2024 Rare Plant Forum Proposals

Bushy bluestem – *Andropogon glomeratus*

(=*A. virginicus* var. *abbreviatus*)

Andropogon glomeratus
photo by Darlene Madarish

Current Status in PA Regulations: TU
Current PABS Status: PR
Proposed Status: N
Coefficient of Conservatism: 4
Proposed by: Steve Grund, Darlene Madarish, Loree Speedy, and Mark Bowers

Overview

Andropogon glomeratus was added by the VPTC as a TU species in 1992, a status that became official in the regs in 1993. It was reviewed at RPF meetings in 1994 and 1998, but no changes were made other than adding the "TF" modifier. In 1999 it went to PT at the committees. In 2015 Mark Bowers presented on this species and the issues that have confounded our attempt to find a consensus on the appropriate status, but no proposal was made at the time. Darlene Madarish, as well as Loree Speedy, have accumulated a great deal of data on the weedy nature of this species in western Pennsylvania, and we have decided that it is time to propose delisting it.

The Rank Calculator analysis places *Andropogon glomeratus* firmly in S4.

Habitat

- FNA: bogs, swamps, savannahs, flatwoods, and ditches of the southeastern United States (Campbell 2019).
- FSUS: Swamps, wet pine savannas, pine flatwoods, bogs, fens, depression ponds, wet disturbed sites (Weakley et al 2023).
- Flora Novae Angliae: Pond shores, ditches, seasonally wet depressions, wetland edges (Haines 2011).
- Plants of Pennsylvania: Swamps and moist meadows (Rhoads and Block 2007)

Most of the Pennsylvania records are from highly altered habitats like power line ROWs, fill behind a store, mine spoils, drained reservoir, old fields, SGL parking areas, and reclaimed strip mines. It also occurs in a few poor (i.e. acidic) fens including at Chalk Hill. Soils tend to be thin and nutrient poor, at least sometimes with low pH.

Andropogon glomeratus habitat at the edge of a road to an old gas well
Photo by Darlene Madarish

Andropogon glomeratus habitat on a ROW showing shallow soil.
Photo by Darlene Madarish

Andropogon glomeratus growing in coal spoil Photo by Loree Speedy

Andropogon glomeratus showing a threat.
Photo by Darlene Madarish

Andropogon glomeratus habitat on a ROW
Photo by Darlene Madarish

North American Distribution & Global / Regional Conservation Concerns

Andropogon glomeratus, in the strict sense (i.e. treating what some call varieties as separate species) has what could be described as a southeastern coastal plain/southern to mid-Appalachian distribution. It is S3 in New York, S1 in Ohio, and S4 in West Virginia (NatureServe 2024). It is not considered to be of conservation concern in other states adjacent to Pennsylvania. I have not included the NatureServe map because they do not provide a map for the narrow concept, so the *Andopogon glomeratus* map includes several varieties and extends to the west coast.

Pennsylvania Distribution

When we first started tracking this taxon, it was known mostly from good quality wetlands in the southeast part of the state, with an apparently disjunct population at Chalk Hill Bog in Fayette County. It has since become clear that it is (or has become) much more widespread in western Pennsylvania. The BONAP map (left) shows five more counties than did Rhoads and Klein (1993), but the Union County record turns out to be a false report (based on Union County, New Jersey).

Extensive collecting by Leroy Henry, Fred Utech, and Walter Zanol through 1990s without encountering this species until 1991 except at or near Chalk Hill Bog suggests that most if not all other western Pennsylvania stations represent recent colonizations.

Extant locations

Eighteen, plus more than 53 records that have not been processed as element occurrences because the plants are growing in such highly modified habitats and DCNR did not want them to trigger environmental review hits.

Historical Locations

There are seven historic locations (excluding a few that are clearly represented by extant records).

Invasive tendency?

Andropogon glomeratus has become naturalized outside of its native range in Mexico, Central Europe, South Africa, Japan, and Hawaii (CABI Digital Library 2024), although the problematic taxon in Hawaii is actually *A. glomeratus* var. *pumilus*, which FSUS treats as a species *Andropogon tenuispatheus* (Faccenda 2022). *A. tenuispatheus* does not range as far north as Pennsylvania, and Clare Ciafre with Steve Grund examined the specimens from western Pennsylvania and concluded that *A. tenuispatheus* was not the culprit; all specimens of *Andropogon glomeratus* at CM appear to be correctly identified as the narrow concept (var. *glomeratus* of authors who treat varieties).

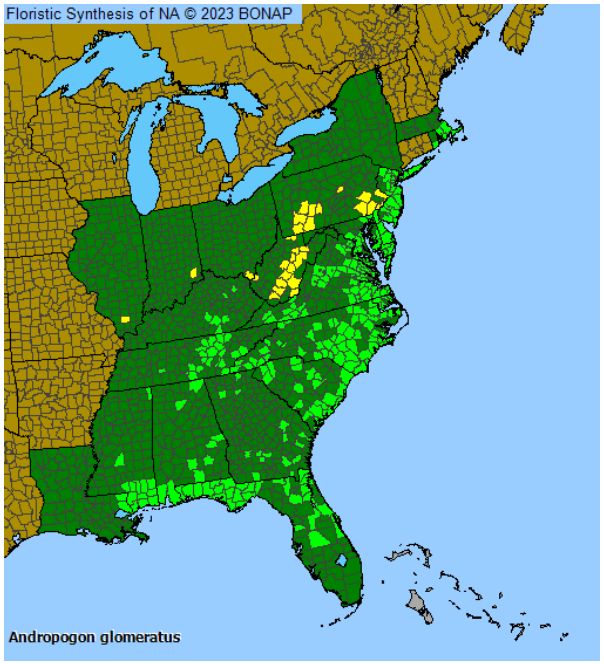
The habitats from which this species has been collected, including eastern collections, describes a species tolerant of profound anthropogenic disturbance.

