteau Wildlife Management Area, Wagoner County, Oklahoma. Oklahoma Native Plant Record 4: 30–39.
Hoagland, B.W., and F.L. Johnson. 2004b. Vascular flora of Love Valley Wildlife Management Area, Love County, Oklahoma. Proceedings of the Oklahoma Academy of Science 83:47–62.
Hoagland, B.W., and F.L. Johnson. 2004c. Vascular flora of Red Slough and Grassy Slough Wildlife Management Areas, Gulf Coastal Plain, McCurtain County, Oklahoma. Castanea 69:284–296.
Hoagland, B.W., and F.L. Johnson. 2005. Vascular flora of the Deep Fork River in Okmulgee, Creek, and Okfuskee Counties. Publications of the Oklahoma Biological Survey 6:15–29.
Hoagland, B.W., and K. Wallick. 2003. Vascular flora of Oologah Wildlife Management Area in Nowata County, Oklahoma. Proceedings of the Oklahoma Academy of Science 83:47–62.
Hoagland, B.W., A.K. Buthod, and W.J. Elisens W. 2004a. Vascular flora of Washita Battlefield National Historic Site, Roger Mills County, Oklahoma. Sida 21: 1187–1197.
Hoagland, B.W., P. Callahan-Crawford, P. Crawford, and Johnson F.L. 2004b. Vascular flora of Hackberry Flat, Frederick Lake, and Suttle Creek, Tillman County, Oklahoma. Sida 21:429–445.
Hoagland, B.W., A.K. Buthod, I. Butler, P. Crawford, W.J. Elisens, and R. Tyrl. 2006. Oklahoma Vascular Plants Database. Available online at www.biosurvey.ou.edu. Accessed 1 October 2006.
Hunt, C.B. 1974. Natural Regions of the United States and Canada. W.H. Freeman, San Francisco, CA.
Oklahoma Climatological Survey. 2006. Oklahoma climatological data. Available online at www.ocs.ou.edu. Accessed 1 October 2006.
Oklahoma Natural Heritage Inventory (ONHI). 2006. Oklahoma Natural Heritage Inventory working list of rare Oklahoma plants. Available online at www.biosurvey.ou.edu/publicat.html. Accessed 1 October 2006.
Oklahoma Water Resources Board. 1990. Oklahoma Water Atlas. Oklahoma Water Resources Publication 135. Oklahoma City, OK.
Newland, C.T., J.A. Icenhower, and J.B. Cox. 1964. Soil survey of Ottawa County, Oklahoma. United States Department of Agriculture, Washington, DC.
Palmer, M.W., G.L. Wade, and P. Neal. 1995. Standards for the writing of floras. Bioscience 45:339–345.
Reed, E.W., S.L. Schoff, and C.C. Branson. 1955. Ground-water resources of Ottawa County, Oklahoma. Oklahoma Geological Survey, Norman, OK.
Trewartha, G.T. 1968. An Introduction to Climate. McGraw-Hill, New York, NY.
USDA-NRCS 2006. The PLANTS database. Available online at plants.usda.gov. Accessed 1 October 2006. National Plant Data Center, Baton Rouge, LA.
Wallis, C.S. 1953. The Spermophyta of Cherokee County, Oklahoma (exclusive of the Poaceae, Cyperaceae, and Juncaceae). M.Sc. Thesis. Oklahoma A&M College, Stillwater. OK

Wallis, C.S. 1957. Additions to the Oklahoma flora from the Oklahoma Ozarks. Proceedings of the Oklahoma Academy of Science 38:3–5.
Wallis, C.S. 1959. Vascular plants of the Oklahoma Ozarks. Ph.D. Dissertation. Oklahoma State University, Stillwater, OK.
Wallis, C.S., and U.T. Waterfall. 1953. Additions to the Oklahoma flora from Cherokee County. Proceedings of the Oklahoma Academy of Science 34:124–125.
Waterfall, U.T. 1973. Keys to the Flora of Oklahoma. Published by the author, Stillwater, OK.
Waterfall, U.T., and C.S. Wallis. 1962. Some geographic relationships of the vascular flora of the Oklahoma Ozarks: Studies in the composition and distribution of the Oklahoma flora. Proceeding of the Oklahoma Academy of Science 43:61–63.
Waterfall, U.T., and C.S. Wallis. 1963. A list of the vascular flora of the Oklahoma Ozarks. Proceeding of the Oklahoma Academy of Science 44:11–22.
Yatsievych, G. 1999. Steyermark's Flora of Missouri, Vol. 1, Revised Edition. Missouri Department of Conservation in cooperation with the Missouri Botanical Garden Press, St. Louis, MO.

