The Miller Blue Hole is located approximately six miles west of the similar but commercially famous Castalia Blue Hole and near the junction of U.S. Route 6 and Sandusky County Route 290. In 1932, the Ohio State Division of Conservation purchased from the Miller family a 13-acre tract of land surrounding the nearly 2-acre, elliptically shaped hole (Langlois, 1958). The outlet stream overflows the hole's northeastern rim, journeys eastward a short distance, then 2 miles northward, and empties into Sandusky Bay (fig. 1). The hole and stream lie entirely within Sections Four and Nine of Townsend Township.

**METHODS**

Care was taken in an effort to collect members of all vascular species along the entire watercourse including the hole, the stream, and the banks within 6 ft of the shore line, a total area of approximately 6 acres. The catalogue of plants of this paper is substantiated by voucher specimens deposited in The Ohio State University Herbarium, Columbus. Collections and observations were made during 1959–1962.

**GEOLOGY**

The source of water is apparently rainfall on the uplands to the south. The water enters numerous sinkholes and a system of subterranean passageways corroded through or beneath Silurian dolomites of the Bass Island Group (Orton, 1899; Stout, 1941). The water level in these caverns nears the surface as its slope grades gently toward Sandusky Bay until a contour is reached such that any penetration, natural or artificial, into the caverns results in a spring (Wolfe, 1931).

After their uplift during the Appalachian revolution (Orton, 1899), these rocks were sculptured by acid-charged water that had entered the widened cleavage planes. They occupy their present-day position after the recessions of the Pleistocene glaciers and ensuing tiltings of the land mass (Moseley, 1899). The glaciers deposited a coating of drift in thickness probably not more than 25 ft (Stout, 1941). According to the elevations of post-glacial lake beaches listed by Forsythe (1959), the Miller Blue Hole area was covered by Lakes Maumee, Whittlesey, and Warren. This level topography lies within the Erie Lake Plain of the Central Lowlands (Ver Steeg and Yunck, 1932).

**SOILS**

The substrate of the vegetation of this region is comprised of Toledo silty clay and Warner's loam soils. Toledo silty clay is derived basically from Lake Maumee deposits (Allen et al., 1920). It occurs on level land including most of the stream banks. Since it is of very poor drainage, extensive ditches and tiling systems abound in the area. Warner's loam regions (fig. 1) appear as overflow deposits of the Miller Blue Hole covering approximately one square mile and as marl deposits of Castalia Blue Hole and Upper Springs forming the extensive nearby

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Castalia prairie. Warner's loam is composed of a dark-gray to black silty marly loam surface layer, a whitish to light-gray loose marl subsurface layer, and a subsoil of a yellowish-brown calcareous clay (Allen et al., 1920). Solidified marl deposits called tufa are strewn over the surface, displaced by agricultural practices.

Tufa is a porous travertine formed as a deposit of calcium carbonate that has been separated from calcium bicarbonate contained in the underground supply of water. Tiny particles of calcium carbonate held in suspension account for a milky appearance of the water (Langlois, 1958). Upon settling out, the carbonate encrusts those objects with which it comes in contact. The deposit here is largely upon Chara, the thalli of which are often clearly outlined in the tufa.

![Figure 1](image_url)

**Figure 1.** Map of Miller Blue Hole region. The collection stations at the hole (1) and along the overflow stream (2-7) are described in text. Warner's loam is within dotted enclosures A and B about the Miller Blue Hole and the Castalia Blue Hole respectively. (Modified with permission of U.S. Government Printing Office).

**CLIMATE**

The climate at Miller Blue Hole is less modified by Lake Erie than at lakeshore cities such as Sandusky. At Vickery, a few miles southeast of the hole, the frost-free season averages 163 days, notably less than Sandusky City's 197 frost-free days (Pierce, 1959). The mean annual temperature at Vickery is 49.8 F (Marvin, 1936); at Sandusky City, 51.3 F (Pierce, 1959). Extreme temperatures at Vickery from 1893 to 1930 are 107 F in August, 1918, and −24 F in February, 1918 (Alexander, 1923; Marvin, 1936). Freezing temperatures have been recorded for all months except June, July, and August (Marvin, 1936).

The rainfall, averaging between 33 and 34 inches annually at Vickery, is quite well distributed throughout the year, the months of greatest rainfall coinciding with those early in the growing season, namely May, June, and July (Marvin, 1936).
ORIGINAL VEGETATION

The vegetation as viewed by pioneers is difficult to ascertain, particularly since man has drained and tilled much of the land. Prior to disruptions by man, the region of Warner’s loam probably supported a vegetation similar to that then growing in the Castalia wet prairie. The gradual slope to Sandusky Bay makes possible the flooding of large areas both here and at Castalia, resulting in marl beds, some reaching 15 ft thick (Stout, 1949). From the straightness and great depth of the stream bed, it appears that the stream is essentially a man-made drainage system. Originally the water probably spilled over the very low northern rim and flooded the area now occupied by the loam. The trees currently found in the area are mostly likely recent invaders after artificial drainage had become effective.

