Xyris montana

Northern Yellow-eyed-grass

Xyridaceae

Xyris montana by Joshua Mayer, 2016

***Xyris montana* Rare Plant Profile**

New Jersey Department of Environmental Protection
State Parks, Forests & Historic Sites
State Forest Fire Service & Forestry
Office of Natural Lands Management
New Jersey Natural Heritage Program

501 E. State St.
PO Box 420
Trenton, NJ 08625-0420

Prepared by:
Jill S. Dodds
jsdodds@biostarassociates.com

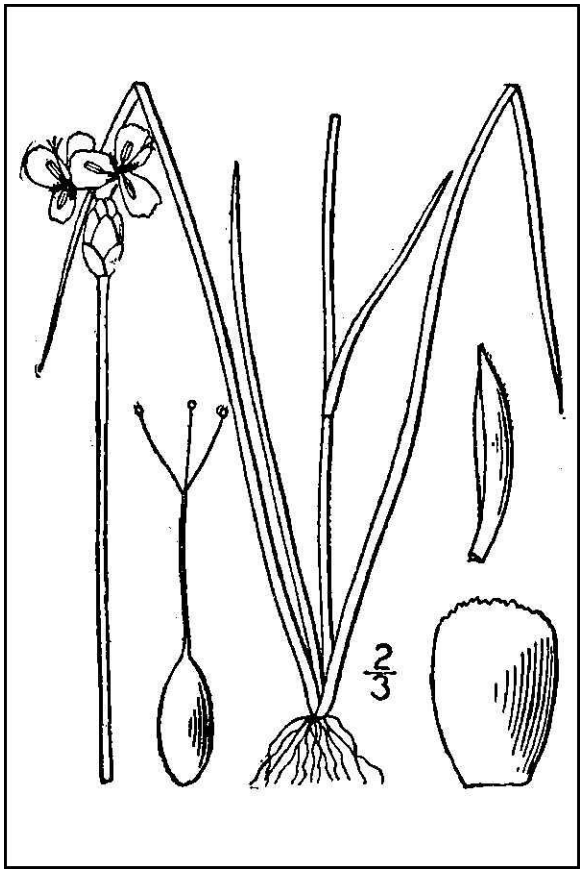
August, 2022

For:
New Jersey Department of Environmental Protection
Office of Natural Lands Management
New Jersey Natural Heritage Program
natlands@dep.nj.gov

This report should be cited as follows: Dodds, Jill S. 2022. *Xyris montana* Rare Plant Profile. New Jersey Department of Environmental Protection, State Parks, Forests & Historic Sites, State Forest Fire Service & Forestry, Office of Natural Lands Management, New Jersey Natural Heritage Program, Trenton, NJ. 15 pp.

Life History

Xyris montana (Northern Yellow-eyed-grass) is a perennial herb in the Xyridaceae. Northern Yellow-eyed-grass has shallow roots that are fibrous and unbranched (Reis 1892, Kral 1966). The plants are rhizomatous and grow in tufts, sometimes forming dense mats (Haberer 1905, Fernald 1921, Kral 1966, Les 2020). The leaves are basal with soft, papillate, reddish sheaths and the blades are linear, deep green and 4–15 cm long. The wiry scapes of the inflorescence are 5–30 cm tall with 2–4 ridges near the top and they may be straight or twisted. The flowering spikes of *Xyris* plants are dense and somewhat conelike with a number of overlapping bracts; those of *X. montana* are ovoid or ellipsoid and 4–8 mm long. The small yellow flowers have three petals and are solitary in the axils of the bracts. *Xyris* flowers have three unequal sepals which are partially or completely concealed behind the bracts: The innermost one is membranous but the characteristics of the two lateral sepals are often helpful in distinguishing species. Both the petals and the innermost sepal are deciduous but the lateral sepals remain attached to the fruit. The lateral sepals of *X. montana* have keels that are jagged or smooth but not fringed, and the tips are firm, red, and slightly protruding beyond the edge of the bracts. (See Britton and Brown 1913, Fernald 1950, Kral 1966, Gleason and Cronquist 1991, Kral 2020). Occasionally the lowest scale of a *Xyris montana* spike develops as a bract 5–15 mm in length (Haberer 1905).



Left: Britton and Brown 1913, courtesy USDA NRCS 2022a. Right: Sean Blaney, 2021.

Fernald (1927) cited the very narrow leaves and small ovoid heads as distinctive characters of *Xyris montana*, and on an earlier trip to Nova Scotia he had also observed that the ready

separation of the scape was unique to the species. In reference to *X. montana*, Fernald (1921) said "*In collecting sods of this northern representative of an austral genus we constantly found our hands filled with loose needle-like flowering and fruiting scapes, for in this species, it appeared, the scapes are unique in freely disarticulating at the very base, all our other species of Xyris firmly holding their fruiting scape through the winter*".