Appendix 1. Annotated species list for a site in the Ozark Plateau, Ottawa County, OK. The first entry is the collection number, followed by life history (A = annual, B = biennial, P = perennial), and habitat (ASCA = *Acer saccharum* - *Quercus alba* - *Carya alba* forest association, BCHA = *Bouteloua curtipendula* herbaceous association, PEQM = *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* forest association, WETL = herbaceous wetlands, DAOF = Disturbed areas and old-field vegetation). Non-native species are denoted with a double-dagger (‡), those tracked by the Oklahoma Natural Heritage Inventory with a dagger (†), and species previously unreported from Ottawa County with an asterisk (*). Voucher specimens were deposited at the Robert Bebb Herbarium at the University of Oklahoma (OKL).

PTERIDOPHYTA

ASPLENIACEAE

Asplenium platyneuron (L.) B.S.P.: #6680; P; ASCA.

DRYOPTERIDACEAE

Cystopteris tennesseensis Shaver: #7145; P; ASCA.

Polystichum acrostichoides (Michx.) Schott: #3613; P; ASCA.

Woodsia obtusa (Spreng.) Torr.: #3836; P; ASCA.

OPHIOGLOSSACEAE

Botrychium virginianum (L.) Sw.: #3634; P; ASCA.

PTERIDACEAE

**Adiantum pedatum* L.: #3630; P; ASCA.

Pellaea atropurpurea (L.) Link: #3837; P; ASCA.

THELYPTERIDACEAE

Phegopteris hexagonoptera (Michx.) Fée: #4425; P; ASCA.

CONIFEROPHYTA

CUPRESSACEAE

Juniperus virginiana L.: #4119; P; BCHA, DAOF, PEQM.

PINACEAE

**Pinus echinata* P. Mill.: #3622; P; BCHA, ASCA; PEQM.

MAGNOLIOPHYTA

MAGNOLIOPSIDA

ACANTHACEAE

Ruellia humilis Nutt.: #4079; P; BCHA, DAOF.

ACERACEAE

Acer negundo L.: #6675; P; WETL.

**A. rubrum* L.: #4101; P; ASCA.

A. saccharum Marsh.: #3644; P; ASCA.

AMARANTHACEAE

‡*Amaranthus rudis* Sauer: #6729; A; DAOF.

ANACARDIACEAE

Rhus aromatica Ait.: #3619; P; PEQM.

R. glabra L.: #4135; P; DAOF.

Toxicodendron radicans (L.) Kuntze: #6451a; P; DAOF.

APIACEAE

**Ammoselinum butleri* (Engelm. ex S. Wats.) Coult. & Rose: #6342; A; DAOF.

Chaerophyllum tainturieri Hook.: #4478; A; DAOF.

Cryptotaenia canadensis (L.) DC.: #4093; P; ASCA.

Sanicula canadensis L.: #4100l; P; ASCA.

Taenidia integerrima (L.) Drude: #6446a; P; ASCA.

**‡Torilis arvensis* (Huds.) Link: #4064; A; DAOF.

Zizia aurea (L.) W.D.J. Koch: #3629; P; ASCA.

ARISTOLOCHIACEAE

Asarum canadense L.: #4349; P; ASCA.

ASCLEPIADACEAE

Asclepias quadrifolia Jacq.: #6457a; P; ASCA.

A. tuberosa L.: #4078; P; BCHA.

A. verticillata L.: #6707; P; BCHA.

Matelea gonocarpos (Walt.) Shinners: #6682; P; ASCA.

ASTERACEAE

Ageratina altissima (L.) King & H.E. Robins.: #6689; P; ASCA.

Ambrosia artemisifolia L.: #4269; A; DAOF.

A. trifida L.: #4288; A; DAOF.

**Antennaria parlinii* Fern.: #4486; P; PEQM.

Bidens bipinnata L.: #4334; A; DAOF.

Brickellia eupatorioides (L.) Shinners var. *eupatorioides*: #6686; P; ASCA.