The larger trees of the immediate area, in size and species, indicate early nearby forests to be of a swamp forest type. The largest, an American elm, measures 61.5 inches DBH. Specimens over 40 inches DBH are represented by bur oak; over 30 inches, by hackberry, cottonwood, sycamore, red oak, black willow; and over 20 inches, by boxelder, green ash, red ash, and slippery elm. Moseley (1899, 1904) reports local residents recalling prairie, often under water, at Castalia and such trees as ash, oak, elm, and hickory as common in northeastern Sandusky County. Orton (1899) also remarks of an extensive marsh or swamp from Castalia Blue Hole to Sandusky Bay.

Surrounding the wet prairie at the hole were an elm-ash-oak-hickory forest to the north, the Great Black Swamp along the lake and bay to the west, the Castalia wet prairie to the east, and more mesic forests on the uplands to the south.

PRESENT-DAY VEGETATION

The Blue Hole

The surface of the spring is essentially elliptical with a north-south major axis of approximately 300 ft and a minor axis of about 220 ft (Hille, 1955). The water, only inches deep above the encircling 5- to 10-ft-wide marl shelf, suddenly deepens into a funnel basin averaging about 25 ft deep. The orifice(s) near the south shore has been plumbed at 62 ft below the surface (Wolfe, 1931). The water level fluctuates during the year. The volume of water varies from 800 to 1000 gal/min at a flow rate of 0.5 to 0.7 ft/sec (Hille, 1955).

The surface temperatures of the hole vary with the season, reaching a maximum of 28 C in August (Hille, 1955) and a minimum of 8.5 C in winter. The temperature decreases as much as approximately one-half degree per 6-ft increase in depth of water (Wolfe, 1931). There is no thermocline. Water entering the hole is nearly devoid of oxygen, but contains large quantities of carbon dioxide. The buffering effect of high concentrations of bicarbonates probably accounts for the near neutral pH readings. The water does not freeze here or along the immediate eastward flow of the stream except at shore lines in insignificant quantities.

The vegetation about Miller Blue Hole (fig. 2) may be conveniently divided into five nearly concentric zones (fig. 5). The open water or innermost zone includes free-swimming and unattached algae, predominantly greens and blue-greens.

The second vegetation zone is a complex one. _Spirogyra_ develops rapidly early in spring and forms a bright-green ring above the marl shelf. _Chara contraria_, attached to the marl shelf and to the steeply sloping sides of the hole, grows upward to the surface. Eventually the _Spirogyra_ becomes entwined about the _Chara_, the two together forming green pinnacles stringing to or near the surface. These pinnacles, characteristic of the hole during the summer months, form the foundation of a mat that includes mosses, diatoms, _Spirogyra, Chara, _
and other algal forms. As the growing season progresses, the mat becomes thickened, protrudes slightly above the surface, and is subject to action of the wind blowing across the surface. Sections of the mat break loose and reform on the eastern shore line, particularly near the stream outlet. Portions of the mat may persist through much of the winter, but by spring the mat is restricted to the stream where it accumulates against obstacles in the water.

This mat supports water cress, *Nasturtium officinale*, in the stream and, according to Wolfe (1931), in the hole also. Where dogwoods and other plants overhang the water, the mat thins and disappears near the shore. Here the water is open and clear, harboring *Chara contraria*, *Lemna minor*, *L. trisulca*, and *Utricularia vulgaris*.

Next is the zone of emergent plants comprised mostly of grasses and sedges, the roots of which are embedded in the calcareous deposits. Hillocks of *Eleocharis calva* project above the shallow waters along the lightly shaded southern and eastern shores. Associated with *Eleocharis* are representatives of several species of which *Gerardia purpurea*, *Muhlenbergia glomerata*, and *Triglochin palustris* are of calcareous bog association.

The fourth zone is composed of plants growing upon the banks. Dogwoods and entanglements of lianas are interspersed with overtopping trees. Underneath the canopy of cottonwood and black willow is a more extensive subcanopy of red ash, green ash, white mulberry, and choke cherry. The dense shrub layer of *Cornus obliqua*, *C. racemosa*, *C. stolonifera*, *Prunus virginiana*, *Sambucus canadensis*, and *Viburnum lentago* is draped with such vines as *Convolutus septum*, *Echinocystis lobata*, *Parthenocissus inserta*, *Polygonum scandens*, *Solanum dulcamara*, and *Vitis riparia*. On mud flats of the northern and western banks are found *Galium triflorum*, *Glyceria striata*, *Muhlenbergia mexicana*, *Pilea pumila*, and *Ranunculus abortivus*. The less shaded southern and eastern banks having a more pronounced drop to water level are inhabited by *Ambrosia trifida*, *Asclepias incarnata*, *Carex blanda*, *Cicuta bulbifera*, *Dryopteris thelypteris*, *Solidago canadensis*, and *Urtica procera*.

Nearly encircling the dogwood zone is a red ash - green ash - white mulberry community. Hackberry and boxelder also appear in the canopy. The shrub layer consists of dogwoods, *Ribes americanum*, and *Xanthoxylum americanum*. There is much seasonal variation in the rather scant herbaceous layer. Some of the more common herbs are *Cryptotaenia canadensis*, *Eupatorium rugosum*, *Hackelia virginianum*, *Osmorhiza longistylis*, *Senecio obovatus*, and *Smilacina stellata*. The ash-mulberry zone quickly grades out into open grassy fields spotted with small ash individuals and dogwoods.