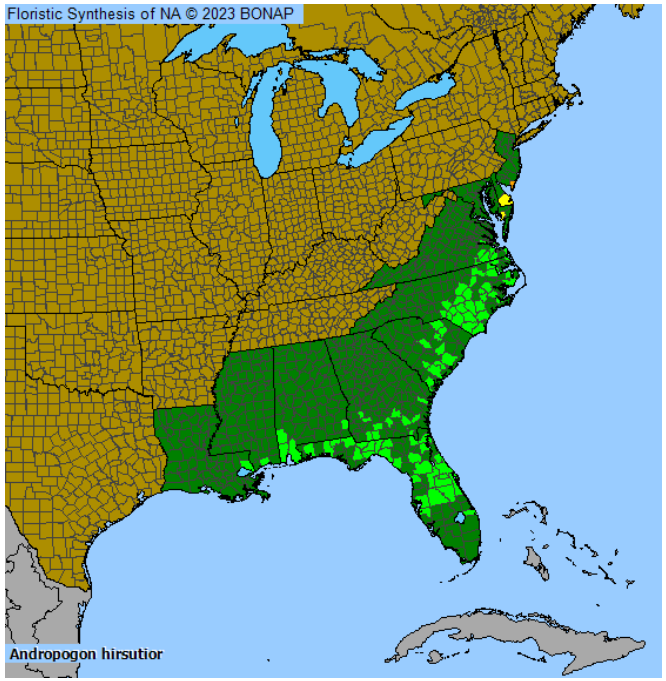
Threats

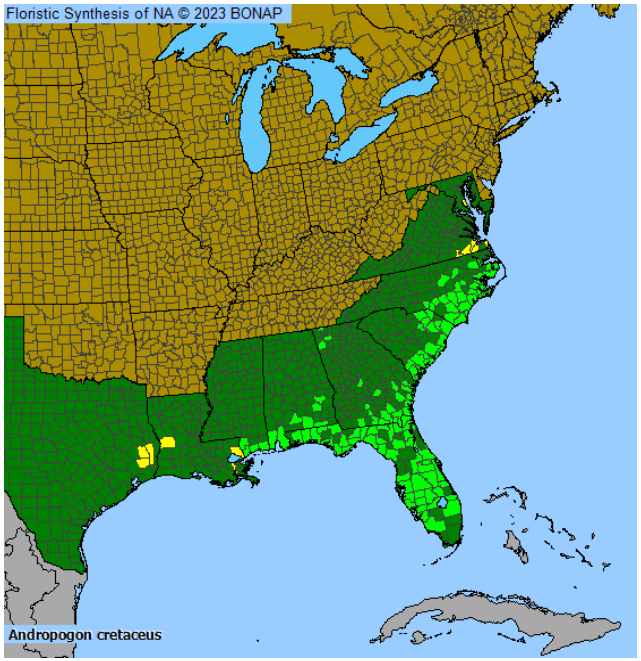
For the few occurrences in natural habitats, mainly poor fens (perhaps sometimes bogs), the usual threats to wetlands apply: draining and other hydrological alterations, encroachment by development, and to a certain extent, invasive species, though the poor soils in which this species thrives are relatively less vulnerable to invasion than at more rich sites. At some sites, succession to forested habitats will likely eliminate some plants or even entire populations if management is not maintained. Those threats are more than countered by the ability of the species to colonize disturbed sites, and the species seems to be increasing rapidly, at least in the western counties.

Taxonomy

Andropogon glomeratus (Walt.) B.S.P. has often been treated as including several varieties, e.g. in FNA (Campbell 2019). FSUS (Weakley et al 2023) elevates them to species. None of those taxa have been documented in Pennsylvania. A few get reasonably close but are coastal plain species and unlikely to still be extant if they ever were in Pennsylvania. They are worth mentioning though, as they are more conservative than *A. glomeratus sensu stricto*, and there is a small chance that one of them could account for some of the *A. glomeratus* records in eastern Pennsylvania. They are *Andropogon cretaceous* (=*A. glomeratus* var. *glaucopis*) and *A. hirsutior* (=*A. glomeratus* var. *hirsutior*). *A. cretaceous*, unlike *A. glomeratus*, has glaucous leaves, and *A. hirsutior* has oblong inflorescences in contrast to the distinctive obconic inflorescences of *A. glomeratus* (the inflorescences of *A. cretaceous* are also noticeably less distinctly obconic than those of *A. glomeratus*).







Identification

Andropogon glomeratus is usually easily identified by its dense, obconic inflorescences compactly arranged at the apex of the plant. The leaves are not notably glaucous.

Status Justification

Because this species is increasing in low quality habitats, regulatory protection is not warranted. At the best sites, this species grows with plenty of rare species we feel more comfortable providing with regulatory protection.

Literature Cited

CABI Digital Library. https://www.cabidigitallibrary.org. Accessed 27 March 2024

Campbell, C.S. 2019. Andropogon. In Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. Vol.25. Oxford University Press. New York and Oxford.

Faccenda, K. 2022. Updates to the Hawaiian grass flora and selected keys to species. Bishop Museum Occasional Papers 148: 41–98

Haines, A. 2011. Flora Novae Angliae. Yale University Press.

Kartesz, J.T. 2023. Synthesis of the North American Flora, Version 2.0. Build – 1.0.8260.21237, Database – 25 January 2023.

NatureServe. 2024. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: 25 March 2024).

Rhoads, A.F. and Klein, W.M., 1993. *The vascular flora of Pennsylvania: annotated checklist and atlas*. American Philosophical Society.

Rhoads, A.F. and Block, T.A., 2007. *The plants of Pennsylvania: an illustrated manual*. University of Pennsylvania Press.

Weakley, A.S. and the Southeastern Flora Team. 2023. *Flora of the Southeastern United States.* University of North Carolina Herbarium, University of North Carolina Botanical Garden, Chapel Hill, North Carolina.

Narrow-leaved reed-grass (southern northern reed-grass?)– *Calamagrostis inexpansa*

Note the narrow, involute leaves.
Photo by R. Garlitz, Michigan Flora online

Current Status in PA Regulations: N
Current PABS Status: PT (or PE, minutes are ambiguous)
Proposal: PE
Coefficient of Conservatism: 8 (EPA region 6, as low as 5 in some prairie states, 10 in Michigan (Freyman et al 2016)
Proposed by: Steve Grund, WPC/PNHP

Proposal Summary

Calamagrostis inexpansa was collected in the summer of 2016 at a fen in Bedford County (S.P. Grund 7264 and J.I. McPherson, CM) that hosts at least seven other tracked plant species, plus a few more if you count the fen down the road and historic records that we have not confirmed. All of the rare species at the site are to some degree of northern affinity. Examination of the *Calamagrostis canadensis* specimens at CM revealed two more collections that were actually *C. stricta* ssp. *inexpansa*, one from the 90's and one from the 60's. Both were from the same site as the Grund and McPherson collection. The NatureServe Rank Calculator analysis returned a rank of S1.

Habitat

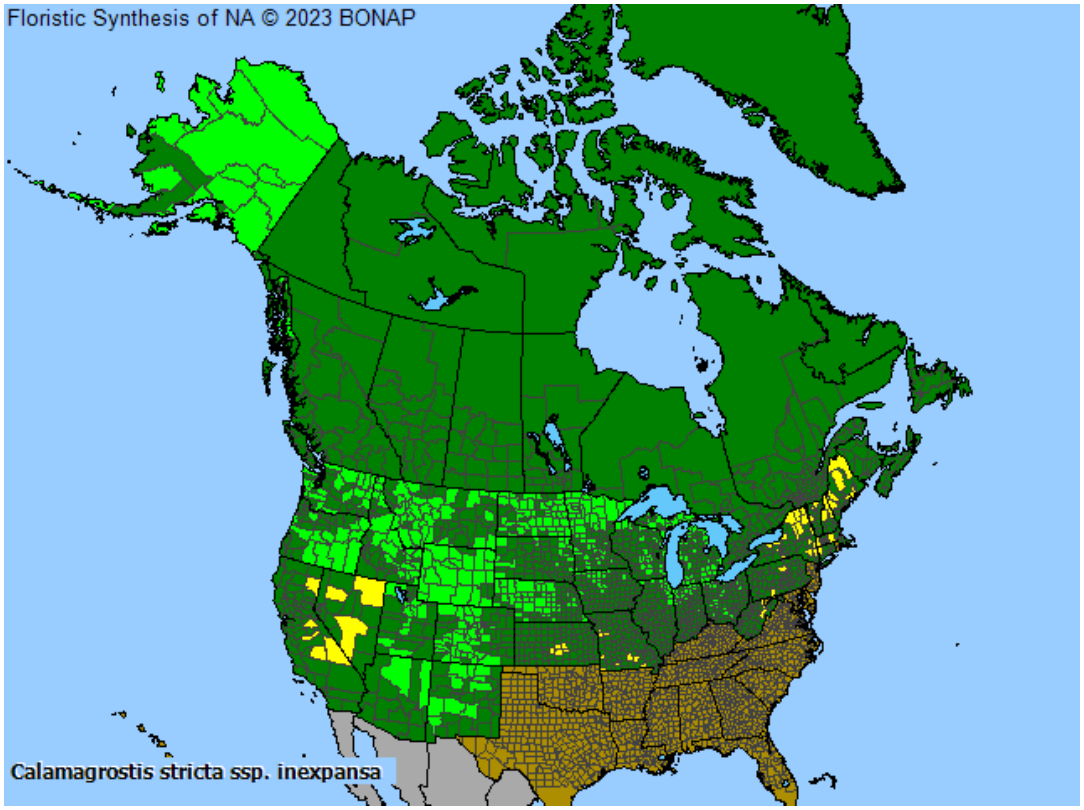
Fens, sedge meadows, interdunal swales, low dunes, and moist cobbly, sandy, or rocky shores, especially of the Great Lakes, often in calcareous habitats; sometimes in drier rocky sites (Reznicek et al 2011).

