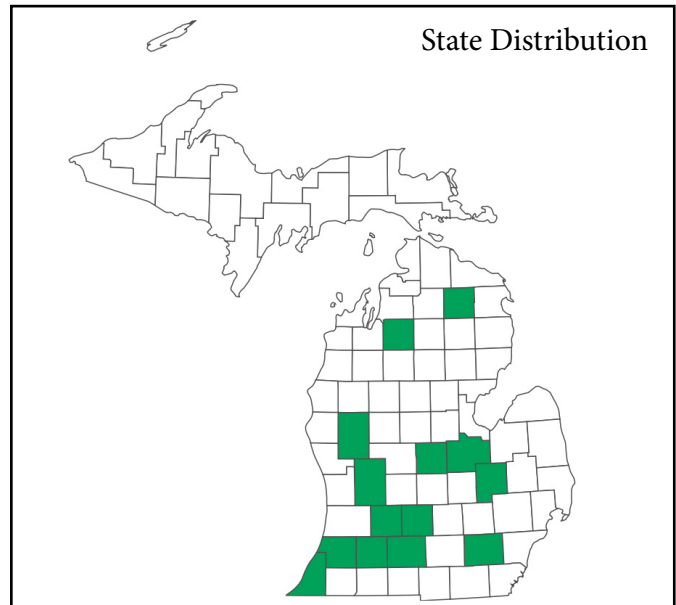
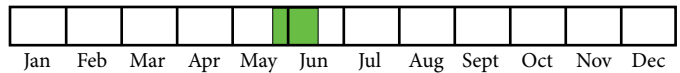




Tyler Basset, MNFI



Best Survey Period



Status: State Threatened

Global and state rank: G5 (Globally Secure) /S1 (State Critically Imperiled)

Other common names: large whorled pogonia orchid, large whorled pogonia, purple fiveleaf orchid

Synonyms: *Arethusa verticillata* Muhl. ex Willd., *Pogonia verticillata* (Muhl. ex Willd.) Nutt.

Family: Orchidaceae (orchid family)

Taxonomy: Gotthilf Heinrich Ernst Muhlenberg of Pennsylvania was the first to formally describe this species in 1805, placing it within the genus *Arethusa* due to the resemblance of the flower to other species within this genus (Wherry 1938, Hill 2007). In 1808, French botanist, Constantine Rafinesque, believed this species was different enough from other plants categorized as *Arethusa* to justify the naming of *Isotria* as a genus. *Isotria* is derived from the Greek words “isos” (equal) and “tria” (three), referring to the three equally shaped sepals. The specific epithet corresponds to the

English word “verticillate,” referencing the whorled arrangement of its leaves. Within the Orchidaceae, *Isotria* is placed within the sub-family Vanilloideae and tribe Pogonieae. The only other Michigan genus within this tribe or sub-family is *Pogonia* (Chase et al. 2015). There are only two species under this genus worldwide and both are native to eastern North America (Kartesz 2025). The second species, *I. medeoloides* (smaller whorled pogonia), is considered extirpated in Michigan (MNFI 2025a).

Total range: The native range of this species extends from eastern Texas and Oklahoma north to Michigan, east to southern Maine, and south to the Florida panhandle. It is listed as SX (Presumed Extirpated) in Maine; SH (Possibly Extirpated) in Ontario; S1 (Critically Imperiled) in Florida, Illinois, Missouri, New Hampshire, Oklahoma, and Texas; S2 (Imperiled) in Alabama, South Carolina, and Vermont; S3 (Vulnerable) in Connecticut, Delaware, Georgia, Indiana, Louisiana, Massachusetts, Mississippi, New York, Rhode Island, and Tennessee; and Apparently Secure, Secure, or Unranked in other states within its range (Kartesz 2025, NatureServe 2025).



State distribution: In Michigan, this species is known or historically known from 19 occurrences across 14 counties in the Lower Peninsula; all but three of these populations were documented prior to 1980 (MNFI 2025b). Documented locations span from Berrien County east to Washtenaw County north to Montmorency County and southwest to Newaygo County. Despite this latitudinal range, 16 of 19 occurrences are located south of the climatic tension zone.