**The Stream**

The overflow stream area was divided into six collecting stations (fig. 1). The width of the stream varies from approximately 12 ft at its source to less than 4 ft at the first bridge (edge of state-owned land) and at various locations where fallen logs and debris have formed natural obstructions. The average width is estimated to be 6 ft. In cross-section, the stream bed is broadly U-shaped with steep banks rising 4 to 5 ft at angles of 45 to 60 degrees or more to the horizontal. In some areas the banks overhang the water. Slumping of banks is not uncommon.
during the wet seasons. The depth of the water may be more than 2 ft near bridges and obstructions but is usually less than 1 ft. Flooding after rains may more than double these values.

Brungs (1959) reports a steady increase in average temperature of stream water (measured midway of the depth) from 12.9°C at source to 19.8°C at mouth during summer months. I found 1960–1961 winter temperatures as low as 8.5°C at source and 4.5°C at mouth. Hence, stream temperatures fluctuate most nearest the mouth. The oxygen content and pH values increase as water flows along the stream's course, while the amounts of carbon dioxide and bicarbonates decrease (Brungs, 1959).

Figure 5. Vegetation zones of Miller Blue Hole (Station One).

The stream banks from the hole to the first bridge (station two) bear many woody taxa including *Celtis occidentalis*, *Cornus racemosa*, *C. stolonifera*, *Crataegus*, *Fraxinus pennsylvanica*, *Platanus occidentalis*, *Populus tremuloides*, *Prunus virginiana*, *Rhamnus lanceolata*, *Sambucus canadensis*, and *Xanthoxylum americanum*. Vines, brambles of *Rubus occidentalis*, shrubs and saplings make thickets nearly impenetrable, particularly where openings appear in the canopy. The herbaceous layer is very sparse; seldom can be found more than a few individuals of a limited number of species. The only liverwort found, *Conocephalum conicum*, inhabits a 20 ft² section of the southern bank near the first bridge. The mat of moss,
Chara, and other algae is found floating in the stream, usually abutting fallen logs and branches. Water cress is common on the mat.

From the above-mentioned bridge one-quarter mile eastward to a point at which the stream angles northeastward (station three), Chara, Spirogyra, water cress, and diatoms constitute most of the vegetation of the stream. Batrachospermum sp., a red alga, was found trailing in the shallow, swift water. Patches of mat occasionally occur entangled with overhanging grasses and sedges, the predominant plants on the banks. Scattered are some herbs, vines, and a few saplings, but no trees (fig. 3).

The site from station three to the junction of Miller Blue Hole Stream with another stream of subequal size flowing westward and with a small temporary stream from the south (station four), supported, until cleared of its woody vegetation in the winter of 1960–1961, plants most closely resembling the original woody vegetation believed to have occupied the region. Probably best described as an elm-ash-oak-hickory complex, the canopy included Acer negundo, Carya ovata, Fraxinus pennsylvanica, Gleditsia triacanthos, Platanus occidentalis, Quercus alba, Q. bicolor, Q. macrocarpa, Q. rubra, Ulmus americana, and U. rubra. Shrubs and small trees were abundant, including Carpinus caroliniana, Cornus obliqua, C. racemosa, Prunus virginiana, and saplings of canopy species. Vines and briers added to the density of the undergrowth. The herbaceous layer was represented by Anemone quinquefolia, Aster sagittifolius, Erythronium americanum, Galium concinnum, Geranium maculatum, Hystrix patula, Thaspium trifoliatum, and others.

North of the junction of streams, a notable change of aquatic vegetation occurs. Chara and the mat are replaced by leafy pondweed, Potamogeton foliosus, which in July and August may cover from 40 to 80 per cent of the stream bottom. During the cold months, Vaucheria forms pads covering as much as one third of the stream bed. A mud bottom, interrupted by patches of stones especially near the stream mouth, replaces the marl characteristic of the first four stations. The adjoining streams also have mud bottoms. The stream becomes wider with shallower, more turbid water bounded by less steep banks than at previous stations.

Except for the depauperate swamp forest area of station six (fig. 4) in the bend of the stream prior to its paralleling Sandusky County Route 290 to Sandusky Bay (station seven), the stream banks are largely grass-covered with interspersed herbs, saplings, and a few large elms and oaks. Thus stations five and seven and portions of six are not very unlike station three except for the aquatic flora. All are bordered by cultivated fields, pasture, or human dwellings. The swamp forest, largely removed during the winter of 1961–1962, was composed primarily of Gleditsia triacanthos, Fraxinus pennsylvanica and its variety subintegerrima, Acer saccharinum, Ulmus americana, and U. fulva.