B. eupatorioides (L.) Shinners var. *corymbulosa* (Torr. & Gray) Shinners: #6987; P; WETL.
Cirsium altissimum (L.) Hill: #4299; P; DAOF.
Conyza canadensis (L.) Cronq.: #4274; A; DAOF.
Coreopsis palmata Nutt.: #4297; P; DAOF.
**Echinacea angustifolia* DC.: #4082; P; BCHA, PEQM.
Eclipta prostrata (L.) L.: #4090; A; WETL.
Erigeron strigosus Muhl. ex Willd.: #4107; A; ASCA.
Eupatorium serotinum Michx.: #6701; P; WETL.
Gamochaeta purpurea (L.) Cabrera: #6343; P; DAOF.
Helenium amarum (Raf.) H. Rock: #3832; A; DAOF.
Helianthus annuus L.: #4287; A; DAOF.
H. hirsutus Raf.: #4130; P; PEQM.
H. tuberosus L.: #4333; P; DAOF.
Heterotheca villosa (Pursh) Shinners: #4292; P; DAOF.
Krigia biflora (Walt.) Blake: #6337; F; P; WETL.
K. caespitosa (Raf.) Chambers: #4085; A; DAOF.
Lactuca canadensis L.: #4320; A; DAOF.
Liatris squarrosa (L.) Michx. var. *hirsuta* (Rydb.) Gaiser: #3896; P; BCHA, PEQM.
Packera plattensis (Nutt.) W.A. Weber & A. Löve: #4492; P; ASCA.
**Polymnia canadensis* L.: #4071; P; ASCA.
Rudbeckia hirta L.: #4129; P; BCHA, DAOF.
**Solidago arguta* Ait.: #7143; P; ASCA.
S. ulmifolia Muhl. ex Willd.: #3835; P; PEQM.
Symphyotrichum anomalum (Engelm.) Nesom: #4309; P; ASCA.
S. drummondii (Lindl.) Nesom: #3890; P; ASCA.
S. oolentangiense (Riddell) Nesom: #6687; P; ASCA.
S. patens (Ait.) Nesom: #6677; P; ASCA, PEQM.
S. turbinellum (Lindl.) Nesom: #6722; P; ASCA.
Verbesina virginica L.: #6678; P; ASCA.
Vernonia baldwinii Torr.: #4298; P; PEQM.
Xanthium strumariaum L.: #6672; A; WETL.

BALSAMINACEAE
Impatiens capensis Meerb.: #3898; P; ASCA.

BERBERIDACEAE
Podophyllum peltatum L.: #4475; P; ASCA.

BETULACEAE
Ostrya virginiana (P. Mill.) K. Koch: #4073; P; ASCA.

BIGNONIACEAE
Campsis radicans (L.) Seem. ex Bureau: #6674; P; DAOF, WETL.
Catalpa bignonioides Walt.: #3889; P; DAOF.

BORAGINACEAE
*‡*Buglossoides arvensis* (L.) I. M. Johnston: #3639; A; DAOF.
‡*Heliotropium indicum* L.: #6700; A; WETL.
Myosotis verna Nutt.: #4531; A; ASCA.

BRASSICACEAE
Arabis canadensis L.: #4114; B; PEQM.
A. laevigata (Muhl. ex Willd.) Poir.: #4484; B; ASCA, BCHA.
‡*Capsella bursa-pastoris* (L.) Medik.: #4483; A; DAOF.
Cardamine concatenata (Michx.) Sw.: #6232; P; ASCA.
C. parviflora L.: #4529; A; ASCA.
C. pennsylvanica Muhl. ex Willd.: #4529; P; ASCA.
Draba brachycarpa Nutt. ex Torr. & Gray: #3636; A; DAOF.
**D. reptans* (Lam.) Fern.: #4541; A; DAOF.
Lepidium densiflorum Schrad.: #4310; A; DAOF.
Rorippa palustris (L.) Bess.: #4088; A; WETL.

CAMPANULACEAE
Campanulastrum americanum (L.) Small: #3834; P; ASCA.
**Triodanis biflora* (Ruiz & Pavón) Greene: #4113; A; DAOF.

CAPPARACEAE
Polanisia dodecandra (L.) DC.: #4113; A; DAOF.

CAPRIFOLIACEAE
Symphoricarpos orbiculatus Moench: #4138; P; PEQM.
Viburnum rufidulum Raf.: #3626; P; PEQM.

CARYOPHYLLACEAE
‡*Arenaria serpyllifolia* L.: #6341; A; DAOF.
Sagina decumbens (Ell.) Torr. & Gray: #3628; A; DAOF.
Silene antirrhina L.: #6347; A; ASCA.
S. virginica L.: #4095; P; ASCA.
‡*Stellaria media* (L.) Vill.: #4543; A; DAOF.