Recognition: *Isotria verticillata* is a glabrous, small (4-40 cm), clonal forb of acidic soils in dry to mesic forests, swamps, and sphagnum bogs (Mehrhoff and Homoya 1993). **The stems are singular and hollow, each terminated by a single whorl of typically five (seldom two, four, or six) oblanceolate to lanceolate leaves.** The leaves are between 2.5 and 10 cm long and 0.7 to 5.3 cm wide with an obtuse to acuminate apex (Mehrhoff and Homoya 1993). The inflorescence is terminal, sitting on a short pedicel, and typically contains a single flower although two can be present in particularly vigorous plants. **The ascending to erect flowers have three long, purple sepals 3.4 to 6.7 cm long, three yellow-green petals that fuse to form a hood, and a trough-shaped lip that is greenish-yellow to white towards the tip and streaked purple towards the base** (Homoya 1993, Reznicek et al. 2025).

This species may be confused with *Isotria medeoloides* (small whorled pogonia); however, the flower of this species is sessile and the only documented population in Michigan has not been reported since 1983 (MNFI 2025b). **Both species of *Isotria* vegetatively resemble *Medeola virginiana* (Indian cucumber-root), but these can best be distinguished by the former having glabrous, often glaucous, smooth stems and the latter having downy pubescent, non-fleshy stems at least at their base** (Homoya 1993, Hill 2007, Reznicek et al. 2025).

Best survey time/phenology: *Isotria verticillata* is most easily identified during its flowering period



Elizabeth Haber, MNFI

between late-May and mid-June.

Habitat: In Michigan, this species has been documented on shorelines, in *Larix laricina* (tamarack) or *Picea mariana* (black spruce) sections of sphagnum-dominated bogs, and occasionally in young dry-mesic forests on sandy, acid soil under canopies of *Quercus* spp. (oak) and *Acer rubrum* (red maple) (Reznicek et al. 2025, MNFI 2025b). A statewide assessment concluded that light availability was generally patchy on most sites while the aspect of sun exposure varied (Bassett et al. 2022). Although ample dry-mesic northern forest exists in the Upper Peninsula, this species has never been documented outside of the Lower Peninsula despite populations in similar habitats of New England (Effron and Briggs 1986).

Isotria verticillata occurs in bog, dry-mesic northern and southern forest, poor conifer swamp, southern hardwood swamp, and on shores (Cohen et al. 2014). Michigan populations of dry-mesic



forests are primarily found in young, second-growth deciduous stands that allow for partial light penetration. Woody associates of mesic to wet sites include *Acer rubrum* (red maple), *Aronia prunifolia* (chokeberry), *Betula alleghaniensis* (yellow birch), *Fraxinus* spp. (ash), *Ilex verticillata* (Michigan holly), *Ilex mucronata* (mountain holly), *Larix laricina* (tamarack), *Lindera benzoin* (spicebush), *Nyssa sylvatica* (black-gum), *Picea mariana* (black spruce), *Toxicodendron vernix* (poison sumac), *Ulmus americana* (American elm), and *Vaccinium corymbosum* (highbush blueberry). Woody associates of drier sites include *Amelanchier* spp. (serviceberry), *Gaultheria procumbens* (wintergreen), *Gaylussacia baccata* (huckleberry), *Hamamelis virginiana* (witch-hazel), *Mitchella repens* (partridgeberry), *Pinus strobus* (white pine), *Quercus alba* (white oak), *Quercus rubra* (northern red oak), *Quercus velutina* (black oak), *Sassafras albidum* (sassafras), *Vaccinium angustifolium* (low sweet blueberry), *Vaccinium myrtilloides* (velvetleaf blueberry), and *Viburnum acerifolium* (maple-leaved viburnum) (MNFI 2025b).

Herbaceous associates of mesic to wet sites include *Carex atlantica* (prickly bog sedge), *Carex canescens* (hoary sedge), *Carex disperma* (softleaf sedge), *Carex leptalea* (bristly-stalked sedge), *Carex trisperma* (three-seeded sedge), *Coptis trifolia* (goldthread), *Menyanthes trifoliata* (bog buckbean), *Osmundastrum cinnamomeum* (cinnamon fern), *Platanthera clavellata* (club-spur orchid), *Sphagnum* mosses, *Symplocarpus foetidus* (skunk-cabbage), and *Thelypteris palustris* (marsh fern). Herbaceous associates of drier sites include *Carex pensylvanica* (Pennsylvania sedge), *Cypripedium acaule* (pink lady-slipper), *Maianthemum canadense* (Canada mayflower), *Pteridium aquilinum* (bracken fern), and *Trientalis borealis* (star-flower) (MNFI 2025b).