**SUMMARY**

The original vegetation of the unique environ of the Miller Blue Hole appears to have been an elm-ash-oak-hickory swamp forest of the Deciduous Forest Formation. Areas too wet for the invasion and establishment of trees supported a wet prairie, a relict probably surviving since the eastward extension of prairies during xeric times following the Wisconsin glacier and the recession of early post-glacial lakes. The wet prairie was apparently best developed on sites now occupied by Warner's loam in the immediate vicinity of the hole and also on more extensive areas eastward centered about the Castalia Blue Hole. Present-day indicator species such as Asclepias tuberosa, Rudbeckia lanciata, Calamagrostis canadensis, Ratibida pinnata, Sorghastrum nutans, Quercus macrocarpa, Silphium terebinthinaceum, Heliopsis helianthoides, and Spartina pectinata reflect the rapidly disappearing wet prairie situation.

Carex prairea, Chara contraria, Gerardia purpurea, Muhlenbergia glomerata,
and *Triglochin palustris* aid in identifying the hole as a calcareous bog. *Nasturtium officinale* and a species of *Batrachospermum* are characteristic of the cold, swift-moving water emerging from the spring.

Much of the surrounding land has been utilized for agricultural purposes, either openly cultivated or converted into forage cropland. Grassy stream banks are subject to annual mowing, spraying of weed eradicators, and burning. Periodically portions of the stream are artificially cleared of their vegetation and bottom tufa deposits. Tiling, though making lands productive agriculturally, has greatly affected the native vegetation. Many of the wooded areas have been cleared. Disturbances of the soil through cultivation and man’s development of dusty roadsides are very likely factors contributing to the appearance of such weedy species as *Abutilon theophrasti*, *Amaranthus hybridus*, *Chenopodium album*, *Cichorium intybus*, *Dactylis glomerata*, *Daucus carota*, and *Portulaca oleracea*.

Escapes from crop and garden cultivation include *Asparagus officinale*, *Avena sativa*, *Fragaria virginiana*, *Hemerocallis fulva*, *Humulus lupulus*, *Lonicera tatarica*, *Medicago sativa*, *Secale cereale*, *Sedum telephium*, and *Syringa vulgaris*.

The level of successions of plant communities corresponds closely to the degree of disturbance by man and his methods. Station four, with relatively good drainage and with little disruption by man, until completely cleared, most nearly approached a mesic forest climax. Stations three and five are most disturbed and plant communities have retrogressed far from a climax vegetation. My concept of the successions in progress in this region is depicted below.

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ELM-ASH-OAK-HICKORY

ELM-ASH

ASH-MULBERRY

DOGWOOD-ASH

DOGWOOD-WILLOW-COTTONWOOD

DOGWOOD-SYCAMORE-COTTONWOOD

DOGWOOD

GRASSES AND COMPOSITES

GRASSES AND SEDGES

GRASSES AND SEDGES

GRASSES AND SEDGES

CHARA-MOSS-ALGAE MAT

CHARA-CRESS-SPIROGYRA

POTAMÓGETON-SPIROGYRA

ALGAE

ALGAE

ALGAE

FIELDS (HOLE)

OPEN WATER (HOLE)

OPEN WATER (STREAM)

OPEN WATER (STREAM)
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(FIELD)
The vascular flora of the Miller Blue Hole region includes representatives of 281 species in 73 families (table 1). Scientific names and sequence of families follow Gray's Manual of Botany, eighth edition. Numbers following common name refer to collecting stations at which plants were found. Taxa marked with an asterisk (*) were found in the immediate vicinity but outside the limits of six feet from the watercourse.

**PTERIDOPHYTA**

**EQUISETACEAE**

*Equisetum arvense* L.  
Field Horsetail. 3,4,7.

*Equisetum kansanum* Schaffner  
Scouring-rush. 3.

**OPHIOGLOSSACEAE**

*Brychium virginianum* (L.) Sw.  
Rattlesnake Fern.

**POLYPODIACEAE**

*Dryopteris thelypteris* (L.) Gray, var. *pubescens* (Lawson) Nakai  
Marsh Fern. 1,3.

**SPERMATOPHYTA-MONOCOTYLEDONAE**

**TYPHACEAE**

*Bromus inermis* Leyss.  
Awnless Brome Grass. 5,6,7.

Bromus *raceopus* L.  
Brome Grass. 6,7.

*Calamagrostis canadensis* (Michx.) Nutt.  
Bluejoint. 3,5,6,7.

*Digitaria sanguinalis* (L.) Scop.  
Common Crab Grass. 6,7.

*Echinochloa crus-galli* (L.) Beauv.  
Barnyard Grass. 5,6,7.

*Eleusine indica* (L.) Gaertn.  
Wiregrass. 2.

*Elymus canadensis* L.  
Canada Wild Rye. 5,6,7.

*Elymus virgicus* L.  
Terrell Grass. 5,6,7.

*Glyceria striata* (Lam.) Hitchc.  
Fowl-meadow Grass. 1,2,3,4.

*Hordeum jubatum* L.  
Squirrel-tail Grass. 5,6,7.

*Juncaginaceae*  

*Triglochin palustris* L.  
Arrow-grass. 1.