CELASTRACEAE
Euonymus atropurpurea Jacq.: #6441a; P; ASCA.

CHENOPODIACEAE
‡*Chenopodium ambrosioides* L.: #4306; A; DAOF.
C. standleyanum Aellen: #6713; A; DAOF.

CLUSIACEAE
**Hypericum hypericoides* (L.) Crantz: #4125; P; PEQM.
H. punctatum Lam.: #4092; P; ASCA.

CONVOLVULACEAE
Ipomoea lacunosa L.: #6702; A; DAOF.
I. pandurata (L.) G.F.W. Mey.: #4128; P; DAOF.

CORNACEAE
Cornus florida L.: #3616; P; ASCA.

CRASSULACEAE
Sedum pulchellum Michx.: #6445a; A; BCHA.

EBENACEAE
Diospyros virginiana L.: #4108; P; ASCA, PEQM.

ERICACEAE
**Vaccinium arboreum* Marsh.: #4084; P; PEQM.
**V. pallidum* Ait.: #4548; P; PEQM.
V. stamineum L.: #3647; P; ASCA.

EUPHORBIACEAE
Acalypha monococca (Engelm. ex Gray) L. Mill. & Gandhi: #6683; A; PEQM.
A. virginica L.: #3908; A; ASCA.
Chamaesyce humistrata (Engelm.) Small: #4385; A; DAOF.
C. maculata (L.) Small: #6697; A; DAOF.
Croton glandulosus L.: #4134; A; DAOF.
C. monanthogynus Michx.: #3831; A; DAOF.
Euphorbia corollata L.: #4291; P; BCHA, PEQM.
E. dentanta Michx.: #4316; A; DAOF.
Tragia betonicifolia Nutt.: #4347; P; BCHA.

FABACEAE
Amorpha canescens Pursh: #4047; P; PEQM.
A. fruticosa L.: #4069; P; WETL.
Amphicarpaea bracteata (L.) Fern.: #4330; A; PEQM.
Baptisia bracteata Muhl. ex Ell.: #4346; P; BCHA, PEQM.
Cercis canadensis L.: #3897; P; PEQM.
Chamaecrista nictitans (L.) Moench: #4272; A; PEQM.
*†*Cladrastis kentukea* (Dum.-Cours.) Rudd: #3623; P; ASCA.
Clitoria mariana L.: #3907; P; PEQM.
Dalea purpurea Vent.: #4062; P; BCHA, PEQM.
Desmodium glutinosum (Muhl. ex Willd.) Alph. Wood: #4075; P; ASCA.
D. laevigatum (Nutt.) DC.: #6688; P; ASCA.
D. nudiflorum (L.) DC.: #4124; P; ASCA.
D. obtusum (Muhl. ex Willd.) DC.: #6694; P; PEQM.
D. paniculatum (L.) DC.: #4355; P; PEQM.
Gleditsia triacanthos L.: #6470a; P; DAOF, WETL.
‡*Kummerowia stipulacea* (Maxim.) Makino: #4313; A; DAOF.
‡*K. striata* (Thunb.) Schindl.: #4314; A; DAOF.
‡*Lespedeza cuneata* (Dum.-Cours.) G. Don.: #6671; P; DAOF.
L. repens (L.) W. Bart: #6671; P; PEQM.
L. x neglecta Mackenzie & Bush (pro sp.): #4382; P; PEQM.
‡*L. thunbergii* (DC.) Nakai: #6705; P; DAOF.
L. violacea (L.) Pers.: #4332; P; DAOF; PEQM.
L. virginica (L.) Britt.: #6720; P; PEQM.
*‡*Medicago lupulina* L.: #6345; A; DAOF.
Psoralidium tenuiflorum (Pursh) Rydb.: #4111; P; BCHA, PEQM.
Robinia pseudoacacia L.: #4280; P; DAOF.
Senna marilandica (L.) Link: #4327; P; WETL.
Stylosanthes biflora (L.) B.S.P.: #4285; P; DAOF.
Tephrosia virginiana (L.) Pers.: #4057; P; BCHA, PEQM.
‡*Trifolium campestre* Schreb.: #4497; A; DAOF.
‡*T. repens* L.: #6340; P; DAOF.