Biology: *Isotria verticillata* is a self-compatible perennial species that can form clones with many stems connected by underground rhizomes. Mycorrhizal fungi are necessary for seedling establishment and nutrient acquisition like other



orchids (Mehroff and Homoya 1993, Rasmussen and Rasmussen 2014). Similarly, *I. verticillata* can experience long periods of dormancy akin to many orchids (Shefferson and Tali 2007, Alahuhta et al. 2014) and emergence is inconsistent across Michigan until the first week of June (Bassett et al. 2022). Flowers last between three and four days (Case 1987). The flowers lack nectar but exhibit visible nectar guides, encouraging pollination by several genera of native bees in the Andrenidae, Anthophoridae, and Halictidae families (Mehroff and Homoya 1993, Haines et al. 2011). The pollen grains, which are not contained in pollinia unlike most orchid species (Johnson and Edwards 2000), are often deposited on several consecutive bees' thoraxes as they visit the same flower. After pollination occurs, the ovary matures into a light green capsule 2-4 cm long on the flowering stem (Haines et al. 2011).

Conservation/management: In Michigan, nine of 19 records are ranked H (Historical), one as F (Failed to Find), two as C or CD (Fair or Fair to Poor estimated viability), four as B or BC (Good or Good to Fair), one as AB (Excellent to Good), and two as E (Viability not assessed). Reliance on mycorrhizal associations for seedling establishment and the potential influence of clonality on fertility and genetic diversity render this species inherently vulnerable to both natural and artificial



disturbances (Barrett 2015).

Since many state occurrences of this species are in bogs, the same primary threats to this community also impact *Isotria verticillata*. Alteration of hydrology from road construction, installation of drainage ditches and dams, and nutrient loading from runoff all lead to significant modifications to vegetative structure and composition (Asada et al. 2005, Kreutzweiser et al. 2008, Willier et al. 2022). Additionally, Michigan and four other states contribute to 98% of peat mining operations in the United States, a process which degrades the ecological integrity of peatlands (Winkler and DeWitt 1985, Reumer et al. 2018, USGS 2024). Conserving populations of *I. verticillata* in bog communities requires avoiding the construction of new roads that bisect peatlands, installing/maintaining culverts under preexisting roads to reduce flooding and drying (Jeglum 1975), using prescribed fire or selective cutting to moderate woody encroachment where appropriate, and reducing general access to peatlands where trampling and compaction from all-terrain vehicles can occur.

In upland or mesic environments, *I. verticillata* is threatened by land-use conversion, habitat fragmentation, and forestry management practices (Hill 2007, NatureServe 2025). This species will always remain at risk of off-target damage via logging operations where populations exist on state forest lands even if occurrences are well-documented prior to harvesting (Bassett 2022). While prolonged dormancy may provide a mechanism by which populations can recover with forest succession following a timber cut, it is possible that increased light exposure from opening the canopy may lead to heat stress (Hill 2007, Fryer 2019). Avoiding clear-cutting in favor of selective thinning should lessen the negative impacts of canopy removal. It is important that land managers and foresters be supplied with the proper spatial data for consultation during multiple stages of every timber harvest including field inventory and desktop compartment review.



Across environments, this species is also threatened by poaching, trampling, deer herbivory, invasive plant species, and forest pests and pathogens that influence vegetation dynamics. Nonnative honeysuckle (*Lonicera* spp.), glossy buckthorn (*Frangula alnus*), and multiflora rose (*Rosa multiflora*) are present or common across multiple sites as well as evidence of tree mortality via spongy moth (*Lymantria dispar*) (Bassett et al. 2022, MNFI 2025b). Pests such as emerald ash borer (*Agrilus planipennis*) and spongy moth are indirect threats as they have killed millions of trees throughout Michigan and the northeast, altering species composition and structure of upland and lowland forests (Poland and McCullough 2006, Mull and Spears 2022). Loss of hardwood trees, particularly ash (*Fraxinus* spp.), opens the forest canopy which causes an increase in invasive species like reed canary grass (*Phalaris arundinacea*) and a conversion to disturbed herbaceous communities on wet to mesic sites (D'Amato et al. 2018).