**ALISMATACEAE**  

*Alisma subcordatum* Raf.  
Water-plantain.
Panicum capillare L.  
Old-witch Grass. 6,7.
Panicum dichotomiflorum Michx.  
Panic Grass. 6.
Phalaris arundinacea L.  
Reed Canary Grass. 6,7.
P. compressa L.  
Canada Bluegrass. 3,5,6,7.
P. pratensis L.  
Kentucky Bluegrass. 2,3,4,6.
Phleum pratense L.  
Common Timothy. 3,5,6,7.
Poa compressa L.  
Canada Bluegrass. 3,5,6,7.
Poa pratensis L.  
Kentucky Bluegrass. 2,3,4,6.
Secale cereale L.  
Rye. 3.
Setaria faberi H. Herrm.  
Foxtail. 3.
Setaria glauca (L.) Beauv.  
Yellow Foxtail. 3,5,6,7.
Setaria viridis (L.) Beauv.  
Green Foxtail. 5,6.
Sorghastrum nutans (L.) Nash  
Indian Grass. 2,5.
Spartina pectinata Link  
Slough Grass. 7.
Triodia flava (L.) Smyth  
Tall Redtop. 7.

Cyperaceae
Carex amphibola Steud., var. turgida Fern.  
Sedge. 7.
Carex blanda Dew.  
Sedge. 1.
Carex brevior (Dew.) Mackenz.  
Sedge. 7.
Carex frankii Kunth  
Frank's Sedge. 5.
Carex hystricina Muhl.  
Porcupine Sedge. 1.
Carex lanuginosa Michx.  
Woolly Sedge. 1,3.
Carex pratensis Dew.  
Sedge. 1.
Carex sparganoides Muhl.  
Bur-reed Sedge. 4.
Carex spicata Huds.  
Sedge. 3,7.
Carex stipala Muhl.  
Afl-fruit Sedge. 6.
Carex vulpinoides Michx.  
Fox Sedge. 1,3.
Cyperus odoratus L.  
Galingale. 1.
Eleocharis calva Torr.  
Spike-rush. 1,3.
Scirpus atrovirens Wild.  
Dark-green Bulrush. 5,6,7.
Scirpus validus Vahl  
Great Bulrush. 1,3,7.

Lemnaceae
Lemma minor L.  
Small Duckweed. 1.
Lemma trisulca L.  
Star Duckweed. 1.

Juncaceae
*Juncus balticus Willd.  
Rush.
Juncus dudleys Wieg.  
Dudley's Rush. 3.
Juncus torreyi Coville  
Torrey's Rush. 1,5,7.

Liliaceae
Allium canadense L.  
Wild Garlic. 4.
Allium vinale L.  
Field Garlic. 4,7.
*Asparagus officinalis L.  
Garden Asparagus. 4.
Bryanthium americanum Ker  
Yellow Dog's-tooth-violet. 4.
Hemeroallis fulva L.  
Common Orange Day-lily. 7.
Lilium michiganense Farw.  
Michigan Lily. 4.
Smilacina stellata (L.) Desf.  
Starry False Solomon's Seal. 1,2,3,4.
Smilax humilis L. var. hispida (Muhl.) Fern.  
Bristly Greenbrier. 1,4.

Iridaceae
Iris versicolor L.  
Iris. 5.
Sisyrinchium angustifolium Mill.  
Blue-eyed-grass. 4.

Spermatophyta-Dicotyledones

Salicaceae
Populus deltoides Marsh.  
Cottonwood. 1,4.
Populus tremuloides Michx.  
Quaking Aspen. 2,4.
Salix nigra Marsh.  
Black Willow. 1.
Salix humilis Marsh.  
Small Pussy Willow. 1,7.

Juglandaceae
Carya ovata (Mill.) K. Koch  
Shagbark Hickory. 4.

Corylaceae
Carpinus caroliniana Walt.  
American Hornbeam. 4.
Corylus americana Walt.  
American Hazelnut. 4.

Fagaceae
Quercus alba L.  
White oak. 4.
Quercus bicolor Willd.  
Swamp White Oak. 4.
Quercus macrocarpa Michx.  
Bur Oak. 4,7.
Quercus rubra L.  
Red Oak. 4.

Ulmaceae
Celtis occidentalis L.  
Hackberry. 1,2,4,5,7.
Ulmus americana L.  
American Elm. 1,3,4,5,6,7.
**Ulmus rubra** Muhl.
Slippery Elm. 4,5,6,7.

**MORACEAE**

_Morus alba_ L.
White Mulberry. 1,2,4,5,7.

**CANNABINACEAE**

_Humulus lupulus_ L.
Common Hop. 3,4,5,6,7.

**URTIACEAE**

_Pilea pumila_ (L.) Gray
Clearweed. 1,5,6.

_Urtica procera_ Muhl.
Nettle. 1,2,3,5,6,7.

**SANTALACEAE**

*Comandra umbellata* (L.) Nutt.
Bastard-toadflax.

**POLYGONACEAE**

_Polygonum aviculare_ L.
Doorweed. 3.

_Polygonum convolvulus_ L.
Black Bindweed. 5.

_Polygonum lapathifolium_ L.
Water Persicaria. 3,5,6,7.

_Polygonum pensylvanicum_ L.
Pinkweed. 3,5.

_Polygonum persicaria_ L.
Lady's-thumb. 6.

_Polygonum scandens_ L.
Climbing False Buckwheat. 1,4,5,6,7.