FAGACEAE
Quercus alba L.: #6458a; P; ASCA, PEQM.
Q. marilandica Muenchh.: #4051; P; PEQM.
Q. muehlenbergii Engelm.: #4137; P; ASCA.
Q. palustris Muenchh.: #6692; P; WETL.
Q. rubra L.: #4049; P; ASCA.
Q. stellata Wangenh.: #4052; P; ASCA, PEQM.
Q. velutina Lam.: #4105; P; PEQM.

FUMARIACEAE
**Corydalis micrantha* (Engelm. ex Gray) Gray: #3609; A; ASCA.
*†*Dicentra cucullaria* (L.) Bernh.: #4488; P; ASCA.

GERANIACEAE
Geranium maculatum L.: #6462a; P; ASCA.
*‡*G. pusillum* L.: #4066; A; DAOF.

HYDRANGEACEAE
Hydrangea arborescens L.: #4345; P; ASCA.

JUGLANDACEAE
Carya cordiformis (Wangenh.) K. Koch: #3903; P; ASCA.
C. ovalis (Wangenh.) Sarg.: #6351; P; PEQM.
C. texana Buckl.: #4388; P; PEQM.

LAMIACEAE
Cunila origanoides (L.) Britt.: #4276; P; ASCA, PEQM.
**Hedeoma hispida* Pursh: #6350; A; BCHA.
**‡Lamium amplexicaule* L.: #6460a; A; DAOF.
‡L. purpureum L.: #6465a; A; DAOF.
Monarda fistulosa L.: #4081; P; PEQM.
Scutellaria lateriflora L.: #4301; P; WETL.
S. ovata Hill: #4058; P; BCHA.
Teucrium canadense L.: #4065; P; WETL.

LAURACEAE
Lindera benzoin (L.) Blume: #6230; P; ASCA.
Sassafras albidum (Nutt.) Nees: #4055; P; ASCA.

MENISPERMACEAE
Cocculus carolinus (L.) DC.: #4281; P; ASCA.
Menispermum candense L.: #6468a; P; ASCA.

MOLLUGINACEAE
Mollugo verticillata L.: #4293; A; DAOF.

MORACEAE
Maclura pomifera (Raf.) Schneid.: #4279; P; DAOF.
Morus rubra L.: #4053; P; ASCA.

NYSSACEAE
**Nyssa sylvatica* Marsh.: #4050; P; ASCA.

OLEACEAE
**Forestiera pubescens* Nutt.: #6727; P; BCHA.
Fraxinus americana L.: #4354; P; ASCA.

ONAGRACEAE
Oenothera biennis L.: #4304; P; DAOF.
O. linifolia Nutt.: #6473a; A; DAOF.

OXALIDACEAE
Oxalis stricta L.: #3906; P; DAOF.
O. violacea L.: #3615; P; ASCA, PEQM.

PASSIFLORACEAE
Passiflora lutea L.: #4282; P; ASCA, PEQM.

PHYTOLACCACEAE
Phytolacca americana L.: #4068; P; DAOF.

PLANTAGINACEAE
Plantago aristata Michx.: #4302; A; DAOF.
P. heterophylla Nutt.: #3641; A; DAOF.
‡P. lanceolata L.: #4048; P; DAOF.
**‡P. major* L.: #4077; P; DAOF.
**P. pusilla* Nutt.: #4539; A; BCHA.
P. rugelii Dcne.: #6698; P; ASCA.
P. virginica L.: #4536; A; BCHA.

POLEMONIACEAE
Phlox divaricata L.: #3638; P; ASCA.
P. pilosa L.: #4496; P; ASCA.

POLYGONACEAE
Polygonum convolvulus L.: #4325; P; WETL.
P. pensylvanicum L.: #6453a; A; WETL.
P. punctatum Ell.: #4323; A; WETL.
P. scandens L.: #4305; P; WETL.

PORTULACACEAE
Claytonia virginica L.: #6455a; P; DAOF.
Portulaca oleracea L.: #6695; A; DAOF.

PRIMULACEAE
**Androsace occidentalis* Pursh: #3614; A; DAOF.
Dodecatheon meadia L.: #4482; P; BHCA.

RANUNCULACEAE
Aquilegia canadensis L.: #3618; P; ASCA.
Clematis versicolor Small ex Rydb.: #4353; P; ASCA.
Delphinium carolinianum Walt.: #4072; P; DAOF.
D. tricorne Michx.: #6447a; P; ASCA.
Ranunculus abortivus L.: #6336; P; WETL.
R. fascicularis Muhl. ex Bigelow: #4535; P; WETL.
R. hispidus Michx.: #4533; P; ASCA.
Thalictrum thalictroides (L.) Eames & Boivin: #3625; P; ASCA.