Taxonomy

The two subspecies of *Calamagrostis stricta* that are recognized in FNA (Marr et al 2007) are wide ranging taxa of northern latitudes. Subspecies *inexpansa* does intergrade to some extent with the type subspecies, but is generally distinct (Marr et al 2007). Only ssp. *inexpansa* has been documented from Pennsylvania. Here we follow Weakley *et al* (2023), where it is treated at the level of species as *Calamagrostis inexpansa*.

Identification

C. stricta in the strict sense (pun intended) does not range near Pennsylvania, so the taxon most easily confused with C. *inexpansa* in our area is *Calamagrostis canadensis*. *C. canadensis* generally has a more open inflorescence, but that can be a tricky character because, as with many grasses, the inflorescence tends to expand as the flowers open, then contract again as the fruit matures. *C. canadensis* is a more extensively clonal species, producing many sterile culms, while *C.. inexpansa*, while rhizomatous, does not apparently produce any sterile culms (Marr et al 2007). The leaves tend to be narrower, and are stiff, contrasting with the lax leaves of *C. canadensis*. These are what seem to me to be the most useful field characters. Identifications should be confirmed using the finer distinctions of callus hair length and distribution, and scabrosity of the awns, see Reznicek et al (2011).



Distribution and regional conservation statuses

This species has a generally northern and high elevation distribution, but *Calamagrostis stricta* (*sensu stricto*) is more strictly northern.

Calamagrostis inexpansa is S3 in Ohio, S2 in New York, and S1 in West Virginia.

Status Justification

In 2017, the RPF decided this taxon should be added as PE, but the VPTC voted to make it PT because of potential habitat in glaciated portions of the state, especially the NW. Eight years have passed, and no new extant populations have been discovered, although with improved access to specimens from herbaria, an 1869 specimen under the synonym *Calamagrostis neglecta* subsp. *inexpansa* from Lycoming County has been discovered at NY.

It is certainly possible that additional extant populations will be discovered, but it seems very unlikely that sufficient discoveries will be made of significant size to push this into Pennsylvania Threatened territory.

Literature Cited

Freyman, W.A., L.A. Masters, and S. Packard. 2016. The Universal Floristic Quality Assessment (FQA) Calculator: an online tool for ecological assessment and monitoring. *Methods in Ecology and Evolution* 7(3): 380–383. Online database at https://universalfqa.org accessed 22 March 2023.

Kartesz, J.T. 2023. Synthesis of the North American Flora, Version 2.0. Build – 1.0.8260.21237, Database – 25 January 2023.

Marr, K.L., R.J. Hebda, and C.W. Greene. 2007. Calamagrostis. In Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. Vol.24. Oxford University Press. New York and Oxford.

NatureServe. 2024. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: 25 March 2024).

Reznicek, A.A., E. G. Voss, & B. S. Walters. MICHIGAN FLORA ONLINE. 2011. University of Michigan. https://lsa-miflora-p.lsait.lsa.umich.edu/#/record/2047, Accessed 22 March 2024.

Weakley, A.S. and the Southeastern Flora Team. 2023. *Flora of the Southeastern United States.* University of North Carolina Herbarium, University of North Carolina Botanical Garden, Chapel Hill, North Carolina.

White cuckoo-flower – *Cardamine dentata* Schult.

Current Status in PA Regulations: PE (as *Cardamine pratensis* var. *palustris*)
Current PABS Status: PE (as *Cardamine pratensis* var. *palustris*)
Proposal: PE (as *Cardamine dentata*)
Coefficient of Conservatism: 10
Proposed by: Steve Grund, WPC/PNHP

Cardamine dentata
Photo by Alexander Mrkvicka

Proposal Summary

The native North American representatives of the *Cardamine pratensis* complex have been known as var. (or subsp.) *palustris*, and we have been tracking them as such for a long time. If treated as a distinct species, the oldest available name is *Cardamine dentata*, and it is here proposed that we adopt that name for the fen species in Pennsylvania.

Habitat

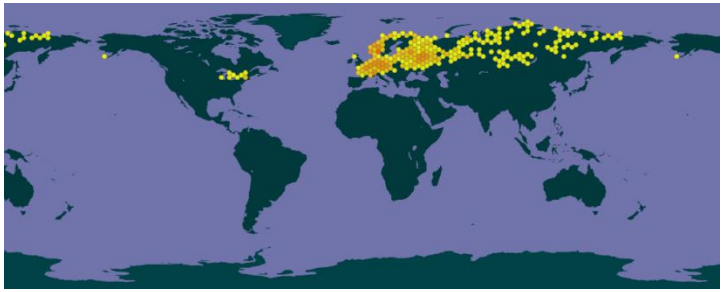
- Flora Novae Angliae: Swamps and fens, usually in regions of high-pH bedrock (Haines 2011).
- FSUS: Seeps, bogs, and swamps (Weakley and Southeastern Flora Team 2023).
- Minnesota Wildflowers: cold and wet, northern forested bogs, cedar swamps, and streams (Chayka continuously updated)