Taylor (1915) reported that the growing season of *Xyris montana* lasted for 118 days. The plants can overwinter as seedlings and mature plants perennate via their rhizomes (Kral 1966). In New Jersey, *X. montana* may bloom from early July through August and fruit is produced during August and September (Hough 1983). *Xyris* flowers last for less than a day, and the time of day that the plants bloom varies according to the species (Kral 1966). Flowers of *X. montana* open in the morning (Les 2020).

Pollinator Dynamics

A specific pollination mechanism has not been identified for *Xyris montana*. Bees are the primary pollinators in the Xyridaceae (Kral 1998) and both bees and flies have been observed visiting the flowers of *Xyris* species (Kral 2020, Les 2020). Self-compatibility reportedly varies within the genus (Les 2020). Some yellow-eyed-grasses are thought to be capable of developing seeds without fertilization (apomixis), and wind may also play a role in the pollination of some *Xyris* flowers (Kral 1983).

The North American species of *Xyris* do not have nectaries or a scent, and they produce relatively small amounts of pollen (Kral 1966, 2020). *Xyris* flowers are typically open for just a few hours (Kral 1983), limiting the opportunity for cross-fertilization of any kind. However, a pollination study of *X. tennesseensis* showed that the flowers did receive a number of insect visitors during the brief time that they were open (Boyd et al. 2011). In fact, one bee species (*Lasioglossum zephyrum*) did not wait for the flowers of *X. tennesseensis* to open but removed the sheathing lower sepal as the flower bud emerged in order to gain early access to the pollen (Wall et al. 2002). The research conducted on *X. tennesseensis* by Boyd et al. (2011) indicated that both halictid bees and syrphid flies visited the flowers to obtain pollen but only the bees transported a significant amount of pollen to other flowers. However, the authors concluded that the role of insects in pollination was not essential because there was no significant difference in seed set between insect-pollinated flowers and those from which insects had been excluded.

While some insects exploit *Xyris* flowers for their pollen, there is another organism that exploits the insect visitors of some yellow-eyed-grasses. *Fusarium xyrophilum* is a fungus that infects *Xyris* plants, inhibits their floral development, and produces showy yellow pseudoflowers on the spikes. Insects attracted to the pseudoflowers then disperse the spores of the fungus to other *Xyris* plants. To date, the fungus has only been reported on *Xyris* species in South America (Slot and Kasson 2021).

Seed Dispersal

Xyris fruits are many-seeded capsules (Fernald 1950), although seed set in *X. montana* can be quite low (Kral 1966, Les 2020). *Xyris montana* seeds are narrowly ellipsoid and 0.7–0.9 mm long (Kral 2020). *Xyris* seeds fall or are shaken from the capsules by the spreading of bracts and sepals or the toppling of old scapes (Kral 1998). The basal disarticulation of *X. montana* scapes remarked upon by Fernald (1921) may help to deposit seeds at some distance from the parent plants. *Xyris* seeds are often buoyant so they may drift if they land on water (Kral 1998), and both wind and post-consumption mammalian dispersal have also been reported in the genus (Les 2020).

Xyris seeds can germinate within two weeks if they land on a moist substrate, but in dry conditions they are able remain dormant for years (Kral 1998). Germination may occur regardless of the season as long as there is adequate moisture, warmth, and sunlight. The seed husks often remain attached to the linear cotyledons for several weeks. After about a month, *Xyris* seedlings form small, usually fan-shaped rosettes of five or more leaves. Most species flower within a year, so seeds released during the fall may develop into blooming plants by the following summer (Kral 1966).

Habitat

Xyris montana usually grows in deep sphagnum mats at elevations of 0–500 meters (Kral 2020). The substrate is typically acidic, and pH ranges from 3.7–6.7 have been reported (Barr 1996, Almquist and Calhoun 2003, Les 2020). In Minnesota, *X. montana* has been found in transitional ecotones between circumneutral sedge fens and strongly acid *Sphagnum* bogs (Gorham et al. 1979a). The *Sphagnum* mats supporting *X. montana* may be floating (Clausen 1939, Barr 1996, Crow and Fahey 2004, Rhoads and Block 2007, NJNHP 2022) or associated with more established bogs, fens, seeps, muskegs, or glacial lake shores (Fernald 1918, Fairbrothers and Hough 1973, Kral 2020, Les 2020). In patterned fens, *X. montana* may occur in a number of microhabitats including flarks, fen pools, and ponded sedge lawns (Almquist and Calhoun 2003, Gorham et al. 1979b, Gorham and Janssens 1992, Graeff 2018, Wheeler et al. 1983).