_Rumex altissimus_ Wood
Pale Dock. 5,7.

_Rumex crispus_ L.
Yellow Dock. 3,7.

_Rumex obtusifolius_ L.
Blunt-leaved Dock. 2,5,7.

**CHENOPODIACEAE**

_Atriplex patula_ L.
Orach. 7.

_Chenopodium album_ L.
Lamb's-quarters. 4,5,7.

**AMARANTHACEAE**

_Amaranthus hybridus_ L.
Green Amaranth. 2,5,7.

**PHYLLOLACCACEAE**

_Phyllostachys americana_ L.
Pokeweed. 1,3,5.

**PORTULACACEAE**

_Portulaca oleracea_ L.
Common Purslane. 3.

**CARYOPHYLLACEAE**

_Cerastium nutans_ Raf.
Nodding Mouse-ear Chickweed. 5.

_Lychmis alba_ Mill.
White Campion. 7.

_Saponaria officinalis_ L.
Soapwort. 7.

_Silene cucubalus_ Wibel
Bladder Campion. 1.

**RANUNCULACEAE**

_Anemone quinquefolia_ L.
Wood Anemone. 4.

_Anemone virginiana_ L.
Thimbleweed. 1,2,7.

_Clematis virginiana_ L.
Virgin's-bower. 1,7.

_Ranunculus abortivus_ L.
Kidney-leaf Buttercup. 1,2,4.

_Thalictrum dasycarpum_ Fisch. & Lall.
Purple Meadow-rue. 3,4,5,6,7.

**BERBERIDACEAE**

_Podophyllum peltatum_ L.
May-apple. 4.

**MENISPERMACEAE**

_Menispermum canadense_ L.
Moonseed. 4.

**CRUCIFERAE**

_Arabis canadensis_ L.
Sicklepod. 2.

_Barbaraea vulgaris_ R. Br.
Yellow Rocket. 3,4.

_Brassica kaber_ (DC.) L.C. Wheeler
Charlock. 6,7.

_Brassica nigra_ (L.) Koch
Black Mustard. 6,7.

_Capsella bursa-pastoris_ (L.) Medic.
Shepherd's Purse. 4,7.

_Descurainia pinnata_ (Walt.) Britt.,
var. brachycarpa (Richards.) Fern.
Tansy Mustard. 3.

_Lepidium campestre_ (L.) R. Br.
Cow-cress. 3,5,7.

_Lepidium virginicum_ L.
Poor Man's Pepper. 2.

_Nasturtium officinale_ R. Br.
True Water Cress. 2,3,4.

_Thlaspi arvense_ L.
Field Penny-cress. 5.

**CRASSULACEAE**

_Sedum telephium_ L.
Garden Orpine. 7.

**SAXIFRAGACEAE**

_Ribes americanum_ Mill.
Wild Black Currant. 1,2,4.

**PLATANACEAE**

_Platanus occidentalis_ L.
Sycamore. 1,2,4.

**ROSACEAE**

_Agrimonia parviflora_ Ait.
Small-flowered Agrimony. 1.

_Crataegus sp._
Hawthorn. 2,4.

_Crataegus sp._
Hawthorn. 2,4,6.

_Fragaria virginiana_ Duchesne
Strawberry. 1,2,3.
**Geum canadense** Jacq.  
White Avens.  1,6.

*Potentilla norvegica* L.  
Rough Cinquefoil.  3.

*Prunus americana* Marsh.  
Wild Plum.  4.

*Prunus virginiana* L.  
Choke Cherry.  1,2,4.

*Pyrus coronaria* L.  
Swamp Rose.  6,7.

*Rubus flagellaris* Willd.  
Common Dewberry.  4.

*Rubus occidentalis* L.  
Black Raspberry.  1,2,7.

**LEGUMINOSAE**

*Amphicarpa bracteata* (L.) Fern.  
Hog-peanut.  7.

*Cassia hebecarpa* Fern.  
Wild Senna.  1,2.

*Desmodium perplexum* Schub.  
Tick-trefoil.  1,2.

*Gleditsia triacanthos* L.  
Honey-locust.  4,5,6,7.

*Lathyrus palustris* L.  
Vetchling.  3.

*Medicago lupulina* L.  
Black Medick.  3,7.

*Medicago sativa* L.  
Alfalfa.  6.

*Melilotus alba* Desr.  
White Sweet Clover.  3,5,6,7.

*Melilotus officinalis* (L.) Lam.  
Yellow Sweet Clover.  5,7.

*Trifolium hybridum* L.  
Alsike Clover.  3.

*Trifolium pratense* L.  
Red Clover.  3,7.

**OXALIDACEAE**

*Oxalis europaea* Jord.  
Wood Sorrel.  1,5,6,7.

**GERANIACEAE**

*Geranium maculatum* L.  
Wild Cranesbill.  4.

**RUTACEAE**

*Xanthoxylum americanum* Mill.  
Prickly-ash.  1,2,4.

**EUPHORBIACEAE**

*Acalypha virginica* L.  
Three-seeded Mercury.  7.

*Euphorbia dentata* Michx.  
Toothed Spurge.  3.

*Euphorbia maculata* L.  
Eyebane.  3,6.