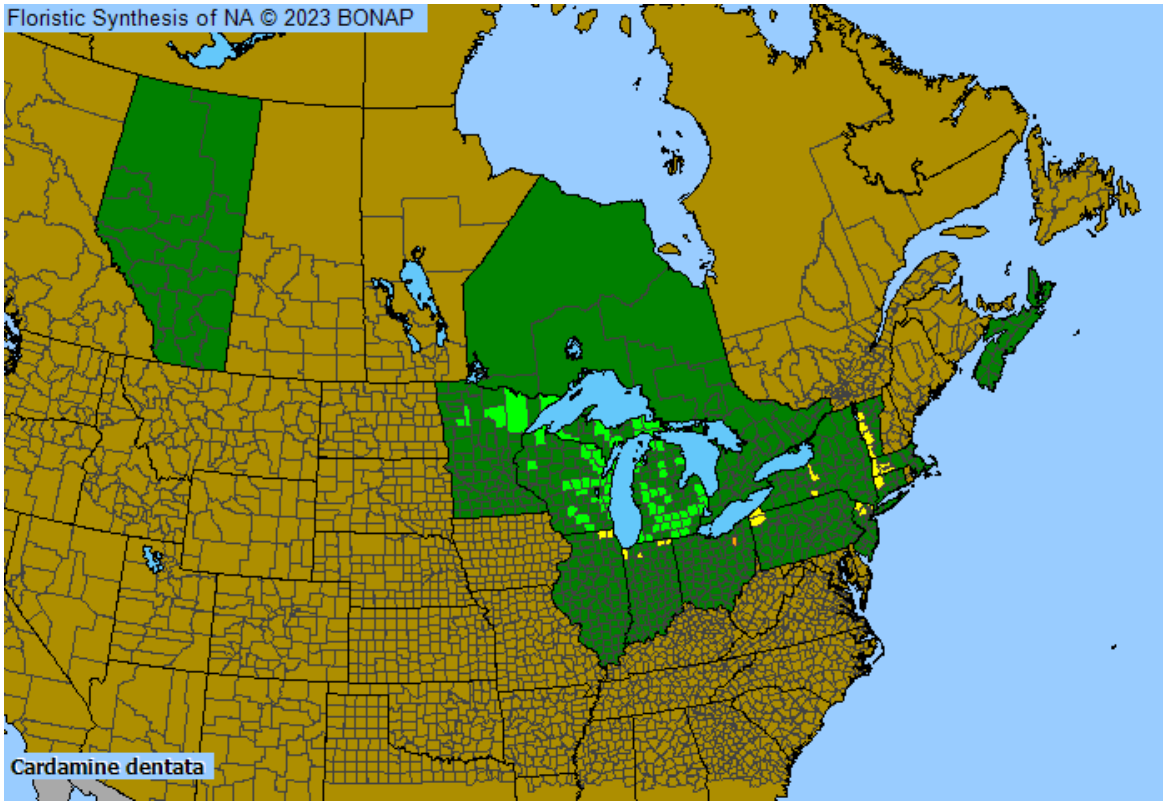
Taxonomy

Flora of the Southeastern United States (FSUS, Weakley et al 2023) treats this taxon at the level of species, *Cardamine dentata*. A study of the complex in Europe (Franzke and Hurka 2000) determined that *Cardamine palustris* and *C. dentata* are conspecific, and *C. dentata* has priority. DCNR is following FSUS as their default taxonomy, but can make specific exceptions. In this case, one could probably make a very good argument for either treating it within *C. pratensis*, or segregating it as a closely related species, but if we are not strongly opposed to the FSUS treatment, it is best to follow it for consistency. It is distinct morphologically and by habitat. Though morphologically similar to *C. pratensis*, this is more similar, and probably identical, to the otherwise European *C. dentata*, where it is placed by recent floras of our region (Haines 2011, Weakley et al 2023). The flowers never seem to produce any pink pigments, which are usually if not always present (though often subtle to detect, even with fresh material) in *C. pratensis*. The cauline leaflets narrow basally to a short petiolule in *C. dentata*, but not in *C. pratensis* sensu stricta, though there are occasional exceptions with this character. *C. dentata* can produce roots (and what might be called “metaleaflets”) from the leaflets, which is unknown for *C. pratensis*. Differences in habitat and tolerance of disturbance are also significant (high-quality calcareous fens for *Cardamine dentata* vs. disturbed floodplains, streambanks, and other disturbed habitats for *C. pratensis*). Our plants in the NW fens are clearly the white-flowered taxon.

Biology and Life History

Cardamine dentata in Pennsylvania is known only from a few hydric calcareous fens in the glaciated NW, in all known cases with many other rare plant species characteristic of fens. Adaptation to hydric conditions is suggested by the adventitious roots occasionally produced from the leaves. Whether that makes those leaves stolons or not is a semantic question, but apparently Schultes's description of them as stolons led to the perceived need by some twentieth-century authors to recognize Petermann's later name *Cardamine palustris* as distinct from *C. dentata*.





Distribution and regional conservation statuses

This taxon in North America has a primarily Great Lakes distribution, but also southward in the vicinity of the Hudson and northern New Jersey, as well as Nova Scotia and the Aleutians, and disjunct in Alberta. One could argue this is either a circumboreal or cis-Atlantic distribution, and it may well be undetected in parts of western Canada and the northern western states.

Status Justification

The status we assigned, PE, for this taxon as *Cardamine pratensis* var. *palustris* is still applicable. We believe that this taxon is best treated as a full species, and that *Cardamine dentata* is the oldest available name.

Literature Cited

Chayka, K. Minnesota Wildflowers: a field guide to the flora of Minnesota. www.minnesotawildflowers.info. Accessed 15 March 2024.

Franzke, A. and H. Hurka, 2000. Molecular systematics and biogeography of the Cardamine pratensis complex (Brassicaceae). *Plant systematics and Evolution*, *224*, pp.213-234.

Haines, A. 2011. Flora Novae Angliae. Yale University Press.

Kartesz, J.T. 2023. Synthesis of the North American Flora, Version 2.0. Build – 1.0.8260.21237, Database – 25 January 2023.

NatureServe. 2024. NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: 12 March 2024).

Weakley, A.S. and the Southeastern Flora Team. 2023. *Flora of the Southeastern United States.* University of North Carolina Herbarium, University of North Carolina Botanical Garden, Chapel Hill, North Carolina.

Carex hitchcockiana – Hitchcock's sedge

Current Status in PA Regulations: N
Current PABS Status: PR
Proposed Status: PT
Coefficient of Conservatism: 8; 8-10 elsewhere, with Michigan an outlier at 5
Proposed by: Jessica McPherson, WPC/PNHP