The floating mat beneath one Pennsylvania occurrence of *Xyris montana* at an open, sunny site was composed of *Sphagnum cuspidatum*, *S. fallax*, *S. magellanicum*, and *S. recurvum*, and the yellow-eyed-grass was growing with an assortment of sedges such as *Eriophorum gracile*, *Rhynchospora alba*, *Carex canescens* and *C. limosa* (Barr 1996). At a site in Newfoundland and Labrador reported associates of *X. montana* included *Bartonia paniculata* and *Schizaea pusilla* (Quinn 2008) and in Minnesota the species co-occurred with plants such as *Lycopodiella inundata*, *Scheuchzeria palustris*, *Rhynchospora alba* and *R. fusca* (MNDNR 2022). In the northeast, Northern Yellow-eyed-grass can sometimes be found growing among low ericaceous shrubs such as *Chamaedaphne calyculata*, *Andromeda glaucophylla* and *Kalmia polifolia* (Crow and Fahey 2004, Lynn and Karlin 1985, Karlin and Lynn 1988). It appears that *Xyris montana* is tolerant of beaver activity, as it has been noted as growing in beaver meadows (Haberer 1905)

and persisting at sites that have been altered by beavers (Lynn and Karlin 1985, Mitchell and Niering 1993).

Wetland Indicator Status

Xyris montana is an obligate wetland species, meaning that it almost always occurs in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2022b)

XYMO

Coefficient of Conservatism (Walz et al. 2018)

CoC = 10. Criteria for a value of 9 to 10: Native with a narrow range of ecological tolerances, high fidelity to particular habitat conditions, and sensitive to anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

The global range of *Xyris montana* is restricted to the northeastern United States and Canada (POWO 2022). Most or all populations occur within the area affected by the Wisconsin glacier (Kral 2020). The map in Figure 1 depicts the extent of *X. montana* in North America.

The USDA PLANTS Database (2022b) shows records of *Xyris montana* in five New Jersey counties: Bergen, Monmouth, Morris, Passaic, and Sussex (Figure 2). Some herbarium specimens labeled as *X. montana* also originated in Burlington and Ocean counties (Mid-Atlantic Herbaria 2022). The data include historic reports and do not accurately reflect the distribution of the species.

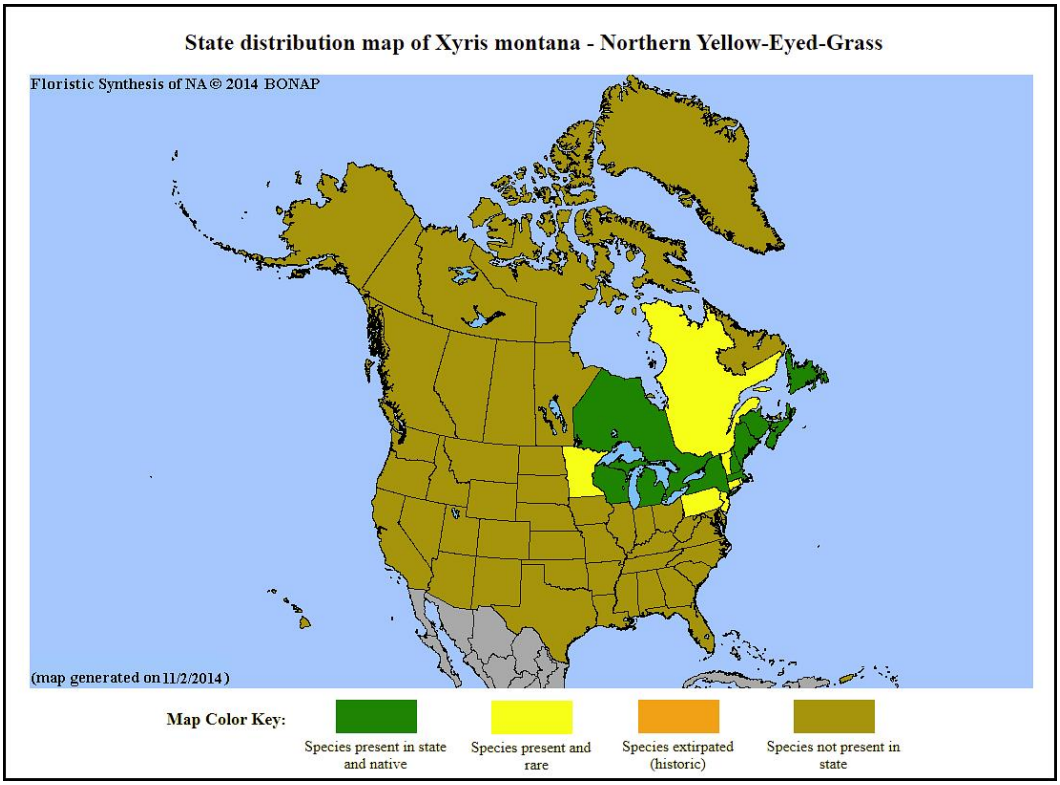


Figure 1. Distribution of X. montana in North America, adapted from BONAP (Kartesz 2015).