RHAMNACEAE
**Frangula caroliniana* (Walt.) Gray: #3627; P; ASCA.

ROSACEAE
Agrimonia pubescens Wallr.: #4537; P; ASCA.
A. rostellata Wallr.: #3895; P; ASCA.
Amelanchier arborea (Michx. f.) Fern.: #3633; P; PEQM.
Geum canadense Jacq.: #4343; P; ASCA.
G. vernum (Raf.) Torr. & Gray: #3648; P; ASCA.
Potentilla simplex Michx.: #6338; P; ASCA.
Prunus serotina Ehrh.: #6335; P; ASCA, PEQM.
‡*Rosa multiflora* Thunb. ex Murr.: #6466a; P; DAOF.
R. setigera Michx.: #4104; P; DAOF.
Rubus aboriginum Rydb.: #3643; P; DAOF.
R. occidentalis L.: #4352; P; DAOF.

RUBIACEAE
Cephalanthus occidentalis L.: #6669; P; WETL.
Galium aparine L.: #6459a; A; ASCA.
†*G. arkansanum* Gray: #4294; P; ASCA.
G. pilosum Ait.: #3830; P; ASCA.
‡*G. tinctorium* L.; #4117; P; ASCA.
**G. virgatum* Nutt.; #4481; A; DAOF.
Hedyotis nigricans (Lam.) Fosberg: #6676; P; BCHA.
Houstonia pusilla Schoepf: #3637; A; DAOF.
Spermacoce glabra Michx.: #6703; P; WETL.

RUTACEAE
**Ptelea trifoliata* L.: #4123; P; PEQM.

SAPINDACEAE
Cardiospermum halicacabum L.: #66881; A; WETL.

SAPOTACEAE
Sideroxylon lanuginosum Michx.: #4136; P; PEQM.

SAXIFRAGACEAE
Heuchera americana L. var. *hirsuticaulis* (Wheelock) Rosendahl, Butters & Lake: #4532; P; ASCA.

SCROPHULARIACEAE
**Nuttallanthus canadensis* (L.) D. A. Sutton: #6346; A; DAOF
Scrophularia marilandica L.: #4360; A; ASCA.
‡*Verbascum thapsus* L.: #4271; B; DAOF.
‡*Veronica arvensis* L.: #4546; A; DAOF.
V. peregrina L.: #3640; A; DAOF.

SIMAROUBACEAE
*‡*Ailanthus altissima* (P. Mill.) Swingle: #4132; P; DAOF.

SOLANCEAE
Solanum carolinense L.: #6696; P; DAOF.

ULMACEAE
Celtis laevigata Willd. var. *reticulata* (Torr.) L. Benson: #3899; P; BCHA, PEQM.
Ulmus alata Michx.: #4109; P; PEQM.

URTICACEAE
Boehmeria cylindrica (L.) Sw.: #4283; A; ASCA.
Parietaria pensylvanica Muhl. ex Willd.: #4060; A; ASCA, DAOF.
Pilea pumila (L.) Gray: #6690; A; ASCA.

VALERIANACEAE
Valerianella radiata (L.) Dufr.: #4477; A; ASCA.

VERBENACEAE
Phryma leptostachya L.: #4054; P; ASCA.
Verbena urticifolia L.: #4133; A; WETL.

VIOLACEAE
Viola palmata L.: #3624; P; ASCA.
V. pedata L.: #4485; P; ASCA.
V. pubescens Ait.: #3611; P; ASCA.
V. sororia Willd.: #4528; P; ASCA.

VITACEAE
Ampelopsis cordata Michx.: #3904; P; WETL.
Parthenocissus quinquefolia (L.) Planch.: #6469a; P; ASCA, DAOF.
Vitis cinera (Engelm.) Millard: #3893; P; DAOF.
V. vulpina L.: #4116; P; PEQM.

LILIOPSIDA
ARACEAE
Arisaema triphyllum (L.) Schott: #3642; P; ASCA.

COMMELINACEAE
Commelina erecta L.: #4127; P; ASCA, WETL.
Tradescantia ohiensis Raf.: #6449a; P; ASCA.