Photos by Katy Chayka (wow, Katy!), from MinnesotaWildflowers.info

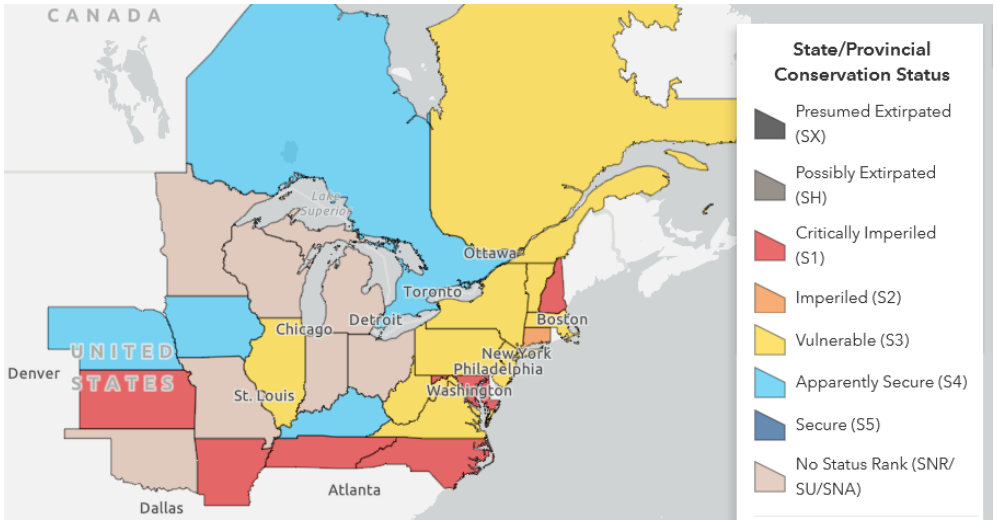
Proposal Summary

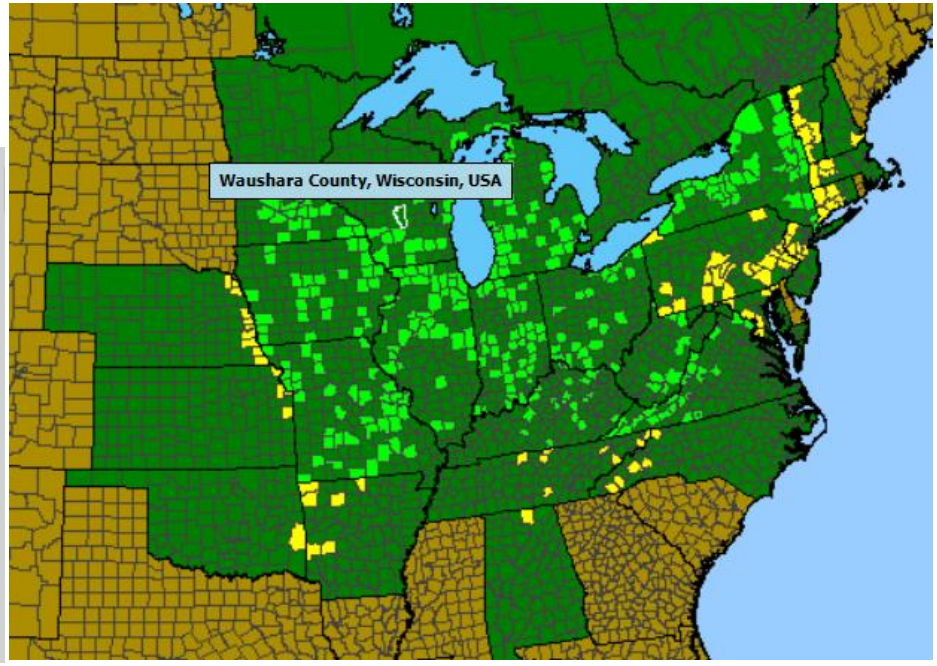
The number of known extant populations (15), plus the significant threats to this limestone forest specialist faces from invasive species and habitat destruction, and the species' high degree of conservatism, are consistent with Pennsylvania Threatened. We propose to change the PABS status from Pennsylvania Rare to Pennsylvania Threatened.

North American Distribution & Global / Regional Conservation Concerns

Carex hitchcockiana is found in the Northeast, across the Mid-atlantic, and the north-eastern Midwest. Its distribution is patchy in much of the range; this is likely due to a combination of lack of habitat (it is a limestone forest specialist), habitat loss (much of the Midwest), and some degree of under-documentation (it is a *Carex*, and not a particularly showy one).

It is assigned conservation status in most of the states and provinces where it occurs. It is S3 in NY, S1 in MD, and S3 in NJ.

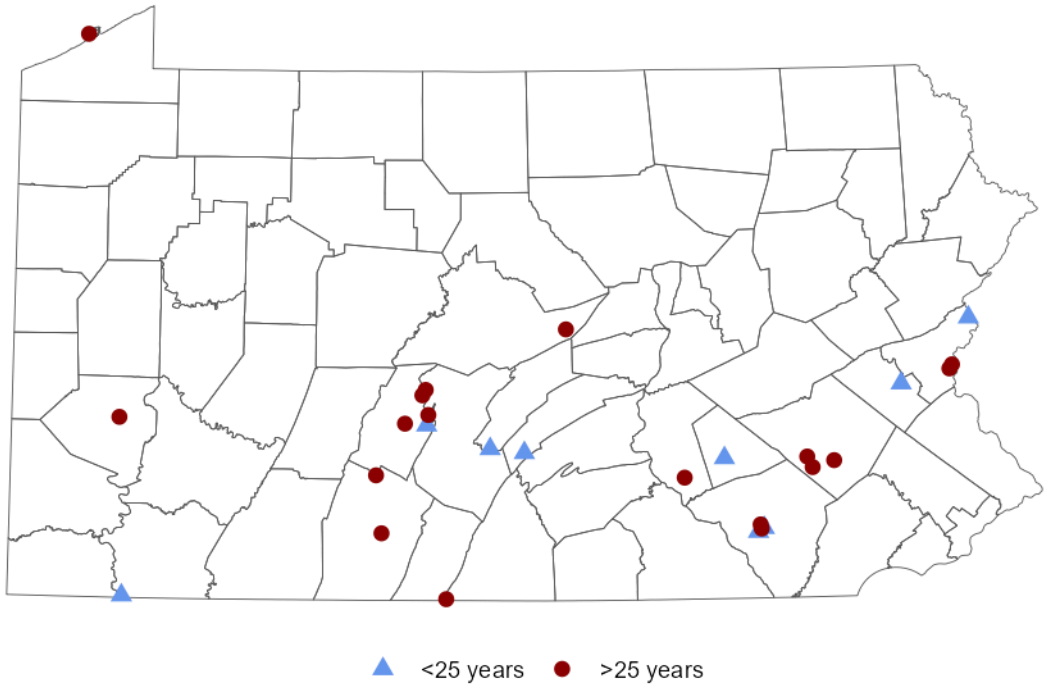




Pennsylvania Distribution

This species is known primarily from the limestone regions of Central Pennsylvania, with a few outliers.

Hitchcock's Sedge (*Carex hitchcockiana*)



Habitat

- Pennsylvania: forested limestone slopes (PNHP data).
- Flora of Virginia: Rich, well-drained floodplain forests, rich cove forests, dry-mesic to dry calcareous forests over limestone, dolostone and, rarely, mafic rocks; somewhat anomalous populations occur in extremely acidic soils of northern hardwood forests at high elevations of Allegheny Mountain in Highland County. Locally frequent in carbonate rock districts of the Ridge and Valley and Cumberland Mountains; rare elsewhere in the mountains and Piedmont. (Weakley, Ludwig, and Townsend 2012).

Extant locations

- 15 extant locations. Many have not been confirmed recently.
- 1 "B" site, 5 "BC" sites, 2 "C", 7 "E".

Historical Locations

- There are 12 historical records, 8 of which have location data potentially precise enough to relocate.

Conservation Concerns

The mesic forested limestone habitats preferred by this species are highly susceptible to invasion by non-native species, and this species does not have the size or competitive vigor to handle many of the more vigorous invasive species of such settings.

Identification

This is a species of the Griseae/Oligocarpae group of *Carex*, with many raised nerves on the perigynia. It is distinguished from others in the group by the white/brown culm bases (no red or purple), and the hispidulous leaf sheathes (no other member of the group in PA has this trait).

Status Justification

This species was first proposed in 2013, and at that time, with limited data available and some concern the species might be under-documented, the VPTC assigned a status of PR. However, 11 years later, we still have few known sites (15), most are not extensive, and invasive species pose serious threat. It is a highly conservative species not likely to be found outside remnant habitats. As DCNR prepares justification materials to assign a regulatory status for this species, our recommendation should align with current data. Pennsylvania Threatened is the most appropriate status due to the limited number of extant populations, the limited habitat and high degree of conservatism of the species, and the threat from invasive species and habitat loss.