Comments: This species is cryptic in nature, with aboveground emergence varying from year to year, thus increasing the likelihood of it being overlooked, even in sites where it currently exists. *Isotria verticillata* is dormant in certain years and is particularly difficult to identify without flowers in dense habitat that also contains *Medeola virginiana*. Furthermore, its precise emergence window in the late spring can be hard to predict.



The other species of *Isotria*, *I. medeoloides* (smaller whorled pogonia), was historically found in Michigan but is now considered extirpated (MNFI 2025a). This species is federally threatened and has not been observed at the only known Michigan site since 1983. Despite this, the land surrounding the occurrence is protected and suitable habitat could exist in the vicinity. *Isotria medeoloides* was recently rediscovered in Vermont after not being seen since 1902 (Vermont Fish and Wildlife Department 2022), indicating that renewed efforts to search for this similarly cryptic species may prove successful.

Research Needs: Bassett et al. (2022) highlight the need for species distribution modeling, monitoring of existing populations, and additional surveys for new populations. Suitable survey sites could be identified from data collected during this study as well as from species distribution modeling and aerial photo interpretation. Population trends for this species could not be assessed because previous population data was lacking, suggesting that repeated observation of known occurrences would clarify trends and possibly help relate them to environmental factors.

Related abstracts: bog, dry-mesic northern forest, dry-mesic southern forest, poor conifer swamp, and southern hardwood swamp.

Selected references:

Alahuhta, K., E. Crone, A. Ettinger, H. Hens, A. Jakalaniemi, and J. Tuomi. 2014. Instant death, slow death, and the consequences of assumptions about prolonged dormancy for plant population dynamics. *Journal of Ecology* 105: 471-483.

Asada, T., B.G. Warner, and S.L. Schiff. 2005. Effects of shallow flooding on vegetation and carbon pools in boreal peatlands. *Applied Vegetation Science* 8: 199-208.

Barrett S.C. 2015. Influences of clonality on plant



sexual reproduction. *Proceedings of the National Academy of Sciences of the United States of America* 112: 8859-8866.

Bassett, T.J., E.A. Haber, L.N. May, and J.M. McLaughlin. 2022. Conservation Status Update of Whorled Pogonia (*Isotria verticillata*) in Michigan. Michigan Natural Features Inventory Report Number 2022-32, Lansing, Michigan, USA. 36 pp.

Case, F.W., Jr. 1987. Orchids of the Western Great Lakes Region. Revised Edition. Bulletin 48, Cranbrook Institute of Science, Bloomfield Hills, Michigan, USA. 251 pp.

Chase, M.W., K.M. Cameron, J.V. Freudenstein, A.M. Pridgeon, G. Salazar, C. van den Berg, and A. Schuiteman. 2015. An updated classification of Orchidaceae. *Botanical Journal of the Linnaean Society* 177: 151-174.

Cohen, J.G., M.A. Kost, B.S. Slaughter and D.A. Albert. 2014. *A Field Guide to the Natural Communities of Michigan*. MSU Press, East Lansing, Michigan, USA. 362 pp.

D'Amato, A., B. Palik, R. Slesak, G. Edge, C. Matula, and D. Bronson. 2018. Evaluating adaptive management options for black ash forests in the face of emerald ash borer invasion. *Forests* 9: 348-365.



Effron, M. and E.C. Briggs. 1986. Rediscovery of *Isotria verticillata* (Willd.) Raf. (Orchidaceae) in Vermont. *Rhodora* 88: 407-408.

Fryer, J.L. 2019. *Isotria medeoloides*, small whorled pogonia and *Isotria verticillata*, large whorled pogonia. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available online: <www.fs.usda.gov/database/feis/plants/forb/isospp/all.html>.

Haines, A., E. Farnsworth, and G. Morrison. 2011. New England Wild Flower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Yale University Press, New Haven, Connecticut, USA.

Hill, S.R. 2007. Conservation Assessment for the Large Whorled Pogonia Orchid (*Isotria verticillata* [Muhl. ex Willd.] Raf.). Division of Biodiversity and Ecological Entomology - Biotic Surveys and Monitoring Section. INHS Technical Report 2007 (8).

Homoya, M.A. 1993. Orchids of Indiana. Indiana University Press: Bloomington, Indiana, USA. 276 pp.

Jeglum, J.K. 1975. Vegetation-habitat changes caused by damming a peatland drainageway in northern Ontario. *Canadian Field Naturalist* 89: 400-412.