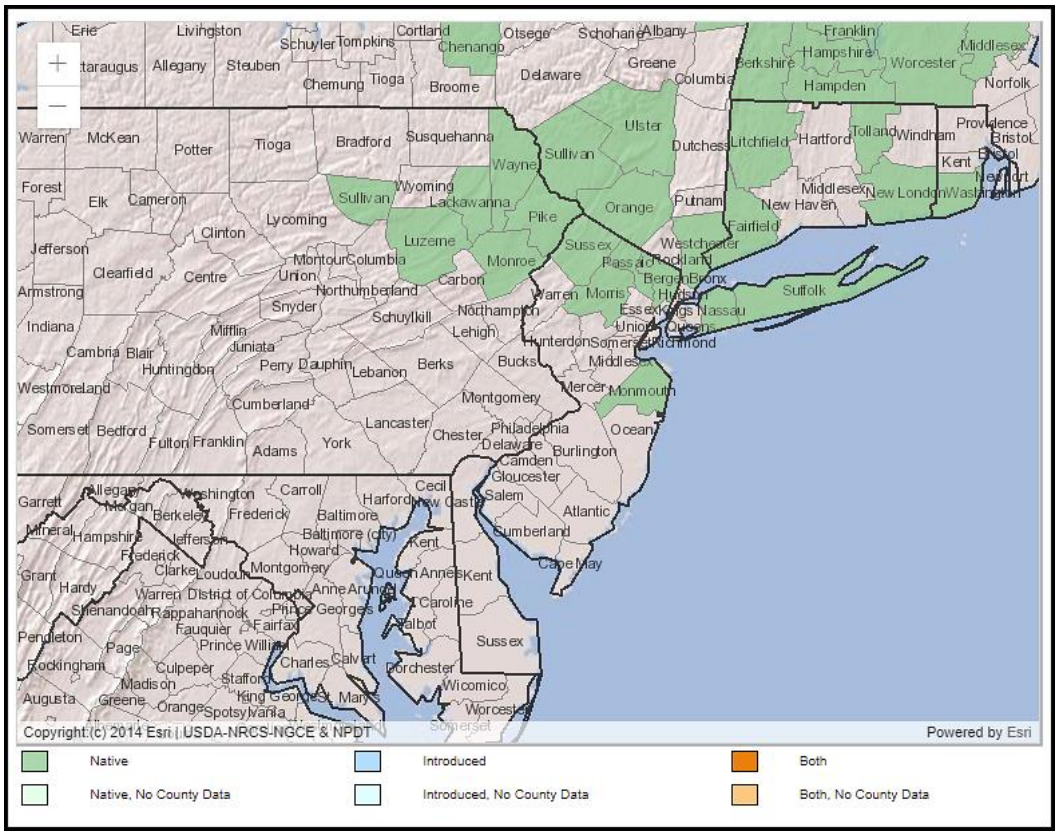


Figure 2. County records of X. montana in New Jersey and vicinity (USDA NRCS 2022b).

Conservation Status

Xyris montana is considered globally secure. The G5 rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats (NatureServe 2022). The map below (Figure 3) illustrates the conservation status of *X. montana* throughout its range. Northern Yellow-eyed-grass is critically imperiled (very high risk of extinction) in three states, imperiled (high risk of extinction) in two states, and vulnerable (moderate risk of extinction) in one state and three provinces. The species is considered secure or apparently so in two states and two provinces and is unranked in four other states where it occurs.