Literature Cited

Pennsylvania Natural Heritage Program biotics database. 2024.

Weakley, Alan S., J. Christopher Ludwig, and John F. Townsend. 2012. "Flora of Virginia." Edited by Bland Crowder. *Foundation of the Flora of Virginia Project Inc., Richmond. Fort Worth: Botanical Research Institute of Texas Press.*

Weakley, Alan S., and Southeastern Flora Team. 2023. *Flora of the Southeastern United States*. University of North Carolina Herbarium, North Carolina Botanical Garden. https://fsus.ncbg.unc.edu/.

Purple sedge – *Carex purpurifera*

Current Status in PA Regulations: N
Current PABS Status: N
Proposal: PE
Coefficient of Conservatism: none in PA (new to state). 10, 10, 9 (Mid-Atlantic Wetland Working Group, WV, OH)
Proposed by: Jessica McPherson, WPC/PNHP

Carex purpurifera spike
Photo by Jessica McPherson

Carex purpurifera culm
Photo by Jessica McPherson

Proposal Summary

A population of *Carex purpurifera* was found in SW Pennsylania in the summer of 2023 that appears to be native. With only one known population, we propose a status of Pennsylvania Endangered.

Habitat

- Flora of Virginia: Rich cove forests, dry-mesic to dry calcareous forests over Mississipian limestone (Weakley, Ludwig, and Townsend 2012).
- Flora of the Southeastern United States (FSUS): Moist, rich cove forests, at low elevations, over calcareous or mafic rocks (Weakley and Southeastern Flora Team 2023)
- FNA: Moist, deciduous or, rarely, mixed deciduous-evergreen forests, around limestone escarpments, washes, sinks, and cave entrances. (Bryson & Naczi 2024)
- West Virginia: “elev. 750 m., northeast aspect on limestone, mixed mesophytic forest with Cy. cordiformis, Ac. saccharum, Aesculus flava Ait., F. americana, Podophyllum peltatum L., Cardamine concatenata (Michx.) Sw., and Trillium sessile” (Vanderhorst et al. 2019).
- Observed PA habitat: “Limestone Run,” but not in the highly calcareous areas with other rich indicators. Sub-mesic forest; mostly out of the floodplain and just above the lower slope area, but also some plants on high terraces. The soils where it grew were uniformly rocky, well-drained, and sandy, even in low topographic positions. It liked rocky micro-convexities, like the summits of steep stream and channel banks or rounded mid-slope areas, with little competition. Not found where *Actaea* or *Laportea* or *Dryopteris* spp. form dense herb layers. The population was densest and the individuals most vigorous in the above-described mid-slope zone, but it did occur more sparsely both upslope and downslope. Rob Naczi asserts that it is a calciphile, but it was not in the most calcareous portions of the site. The pH values we got from the soil test kit ranged from 5.0-6.5, but it was 5.0 in the area where the plants seemed most dense and well-developed. From the kit and the flora, we could tell there was some local variation, with some of the rocks calcareous and some not. It’s hard to assess what mineral influence the plants might be experiencing in these situations where there is fine-scale variability, even perhaps within a foot of soil based on what soil is in contact with which rocks; but reading the flora, I’d say it mostly stayed out of the rich areas. It did not co-occur with *Carex albursina*; common associates were *Viola*

rotundifolia, Clintonia umbellulata, Tiarella cordifolia, Polystichum acrostichoides, Polygonatum pubescens, Betula allegheniensis, Liriodendron tulipifera, Dryopteris intermedia, Thelypteris noveboracensis.

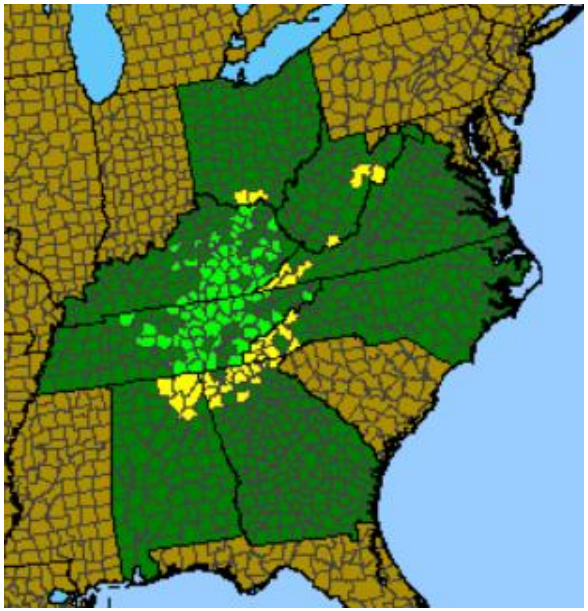
Identification

This species is very distinctive among Pennsylvania's Laxiflorae-group Carex species. The laxiflorae group occur in non-wetland forest habitat and fertile culms have triangular compressible stems. None of our other species in this group have the extensive crimson-red bases of this species. Our only red-based laxiflorae are *Carex gracilescens*, which is much smaller and has only a bit of red at the culm bases, and *Carex ormostachya*, which is also smaller and has barely detectable wine/purple coloration at culm bases. At a passing glance it could be mistaken for *Carex careyana* of the Careyanae group, which is also large and red-based, but does not have compressible stems, has much shorter bracts, and has sharply triangular perigynia (vs. rounded in *C. purpurifera*); or *Carex gracillema*, which has fairly bright red culm bases but beakless perigynia on long, drooping peduncles.

Carex manhartii – another Carex found south of PA - is the most similar species to *C. purpurifera*. Keys in FNA and Flora of the Southeastern United States use different characters to distinguish them. Rob Naczi warns that terminal spike characters (referenced in both keys) can actually be variable: "The occasional specimen of purpurifera has short peduncles on the staminate (terminal) spike...However, check of the population (if more plants) should reveal some with longer peduncles." (Naczi personal communication 2023).

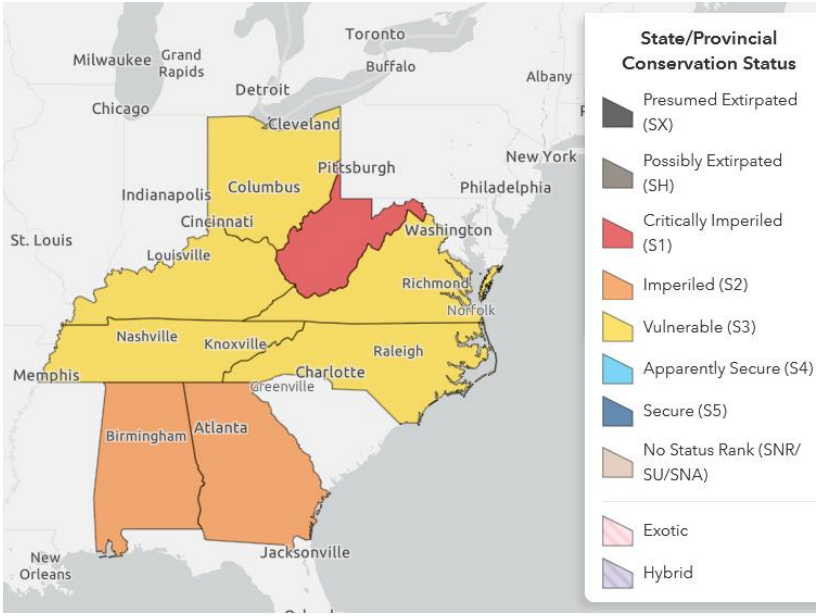
We found the papillose overwintering leaf character used in FNA to be fairly visible, and the terminal spike characters to be variable. FSUS and another paper (Gaddy 1995) say culms and leaves of *Carex purpurifera* are glaucous, but we found this character to be either very subtle or absent.