**ANACARDIACEAE**

*Rhus glabra* L.  
Smooth Sumac.  4.

*Rhus radicans* L.  
Poison-ivy.  1,2,3,4,5,6,7.

*Rhus typhina* L.  
Staghorn Sumac.  4,7.

**CELASTRACEAE**

*Celastrus scandens* L.  
Climbing Bittersweet.  2,3,4.

*Euonymus atrorubens* Jacq.  
Wahoo.  4.

**ACERACEAE**

*Acer negundo* L.  
Box elder.  1,2,4,7.

*Acer saccharinum* L.  
Siver Maple.  6,7.

**BALSAMINACEAE**

*Impatiens capensis* Meerb.  
Spotted Touch-me-not.  3,5,6,7.

**RHAMNACEAE**

*Rhamnus cathartica* Pursh  
Buckthorn.  2.

**VITACEAE**

*Parthenocissus inserta* (Kerner) K. Fritsch  
Woodbine.  1,2,3,4,7.

*Vitis riparia* Michx.  
River-bank Grape.  1,2.

**TILIACEAE**

*Tilia americana* L.  
Basswood.  4.

**MALVACEAE**

*Aputilon theophrasti* Medic.  
Velvet-leaf.  3,5.

*Malva neglecta* Wallr.  
Common Mallow.  7.

**VIOLACEAE**

*Viola papilionacea* Pursh  
Common Blue Violet.  2,7.

**ONAGRACEAE**

*Gaura biennis* L.  
Gaura.  6.

*Oenothera biennis* L.  
Common Evening-primrose.  5,6,7.

**UMBELLIFERAE**

*Angelica atropurpurea* L.  
Alexanders.  7.

*Chaerophyllum procumbens* (L.) Crantz  
Spreading Chervil.  5,6.

*Cicuta bulbifera* L.  
Bulb-bearing Water-hemlock.  1,3.

*Cicuta maculata* L.  
Spotted Water-hemlock.  7.

*Cryptotaenia canadensis* (L.) DC.  
Honewort.  1.

*Daucus carota* L.  
Wild Carrot.  3,5,6,7.

*Osmorhiza longistylis* (Torr.) DC.  
Anise-root.  1,4.

*Pastinaca sativa* L.  
Parsnip.  7.

*Sanicula canadensis* L.  
Black Snakeroot.  2,6.

*Sanicula peregrina* Bickn.  
Black Snakeroot.  1,4.

*Thaspium trifoliatum* (L.) Gray  
Meadow-parsnip.  3,4.
CORNACEAE
Cornus drummondii Meyer
Dogwood. 1,7.
Cornus obliqua Raf.
Silky Dogwood. 1,2,4,7.
Cornus racemosa Lam.
Pancled Dogwood. 1,2,4,7.
Cornus stolonifera Michx.
Red Osier. 1,2.

PRIMULACEAE
Lysimachia ciliata L.
Loosestrife. 3,5,6,7.

OLEACEAE
Fraxinus pennsylvanica Marsh.
Red Ash. 1,2,4,6.
Fraxinus pennsylvanica Marsh., var. subintegerrima (Vahl) Fern.
Green Ash. 1,2,4,6,7.
Syringa vulgaris L.
Lilac. 7.

APOCYNACEAE
Apocynum cannabinum L.
Indian Hemp. 3,7.

ASCLEPIADACEAE
Asclepias incarnata L.
Swamp Milkweed. 1,5,6,7.
Asclepias syriaca L.
Common Milkweed. 2,3,5,6,7.
*Asclepias tuberosa L.
Butterfly-weed.

CONVOLVULACEAE
Convolvulus sepium L.
Hedge Bindweed. 1,5,7.
*Cuscuta campestris Yuncker
Dodder on Trifolium pratense L.

BORAGINACEAE
Hackelia virginiana (L.) I. M. Johnston
Stickseed. 1.
Lithospermum arvense L.
Corn Gromwell. 3,7.

VERBENACEAE
Verbena hastata L.
Blue Vervain. 1,3,5,6,7.
Verbena urticifolia L.
White Vervain. 1.

LABIATAE
Agastache nepetoides (L.) Ktze.
Yellow Giant Hyssop. 6.
Glehoma hederacea L.
Ground-ivy. 6.
Lamium amplexicaule L.
Common Henbit. 5.
Lycopus americanus Muhl.
Water-horehound. 1,5,6.
Mentha arvensis L.
Mint. 5.
Mentha piperita L.
Peppermint. 1,2,3.
Nepeta cataria L.
Catnip. 2,7.

PRUNELLA vulgaris L.
Heal-all. 3,6.
Pycnanthemum virginianum (L.) Durand & Jackson
Mountain-mint. 2.
Scutellaria lateriflora L.
Mad-dog Skullcap. 5.
Stachys tenuifolia Wild.
Hedge-nettle. 5.
Teucrium occidentale Gray
Hairy Germander. 5.

SOLANACEAE
Datura stramonium L.
Common Jimsonweed. 2,6.
Physalis heterophylla Nees
Ground-cherry. 3,5.
Physalis subglabra Mackenz. & Bush
Ground-cherry. 5.
Solanum dulcamara L.
Bittersweet Nightshade. 1,2,3,5,7.
Solanum nigrum L.
Black Nightshade. 5.