CYPERACEAE
Carex granularis Muhl. ex Willd.: #4174; P; ASCA.

C. grayi Carey: #4175; P; WETL.
C. leavenworthii Dewey: #4176; P; ASCA.
**C. oligocarpa* Schkuhr ex Willd.: #4177; P; ASCA.
Cyperus echinatus (L.) Wood: #4275; P; DAOF.
C. erythrorhizos Muhl.: #6719; A; WETL.
Fimbristylis vahlii (Lam.) Link: #6673; A; WETL.

DIOSCOREACEAE
Dioscorea villosa L.: #6450a; P; ASCA.

IRIDACEAE
Sisyrinchium campestre Bickn.: #6442a; P; DAOF.

LILIACEAE
Allium canadense L.: #6352; P; ASCA.
Camassia scilloides (Raf.) Cory: #3631; P; ASCA.
Erythronium albidum Nutt.: #6234; P; ASCA.
**E. americanum* Ker-Gawl.: #4545; P; ASCA.
**E. rostratum* W. Wolf: #3632; P; ASCA.
Hypoxis hirsuta (L.) Coville: #4473; P; DAOF, PEQM.
Nothoscordum bivalve (L.) Britt.: #4490; P; DAOF.
Polygonatum biflorum (Walt.) Ell.: #6443a; P; ASCA.

POACEAE
*‡*Aira caryophyllea* L.: #4086; A; DAOF.
Andropogon gerardii Vitman: #4300; P; BCHA, PEQM.
A. virginicus L.: #6718; P; DAOF.
Bouteloua curtipendula (Michx.) Torr.: #4278; P; BCHA.
Bromus pubescens Muhl. ex Willd.: #4344; P; ASCA.
*‡*B. tectorum* L.: #6349; A; DAOF.
Chasmanthium latifolium (Michx.) Yates: #3891; P; ASCA, WETL.
Danthonia spicata (L.) Beauv. ex Roemer & J.A. Schultes: #4059; P; BCHA, PEQM.
**Dichanthelium acuminatum* (Sw.) Gould & C.A. Clark var. *fasciculatum* (Torr.) Freckmann: #4318; P; ASCA.
D. boscii (Poir.) Gould & C.A. Clark: #4099; P; ASCA.
D. dichotomum (L.) Gould: #4336; A; ASCA.
D. linearifolium (Scribn. ex Nash) Gould: #6471a; P; ASCA, PEQM.
D. sphaerocarpon (Ell.) Gould: #4335; P; ASCA.
Digitaria sanguinalis (L.) Scop.: #6717; A; DAOF.
*‡*Echinochloa colona* (L.) Link: #6699; A; WETL.
*‡*Eleusine indica* (L.) Gaertn.: #4286; A; DAOF.
Elymus hystrix L.: #4321; P; ASCA.
E. virginicus L.: #4098; P; PEQM.
**Eragrostis capillaris* (L.) Nees: #6725; A; DAOF.
E. hirsuta (Michx.) Nees: #6756; P; DAOF.
E. hypnoides (Lam.) B. S. P.: #6721; A; WETL.
E. intermedia A. S. Hitchc.: #4312; P; ASCA.
Hordeum pusillum Nutt.: #6461a; A; DAOF.
Leersia virginica Willd.: #6711; P; WETL.
*Leptochloa panice*a (Retz.) Ohwi: #6709; A; WETL.
Muhlenbergia sobolifera (Muhl. ex Willd.) Trin.: #4383; P; PEQM.
Panicum dichotomiflorum Michx.: #6723; P; ASCA.
*‡*Poa annua* L.: #4487; A; DAOF.
P. sylvestris Gray: # 6728; P; ASCA.
Setaria parviflora (Poir.) Kerguélen: #4337; P; DAOF.
*‡*S. viridis* (L.) Beauv.: #4348; A; DAOF.
Sorghum halepense (L.) Pers.*: #4284; P; DAOF.
Sporobolus clandestinus (Biehler) A. S. Hitchc.: #6712; P; BCHA.
S. vaginiflorus (Torr. ex Gray) Wood: #6706; A; BCHA.
Tridens flavus (L.) A.S. Hitchc.: #4120; P; DAOF, PEQM.
Vulpia octoflora (Walt.) Rudb.*: #6339; A; BCHA.

SMILACACEAE
Smilax bona-nox L.: #4115; P; ASCA, PEQM.
S. tamnoides L.: #6467a; P; ASCA, PEQM.