Johnson, S.D. and T.J. Edwards. 2002. The structure and function of orchid pollinaria. *Plant Systematics and Evolution* 222: 243-269. Available online: <<https://doi.org/10.1007/BF00984105>>.

Kartesz, J.T. 2025. The Biota of North America Program: North American Vascular Flora. <<http://www.bonap.org/>>. Accessed 06 January 2025.



Kreutzweiser, D.P., P.W. Hazlett, and J.M. Gun. 2008. Logging impacts on the biogeochemistry of boreal forest soils and nutrient export to aquatic systems: A review. *Environmental Reviews* 16: 157-179.

Michigan Natural Features Inventory (MNFI). 2025a. Michigan's Rare Plants. Available online: <<https://mnfi.anr.msu.edu/species/plants>>.

Michigan Natural Features Inventory (MNFI). 2025b. Michigan Natural Heritage Database, Lansing, Michigan, USA.

Mehrhoff, L.A. and M.A. Homoya. 1993. *Isotria verticillata*. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 22+ vols. New York and Oxford. Vol. 26. <http://floranorthamerica.org/Isotria_verticillata>. Accessed 07 January 2025.

Mull, A. and L.R. Spears. 2022. Spongy moth (*Lymantria dispar dispar* Linnaeus) [Fact sheet]. Utah State University Extension. Available online: <https://digitalcommons.usu.edu/extension_curall/2257/>.

NatureServe. 2025. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer Web. <<https://explorer.natureserve.org/>>. Accessed 07 January 2025.



Poland, T.M. and D.G. McCullough. 2006. Emerald ash borer: invasion of the urban forest and the threat to North America's ash resource. *Journal of Forestry* 104: 118-124.

Rasmussen H.N. and F.N. Rasmussen. 2014. Seedling mycorrhiza: a discussion of origin and evolution in Orchidaceae. *Botanical Journal of the Linnean Society* 175: 313-327.

Reumer, M., M. Harnisz, H.J. Lee, A. Reim, O. Grunert, A. Putkinen, H. Fritze, P.L.E. Bodelier, and A. Ho. 2018. Impact of peat mining and restoration on methane turnover potential and methane-cycling microorganisms in a northern bog. *Applied and Environmental Microbiology* 84: e02218-17.

Reznicek, A.A., E.G. Voss, and B.S. Walters. 2025. Michigan Flora Online. University of Michigan. Web. <<https://lsa-miflora-p.lsa.umich.edu/#/record/1882>>. Accessed 07 January 2025.

Shefferson, R.P. and K. Tali. 2007. Dormancy is associated with decreased adult survival in the burnt orchid, *Neotinea ustulata*. *Journal of Ecology* 95: 217-225. Available online: <<https://doi.org/10.1111/j.1365-2745.2006.01195.x>>.

United States Geological Survey (USGS). 2024. Mineral Commodity Summaries – Peat. Available online: <<https://pubs.usgs.gov/periodicals/mcs2024/mcs2024-peat.pdf>>.

Vermont Fish and Wildlife Department. 2022. Federally Threatened Orchid Discovered in Vermont. Available online: <<https://vtfishandwildlife.com/newsroom/federally-threatened-orchid-discovered-in-vermont>>. Press Release.

Wherry, E.T. 1938. Notable Pennsylvania orchids. *Proceedings of the Pennsylvania Academy of Science* 12: 42-45. Available online: <<http://www.jstor.org/stable/44108981>>.



Willier, C.N., J.M. Dennett, K.J. Devito, C.W. Bater, and S.E. Nielsen. 2022. The extent and magnitude of edge effects on woody vegetation in road-bisected treed peatlands in boreal Alberta, Canada. *Ecohydrology* 15: e2455.

Wilhelm, G. and L. Rericha. 2017. *Flora of the Chicago Region: A Floristic and Ecological Synthesis*. Indiana Academy of Science, Indianapolis, Indiana, USA.

Winkler, M.G. and C.B. DeWitt. 1985. Environmental impacts of peat mining in the United States: documentation for wetland conservation. *Environmental Conservation* 12: 317-330.

Abstract citation: Wojtowicz, C.C. and S.M. Warner. 2025. Special plant abstract for *Isotria verticillata* (whorled pogonia). Michigan Natural Features Inventory. Lansing, MI.

Copyright 2025 Michigan State University Board of Trustees.

Michigan State University Extension is an affirmative-action, equal-opportunity organization.

Funding for abstract provided by Michigan Department of Transportation