Distribution and regional conservation statuses



This species' range is centered on the southern Appalachians. It is ranked as G4 but has conservation status in every state where it is known to occur.

- Rob Naczi might have data not included in the Kartesz map.
- Per Vanderhorst et al. 2019, there is only one verified location in West Virginia, in Mercer County (the southernmost county).
- The Digital Atlas of the Flora of VA lists only the 4 SW counties shown in the Kartesz map.



Extant Locations

There is currently one known population in Pennsylvania. There is moderate possibility for additional locations. Rob Naczi had the following comments:

> As far as I know, *Carex purpurifera* has not been recorded for PA, but I've long expected it there. Its occurrences are quite localized, especially in the northern portions of its range, and within the last few decades, it has been discovered in the vicinity of areas that had been botanized well in the past, e.g. in portions of Adams County, OH. In those cases, it was a matter of a *Carex*-observant botanist happening upon the particular special place at the right time.
>
> Look very hard. *Carex purpurifera* is very, very localized, as I mentioned; you can walk through acres of seemingly good habitat without finding it, and then suddenly, you may find several plants within a small area. One population I saw in OH had only a handful of plants, all within an area of only a few square meters. On the other hand, in the core of its range in KY and AL, I've seen populations that numbered in the hundreds. Even large populations tend to occupy small areas, though. So, it's easy to miss this sedge, especially if not walking right where it occurs.
>
> I've been accumulating data for a long time on the occurrences of *Carex purpurifera*, through my own field work and herbarium work. [He spoke of potentially producing a range-wide map, but I don't think it's public yet.]

This species will stand out to botanists familiar with woodland *Carex* because of its large size and distinctive crimson-red stem bases. It most closely resembles *Carex careyana*, which is another sought-after species, and the possibility of finding that would attract attention. However, woodland *Carex* expertise is somewhat uncommon, and without it this species could easily be overlooked. Limestone run is certainly a well-travelled area, this population has probably been here a very long time, and it was just now discovered.

There are areas of similar habitat in the Laurel Highlands; how much habitat depends on how much of a calciphile it actually is, as limestone geology is a minority of the landscape. If it requires limestone as many have asserted, the habitat areas are more limited, and few additional locations are likely to be found.

Historic locations:

None are known. There is limited possibility for mis-filed specimens, as the species is distinctive for a *Carex*. No other species combine the lax triangular stem of the Laxiflorae with the large size and extensively crimson red bases of this species.

Conservation Concerns

The one known site is on State Game Lands in a fairly intact forested area. However, Japanese stiltgrass (*Microstegium vimineum*) has arrived along the edges of nearby roads, so it is presumably only a matter of years before the forest is entirely invaded by this species. *Carex purpurifera* seems to occupy low-competition areas and is shorter than Japanese stiltgrass; it would not likely persist in a vigorous carpet of this invasive species.

Status Justification

Pennsylvania Endangered is the most appropriate status for this newly discovered native species in Pennsylvania because only one population is known, and if additional populations exist, they are likely to be few in number.

Literature Cited

Bryson, Charles T. and Robert F.C. Naczi *Carex purpurifera*. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 25+ vols. New York and Oxford. Vol. 3. http://beta.floranorthamerica.org/Carex_purpurifera Accessed 3/21/2024.

Gaddy, L. L. 1995. "Carex Radfordii (Section Laxiflorae: Cyperaceae), a New Species from the Southern Appalachians." *Novon* 5 (3): 259–61. https://doi.org/10.2307/3392261.

Kartesz, J.T. 2023. Synthesis of the North American Flora, Version 2.0. Build – 1.0.8260.21237, Database – 25 January 2023.

Naczi, Robert F. C. 2023 Personal Communication via email.

NatureServe. 2024. NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: 12 March 2024).

Vanderhorst, James P., Brian P. Streets, Elizabeth A. Byers, Greg Short, Patricia L. Faulkner, and Rodney Bartgis. 2019. "Noteworthy Collections: West Virginia." *Castanea* 84 (1): 13–23.

Weakley, Alan S., J. Christopher Ludwig, and John F. Townsend. 2012. *Flora of Virginia*. 1st ed. Bland Crowder ed. Foundation of the Flora of Virginia Project, Richmond. Fort Worth: Botanical Research Institute of Texas Press.

Weakley, Alan S., and Southeastern Flora Team. 2023. *Flora of the Southeastern United States*. University of North Carolina Herbarium, North Carolina Botanical Garden. https://fsus.ncbg.unc.edu/.

Field chickweed - *Cerastium velutinum* var. *velutinum*

Cerastium velutinum var. *velutinum*
Photo by Gary Fleming

Current Status in PA Regulations: N
Current PABS Status: N
Current S-rank: S3
Coefficient of Conservatism: 10?
Presented by: Rachel Goad, with contributions from Chris Hoess

Summary
This taxon has been recognized in the past as part of *C. arvense*. It is closely related to, and in Pennsylvania it co-occurs with, a globally rare taxon, Goat Hill Chickweed (*C. velutinum* var. *villosissimum*). Additional data is needed to support a status proposal.

Background
This taxon was ranked S3 in 2010. There is no record of discussion by VPTC or at the Rare Plant Forum, though the data we do have suggest that a status may be warranted.

There are two elements of *C. velutinum*: One of these is the globally rare serpentine endemic Goat Hill Chickweed (*C. velutinum* var. *villosissimum*) of which there may be one PA occurrence (though this is under active investigation). Field chickweed (*C. velutinum* var. *velutinum*) occurs on serpentine geology, but also in other habitats. While not globally rare, it may warrant a state status.

In PA, what was formerly known as *Cerastium arvense* (s.l.) splits into *C. arvense* (s.s.), an alien of disturbed places, *C. strictum* (native) and *C. velutinum* (native) (Weakley & Southeastern Flora Team 2022). The varieties of *C. velutinum* were mapped together in the Atlas of the Flora of Pennsylvania as *C. arvense* var. *villosissimum* and *C. arvense* var. *villosum* (Wherry et al. 1979). Rhoads and Klein (1993) included Field chickweed (which they called *C. velutinum* var. *villosum*) in *C. arvense* var. *arvense*, noting "*C. arvense* var. *villosum* **pro parte**". Differences in ploidy and morphology prompted recognition of *C. velutinum* outside of *C. arvense* (Morton 2002; Gustafson et al. 2003). The Plants of Pennsylvania treated the two as varieties of *C. velutinum* (Rhoads & Block 2007).

At one site where both varieties of *C. velutinum* co-occur, they seem to grade into each other and can be difficult to distinguish. Previous research into the genetic status of *C. velutinum* suggested that the subspecific varieties were distinct (Gustafson et al. 2003), but questions still remain. A new generation of genetic tools are being applied to these and other Cerastium-related questions by Chris Hoess at Delaware Technical Community College.