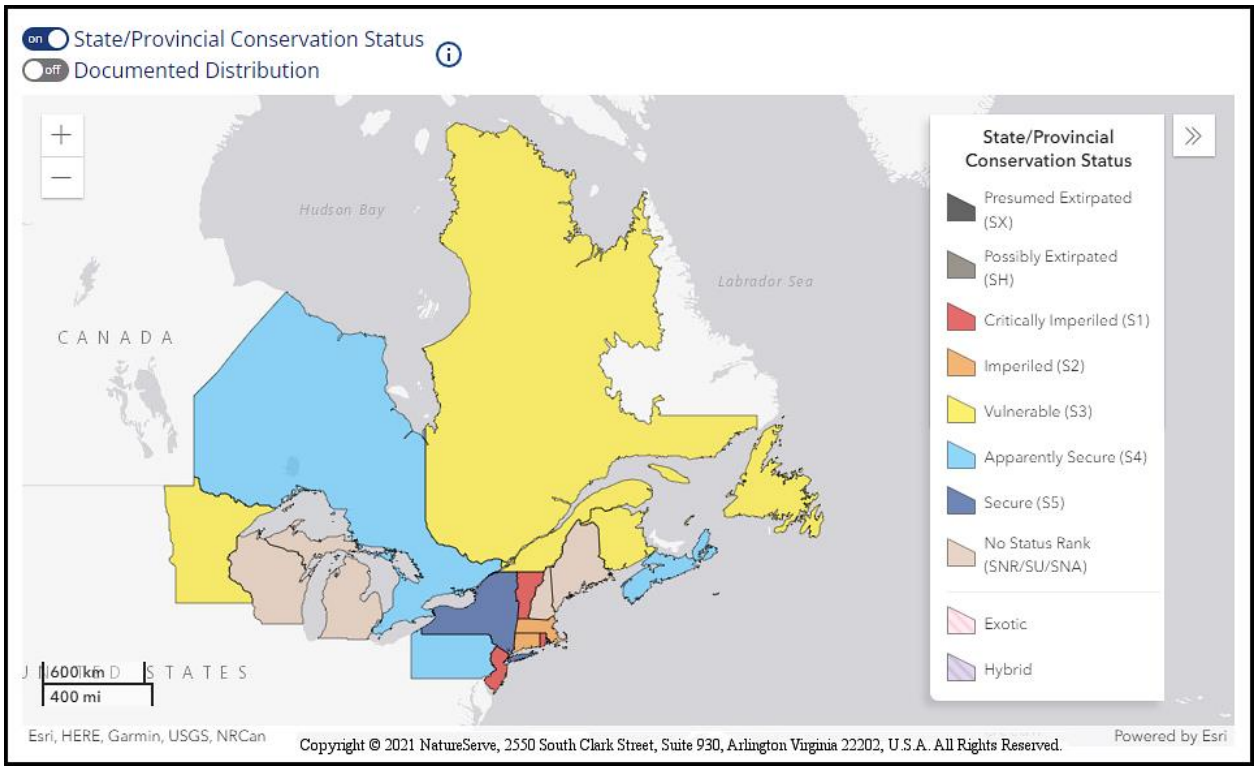


Figure 3. Conservation status of X. montana in North America (NatureServe 2022).

Xyris montana is ranked S1.1 in New Jersey (NJNHP 2022), meaning that it is critically imperiled due to extreme rarity. A species with an S1.1 rank has only ever been confirmed at a single location in the state. *X. montana* is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of extinction in the state. Although the presence of endangered flora may restrict development in certain communities such as wetlands or coastal habitats, being listed does not currently provide broad statewide protection for the plants. Additional regional status codes assigned to *X. montana* signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

The original description of *Xyris montana* indicated that there had been some records of the species from the New Jersey Pine Barrens (Reis 1892). Not long after the initial description had been published, Taylor—who was working on a regional flora—was puzzled about an apparent

gap in the species' range and requested information from other botanists (Taylor 1909). The early confusion was cleared up by Stone (1911), who established that erroneous reports of *Xyris montana* in southern New Jersey had been made based on diminutive specimens of *X. caroliniana*. Consequently, when Taylor's flora was published the southernmost extent of *X. montana* was in the Pocono region of Pennsylvania and the species was not known to occur in New Jersey (Taylor 1915). The first confirmed record of *Xyris montana* in the state was made by Kenneth Mackenzie and Ludlow Griscom in 1920, when Griscom obtained a specimen by lying down at full length on a floating sphagnum mat and grasping a clump of the plants (Griscom 1931). During the ensuing years there were indications that the species was known from several bogs in Sussex County (Fables 1956, Fairbrothers and Hough 1973) and some collections were reported from adjacent counties (Hough 1983, NJNHP 2022). Although there may once have been other populations of *Xyris montana* in northern New Jersey, the location where the species was found by Mackenzie and Griscom remains only site for which sufficient evidence exists to document an occurrence (NJNHP 2022).

Threats

The sole New Jersey occurrence of *Xyris montana* is situated on protected land (TNC 2022) and no threats to the population have been identified (NJNHP 2022). In other parts of its range the species is primarily threatened by habitat destruction resulting from development, peat mining, and other human activities (Crowley 1995). Changes in hydrology or wetland chemistry can also threaten the species, and recreational uses such as fishing and bait collection have damaged some shoreline habitats where *X. montana* occurs (MNDNR 2022). Habitat loss may also come about as a result of natural successional processes (Crowley 1995).

Fusarium xyrophilum, the fungus that sterilizes *Xyris* plants and forms pseudoflowers on them to spread its own spores, has only recently been discovered and described (Laraba et al. 2020). While it is currently known to infect just two *Xyris* species in Guyana (Suszkiw 2021) it is possible that the fungus can (or has already) spread to other yellow-eyed-grasses. As more information becomes available it will be easier to assess whether the organism might become a threat to *Xyris* species in North America.

Xyris montana could prove to be vulnerable to changes in the climate. Damman (1965) categorized Northern Yellow-eyed-grass as a species best suited to moderate conditions, suggesting that *X. montana* and its associates appeared to be adapted to cool summers and sensitive to low winter temperatures, perhaps even benefitting from an insulating blanket of snow during the winter months. As previously noted, alteration of a habitat's hydrology can also pose a threat to *X. montana*. In New Jersey, the impacts of climate change include both elevated temperatures and an increase in extreme conditions such as droughts and floods (Hill et al. 2020). If hotter and drier conditions become prevalent in the southern part of the species range, the future of *Xyris montana* may depend on its ability to migrate northward. Studies have shown that outcrossing is limited in *X. tennesseensis*, and that species is also known to have limited genetic diversity (Downey and Baskauf 2020). That is likely the case for many North American *Xyris* species due to the brevity of their flowering period, and low genetic variability may also limit adaptability in the face of rapidly changing conditions.