SCROPHULARIACEAE
Gerardia purpurea L.
Gerardia. 1.
Mimulus ringens L.
Monkey-flower. 5,6,7.
Scrophularia marilandica L.
Carpenter’s-square. 6.
Verbascum blattaria L.
Moth Mullein. 7.
Verbascum thapsus L.
Common Mullein. 2,3.

LENTIBULARIACEAE
Utricularia vulgaris L.
Bladderwort. 1.

PLANTAGINACEAE
Plantago lanceolata L.
English Plantain. 6.
Plantago major L. x P. rugelii Dcne.
Plantain. 7.

Rubiaceae
Galium aparine L.
Common Cleavers. 1,2,3,4,5,6,7.
Galium concinnum T. & G.
Shining Bedstraw. 4.
Galium triflorum Michx.
Fragrant Bedstraw. 1,2,4.

CAPRIFOLIACEAE
Lonicer a latava L.
Tartarian Honeysuckle. 2.
Sambucus canadensis L.
Common Elder. 1,2,3,7.
Triosteum perfoliatum L.
Tinker’s Weed. 4.
Viburnum lentago L.
Sweet Viburnum. 1,2.

VALERIANACEAE
Valerianella umbilicata (Sulliv.) Wood
Corn-salad. 5,6,7.
DIPSACACEAE

*Dipsacus sylvestris* Huds.
Wild Teasel. 3,6,7.

CUCURBITACEAE

*Echinocystis lobata* (Michx.) T. & G.
Wild Cucumber. 1,5,6,7.

CAMANULACEAE

*Lobelia siphilitica* L.
Great Blue Lobelia. 2,5,6.
*Lobelia spicata* Lam.
Pale-spike Lobelia. 2.

COMPOSITAE

*Ambrosia artemesifolia* L.
Common Ragweed. 2,5,6.
*Ambrosia trifida* L.
Great Ragweed. 1,5,6,7.
*Anthemis cotula* L.
Stinking Chamomile. 6.
*Arctium minus* (Hill) Bernh.
Common Burdock. 4,5,6.
*Aster juncifolius* Rydb.
Aster. 1.
*Aster novae-angliae* L.
New England Aster. 2,4,5,6,7.
*Aster pilosus* Willd.
Aster. 7.
*Aster sagittifolius* Wedemeyer
Arrow-leaved Aster. 4.
*Aster simplex* Willd.
Aster. 7.
*Bidens cernua* L.
Sticktight. 5,7.
*Bidens connata* Muhl.
Beggarticks. 1,4,5,7.
*Bidens frondosa* L.
Beggarticks. 5,6,7.
*Cichorium intybus* L.
Chickory. 7.
*Cirsium arvense* (L.) Scop.
Canada Thistle. 3,5,6,7.
*Cirsium vulgare* (Savi) Tenore
Bull Thistle. 3,5,6,7.
*Erigeron annuus* (L.) Pers.
Daisy Fleabane. 2,7.

*Erigeron canadensis* L.
Horse-Weed. 3.
*Erigeron philadelphicus* L.
Philadelphia Fleabane. 2.
*Eupatorium maculatum* L.
Joe-Pye-Weed. 3,5,7.
*Eupatorium perfoliatum* L.
Common Boneset. 1,3,5.
*Eupatorium rugosum* Houtt.
White Snakeroot. 1,2,3,6.
*Galinsoga ciliaris* (Raf.) Blake
Galinsoga. 7.
*Helianthus giganteus* L.
Sunflower. 3,6,7.
*Heliopsis helianthoides* (L.) Sweet
Ox-eye. 5,6,7.
*Lactuca floridana* (L.) Gaertn.
Blue Lettuce. 5,7.
*Lactuca scariola* L.
Prickly Lettuce. 5,6,7.
*Prenanthes alba* L.
White Lettuce. 2.
*Ratibida pinnata* (Vent.) Barnh.
Prairie-coneflower. 2,8.
*Rudbeckia laciniata* L.
Coneflower. 5,6,7.
*Rudbeckia triloba* L.
Coneflower. 1,3,6,7.
*Senecio aureus* L.
Golden Ragwort. 3.
*Senecio obovatus* Muhl.
Ragwort. 1.
*Silphium terebinthinaceum* Jacq.
Prairie-dock. 3,7.
*Solidago altissima* L.
Goldenrod. 4.
*Solidago canadensis* L.
Canada Goldenrod. 1,4,5,6,7.
*Solidago gigantea* Ait., var. *leiophylla* Fern.
Goldenrod. 6.
*Solidago graminifolia* (L.) Salisb.
Grass-leaved Goldenrod. 5,7.
*Sonchus oleraceus* L.
Common Sow-thistle. 5.
*Taraxacum officinale* Weber
Common Dandelion. 2,4,5,6,7.
*Vernonia altissima* Nutt.
Tall Ironweed. 5,6,7.
*Xanthium pensylvanicum* Wallr.
Cocklebur. 1,3,7.

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**LITERATURE CITED**