Management Summary and Recommendations

Generally speaking, conservation planning for *Xyris montana* should focus on land protection and the preservation of natural habitat conditions. No immediate management needs have been identified for the species in New Jersey. Periodic monitoring visits should be conducted to assure that the community is stable and there are no emerging threats.

Xyris montana is a species that could benefit from the restoration of formerly mined peatlands. At one Canadian site where *X. montana* was present in natural pools of unmined bog remnants, the species was not found in restored sections of the bog four years after restorative work was completed but the researchers recognized that longer monitoring would be required to determine the ultimate effectiveness of the project (Mazerolle et al. 2006). Another peat mine restoration project indicated that *X. montana* was present at a number of restored sites despite being absent at the locations from which donor materials were obtained (Hugron et al. 2020). As efforts to restore peatlands continue more data regarding utilization of the sites by *X. montana* is likely to be published.

There are a number of other areas where additional research would be beneficial to management planning for *Xyris montana*. It seems likely that some insect-mediated cross-fertilization occurs although the agents have not been identified. *X. montana* probably also relies on self-pollination to some extent, but that has not been confirmed either. Because low seed set has been reported in the species, it is important to understand the relative impacts of different fertilization mechanisms on seed production and viability. Although Kral (1998) reported seed dormancy of up to 10 years in the genus *Xyris*, no documentation was found regarding the longevity of *X. montana* seeds. Knowledge concerning the long-distance dispersal mechanisms available to *X. montana* could help to predict whether the species will be able to colonize new habitat or migrate in response to natural successional processes or changing climactic conditions. Managers should also pay heed as new information becomes available regarding the extent and spread of *Fusarium xyrophilum* in order to determine whether action will be needed to protect North American populations of *Xyris* species from the fungus.

Synonyms

The accepted botanical name of the species is *Xyris montana* Ries. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, USDA NRCS 2022b, POWO 2022).

Botanical Synonyms	Common Names
Xyris flexuosa var. *pusilla* A. Gray	Northern Yellow-eyed-grass
Xyris montana f. *albiflora* B. Boivin	
Xyris montana f. *bracteosa* Haberer	
Xyris papillosa Fassett	
Xyris papillosa var. *exserta* Fassett	

References

Almquist, Heather and Aram J. K. Calhoun. 2003. A coastal southern-outlier patterned fen: Lily Fen, Swan Island, Maine. Northeastern Naturalist 10(2): 119–130.

Barr, Camille. 1996. Population study of *Eriophorum gracile* Koch (Cyperaceae) at its southern range limit in Pennsylvania. Bartonia 59: 87–93.

Blaney, Sean. 2021. Photo of *Xyris montana* from New Brunswick, Canada. Shared via iNaturalist at https://www.inaturalist.org/observations/90015543, licensed by https://creativecommons.org/licenses/by-nc/4.0/

Boyd, Robert S., Allison Teem, and Michael A. Wall. 2011. Floral biology of an Alabama population of the federally endangered plant, *Xyris tennesseensis* Kral (Xyridaceae). Castanea 76(3): 255–265.

Britton, N. L. and A. Brown. 1913. An Illustrated Flora of the Northern United States and Canada in three volumes: Volume I (Ferns to Buckwheat). Second Edition. Reissued (unabridged and unaltered) in 1970 by Dover Publications, New York, NY. 680 pp.

Clausen, Robert T. 1939. Some plants of New York. Torreya 39(1): 1–9.

Crow, Garrett E. and Linda L. Fahey. 2004. Floras of Pequawket and Heath Pond Bogs, Ossipee, New Hampshire. Rhodora 106(928): 360–367.

Crowley, K. 1995. *Xyris montana* conservation status factors. NatureServe, Arlington, VA. Accessed August 16, 2022 at https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.146522/Xyris_montana

Damman, A. W. H. 1965. The distribution patterns of northern and southern elements in the flora of Newfoundland. Rhodora 67(772): 363–392.

Downey, Kala M. and Carol J. Baskauf. 2020. Population genetics of a rare wetland species, the Tennessee yellow-eyed grass (*Xyris tennesseensis*, Xyridaceae). Conservation Genetics 21(4): 735–746.

Faber-Langendoen, D. 2018. Northeast Regional Floristic Quality Assessment Tools for Wetland Assessments. NatureServe, Arlington, VA. 52 pp.

Fables, David Jr. 1956. Caesarian flora and fauna, Number 1. Published posthumously in Bartonia 31(1960–61): 3–11.

Fairbrothers, David E. and Mary Y. Hough. 1973. Rare or Endangered Vascular Plants of New Jersey. Science Notes No. 14, New Jersey State Museum, Trenton, NJ. 53 pp.

Fernald, M. L. 1918. The contrast in the floras of eastern and western Newfoundland. American Journal of Botany 5(5): 237–247.

Fernald, M. L. 1921. The Gray Herbarium expedition to Nova Scotia. Rhodora 23(270): 130–152.

Fernald, Merritt Lyndon. 1927. *Xyris montana* in eastern Massachusetts. Rhodora 29: 222–223.

Fernald, M. L. 1950. Gray's Manual of Botany. Dioscorides Press, Portland, OR. 1632 pp.

Gleason, H. A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Second Edition. The New York Botanical Garden, Bronx, NY. 910 pp.

Gorham, Eville, Herbert E. Wright, Jr., Pal H. Glaser, and Gerald A. Wheeler. 1979a. Ecological and floristic studies of the peatland vegetation of northern Minnesota. 1978 Progress Report, prepared for the Minnesota Department of Natural Resources. Available at https://conservancy.umn.edu/bitstream/handle/11299/158340/1/Peat%20program%201979.pdf

Gorham, Eville, Herbert E. Wright, Jr., Pal H. Glaser, and Gerald A. Wheeler. 1979b. Ecological and floristic studies of the peatland vegetation of northern Minnesota. Final Report, prepared for the Minnesota Department of Natural Resources. 195 pp.

Gorham, Eville and Jan A. Janssens. 1992. Concepts of fen and bog re-examined in relation to bryophyte cover and the acidity of surface waters. Acta Societatis Botanicorum Poloniae 61(1): 7–20.

Graeff, Alex. 2018. Ecological drivers of plant community composition in a patterned fen at Seney National Wildlife Refuge, Michigan. Master's Thesis, Northern Michigan University, Marquette, MI. 78 pp.

Griscom, Ludlow. 1931. Dwarf Mistletoe and other plants new to New Jersey. Rhodora 33(388): 101.

Haberer, J. V. 1905. Plants of Oneida County, New York, and vicinity - I. Rhodora 7(77): 92–97.

Hill, Rebecca, Megan M. Rutkowski, Lori A. Lester, Heather Genievich, and Nicholas A. Procopio (eds.). 2020. New Jersey Scientific Report on Climate Change, Version 1.0. New Jersey Department of Environmental Protection, Trenton, NJ. 184 pp.

Hough, Mary Y. 1983. New Jersey Wild Plants. Harmony Press, Harmony, NJ. 414 pp.

Hugron, Sandrine, Méline Guêné-Nanchen, Noémie Roux, Marie-Claire LeBlanc, and Line Rochefort. 2020. Plant reintroduction in restored peatlands: 80% successfully transferred - Does the remaining 20% matter? Global Ecology and Conservation 22: Article e01000.

ITIS (Integrated Taxonomic Information System). Accessed November 13, 2021 at http://www.itis.gov

Karlin, Eric F. and Les M. Lynn. 1988. Dwarf-shrub bogs of the southern Catskill Mountain region of New York State : Geographic changes in the flora of peatlands in northern New Jersey and southern New York. Bulletin of the Torrey Botanical Club 115(3): 209–217.

Kartesz, J. T. 2015. The Biota of North America Program (BONAP). Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, NC. [Maps generated from Kartesz, J. T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP) (in press)].

Kral, Robert. 1966. *Xyris* (Xyridaceae) of the continental United States and Canada. SIDA 2(3): 177–260.

Kral, Robert. 1983. The Xyridaceae of the southeastern United States. Journal of the Arnold Arboretum 64(3): 421–429.

Kral, R. 1998. Xyridaceae. In Klaus Kubitzki and T. Stuzel (eds). The Families and Genera of Vascular Plants, Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (Except Gramineae). Springer-Verlag, Berlin. 521 pp.

Kral, Robert. Page updated November 5, 2020. *Xyris montana* Ries. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 22+ vols. New York and Oxford. Accessed August 16, 2022 at http://floranorthamerica.org/Xyris_montana

Laraba, Imane, Hye-Seon Kim, Robert H Proctor, Mark Busman, Kerry O'Donnell, Frederick C. Felker, M. Catherine Aime, Rachel A. Koch, and Kenneth J. Wurdack. 2020. *Fusarium xyrophilum*, sp. nov., a member of the *Fusarium fujikuroi* species complex recovered from pseudoflowers on yellow-eyed grass (*Xyris* spp.) from Guyana. Mycologia 112(1): 39–51.

Les, Donald H. 2020. Aquatic Monocotyledons of North America: Ecology, Life History and Systematics. CRC Press, Boca Raton, FL. 568 pp.

Lynn, Les. M. and Eric F. Karlin. 1985. The vegetation of the low-shrub bogs of northern New Jersey and adjacent New York: Ecosystems at their southern limit. Bulletin of the Torrey Botanical Club 112(4): 436–444.

Mayer, Joshua. July 9, 2016. *Xyris montana* image from Wisconsin. Licensed under https://creativecommons.org/licenses/by/2.0 via Creative Commons.

Mazerolle, Marc J., Monique Poulin, Claude Lavoie, Line Rochefort, André Desrochers, and Bruno Drolet. 2006. Animal and vegetation patterns in natural and man-made bog pools: implications for restoration. Freshwater Biology 51: 333–350.

Mid-Atlantic Herbaria. 2022. https://midatlanticherbaria.org/portal/index.php Accessed on August 17, 2022.

Mitchell, Carolyn C. and William A. Niering. 1993. Vegetation change in a topogenic bog following beaver flooding. Bulletin of the Torrey Botanical Club 120(2): 136–147.

MNDNR (Minnesota Department of Natural Resources). 2022. *Xyris montana*. Rare Species Guide, accessed August 17, 2022 at https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PMXYR010F0

NatureServe. 2022. NatureServe Explorer [web application]. NatureServe, Arlington, VA. Accessed August 16, 2022 at https://explorer.natureserve.org/

NJNHP (New Jersey Natural Heritage Program). 2010. Special Plants of NJ - Appendix I - Categories & Definitions. Site updated March 22, 2010. Available at https://nj.gov/dep/parksandforests/natural/docs/nhpcodes_2010.pdf

NJNHP (New Jersey Natural Heritage Program). 2022. Biotics 5 Database. NatureServe, Arlington, VA. Accessed February 1, 2022.

POWO. 2022. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Retrieved August 16, 2022 from http://www.plantsoftheworldonline.org/

Quinn, Glenda. 2008. Riverbanks and bogs. Sarracenia 16(3): 25–26.

Reis, H. 1892. Review of the North American species of the genus *Xyris*. Bulletin of the Torrey Botanical Club 19: 38–43.

Rhoads, Ann Fowler and Timothy A. Block. 2007. The Plants of Pennsylvania. University of Pennsylvania Press, Philadelphia, PA. 1042 pp.

Slot, Jason C. and Matt T. Kasson. 2021. Ecology: Fungal mimics dupe animals by transforming plants. Current Biology 31(5): 250–252.

Stone, Whitmer. 1911. The Plants of Southern New Jersey. Quarterman Publications, Boston, MA. 828 pp.

Suszkiw, Jan. 2021. Fungus commits floral fraud to fool insects into spreading it. USDA Agricultural Research Service, Research News. Available at https://www.ars.usda.gov/news-events/news/research-news/2020/fungus-commits-floral-fraud-to-fool-insects-into-spreading-it/

Taylor, Norman. 1909. Local flora notes - II. Torreya 9(12): 257–261.

Taylor, Norman. 1915. Flora of the vicinity of New York - A contribution to plant geography. Memoirs of the New York Botanical Garden 5: 1–683.

TNC (The Nature Conservancy). 2022. Places We Protect. Accessed August 20, 2022 at https://www.nature.org/en-us/get-involved/how-to-help/places-we-protect/

U. S. Army Corps of Engineers. 2020. National Wetland Plant List, version 3.5. https://cwbi-app.sec.usace.army.mil/nwpl_static/v34/home/home.html U. S. Army Corps of Engineers Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH.

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2022a. *Xyris montana* illustration from Britton, N. L. and A. Brown, 1913, An illustrated flora of the northern United States, Canada and the British Possessions, 3 vols., Kentucky Native Plant Society, New York, Scanned By Omnitek Inc. Image courtesy of The PLANTS Database (http://plants.usda.gov). National Plant Data Team, Greensboro, NC.

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2022b. PLANTS profile for *Xyris montana* (Northern Yelloweyed Grass). The PLANTS Database, National Plant Data Team, Greensboro, NC. Accessed August 16, 2022 at http://plants.usda.gov

Wall, Michael A., Allison P. Teem, and Robert S. Boyd. 2002. Floral manipulation by *Lasioglossum zephyrum* (Hymenoptera: Halictidae) ensures first access to floral rewards by initiating premature anthesis of *Xyris tennesseensis* (Xyridaceae) flowers. Florida Entomologist 85(1): 290–291.

Walz, Kathleen S., Linda Kelly, Karl Anderson and Jason L. Hafstad. 2018. Floristic Quality Assessment Index for Vascular Plants of New Jersey: Coefficient of Conservativism (CoC) Values for Species and Genera. New Jersey Department of Environmental Protection, New Jersey Forest Service, Office of Natural Lands Management, Trenton, NJ. Submitted to United States Environmental Protection Agency, Region 2, for State Wetlands Protection Development Grant, Section 104(B)(3); CFDA No. 66.461, CD97225809.

Wheeler, Gerald A., Paul H. Glaser, Eville Gorham, Clifford M. Wetmore, Frank D. Bowers, and Jan A. Janssens. 1983. Contributions to the flora of the Red Lake peatland, northern Minnesota, with special attention to *Carex*. The American Midland Naturalist 110(1): 62–94.