Herbarium work is needed. The Mid-Atlantic Herbarium Portal returns 249 specimens when searched for the name '*C. velutinum*'. The vast majority of these were collected from serpentine barrens communities, but there are also specimens from river scour, bluffs, thin woods and woods edges. Identification review of these specimens, and any others that may also be hiding in *C. arvense* folders, is needed. Notably, just five collections have been made since 2000.

Assessment of extant populations is also needed. Seven populations of *C. velutinum* var. *velutinum* are in PNHP's database, all associated with serpentine barrens, and these are likely our largest extant populations. However, additional habitats (e.g., river scour) have and may still host populations. INaturalist has ~100 research grade observations of *C. velutinum* var. *velutinum* in Pennsylvania, most of which appear to be from serpentine sites, and almost all of which have been reviewed by Chris Hoess. One observation suggests an extant occurrence on the lower Susquehanna. Additional occurrences should be sought outside of serpentine geology.

Habitat

- Plants of Pennsylvania: Woodlands, especially on limestone, serpentine barrens; throughout (Rhoads and Block, 2007)
- FSUS: Rocky river-scour areas, dry limestone bluffs, other open situations. (Weakley and Southeastern Flora Team 2023).
- Flora of Virginia: Crevices and shelves of flood-scoured riverside outcrops; tolerates a range of rock types and chemistries (Weakly et al. 2012)
- Flora of North America: Limestone rocks, woodlands, serpentine barrens (Morton, 2005).

Figure 2. Specimens of *C. velutinum* var. *velutinum* showing perennial, clumping growth, elongated leaves, and large flowers.

Biology and Life History

- Tap-rooted, clump-forming perennial
- Spring-flowering, with affinity for open-canopied, rocky slopes, especially on serpentine geology.

Identification

- Petals long (1cm+), 2-3x as long as the sepals.
- Large, showy flowers
- Leaves relatively long and soft-pubescent, but hair not obscuring leaf surface.
- Pubescence on proximal stems spreading. Stems not obscured by overlapping leaves.
- Wonderful photos on this iNaturalist observation: https://www.inaturalist.org/observations/199275218

Distribution and regional conservation statuses

- NatureServe currently tracks this taxon as *C. arvense* var. *velutinum*. It is listed as S1 in AR, TN, KY, VA, and DE, which are at its southern range; and it is also listed as S1 in Ontario, at its northern range (Fig 3A).
- BONAP maps occurrences in two regional clusters – one in the Midwest centered on Illinois and Missouri, and one in the mid-Atlantic centered on Pennsylvania. The significance and accuracy of this distribution needs to be investigated (Fig 3B).
- Occurrences in PNHP's database are all from the far southeastern part of the state at sites with serpentine outcrops.

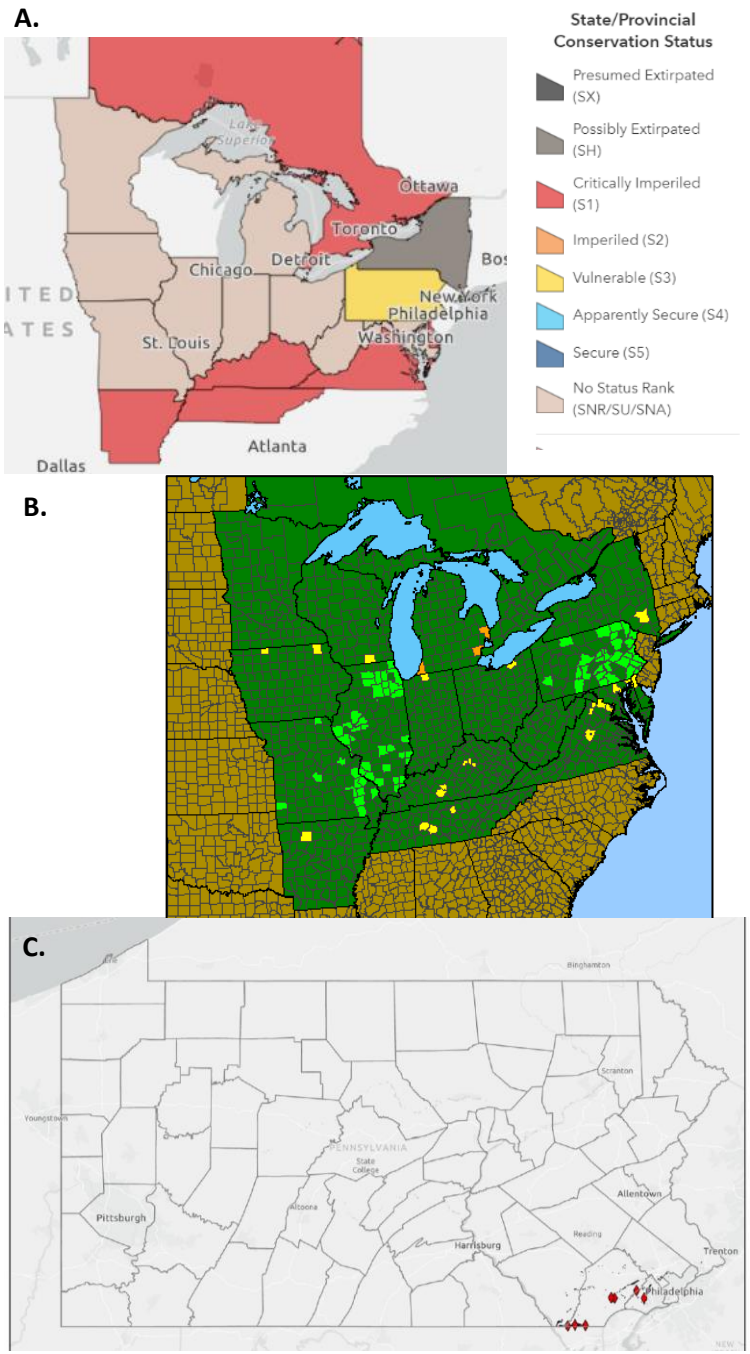


Figure 3. **A.** NatureServe range map with subnational ranks for *C. arvense* var. *velutinum.* **B.** BONAP distribution map for *C. velutinum var. velutinum* (2014); **C.** Map of known extant occurrences of *C. velutinum* var. *velutinum* (red diamonds). Serpentine / mafic outcroppings are shown in black. (PNHP, 2024)

Literature Cited

Gustafson DJ, Romano G, Latham RE, Morton JK. 2003. Amplified Fragment Length Polymorphism Analysis of Genetic Relationships among the Serpentine Barrens Endemic Cerastium velutinum Rafinesque var. villosissimum Pennell (Caryophyllaceae) and Closely Related Cerastium Species. Journal of the Torrey Botanical Society 130:218.

Kartesz JT. 2014. The Biota of North America Program (BONAP). Available from http://www.bonap.net/napa.

Morton JK. 2005. Cerastium. Page Magnoliophyta: Caryophyllidae, part 2. Oxford University Press, New York, Oxford.

NatureServe. 2024. NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: 12 March 2024).

Rhoads AF, Block TA. 2007. The Plants of Pennsylvania, Second edition. University of Pennsylvania Press, Philadelphia, Pennsylvania.

Rhoads AF, Kline WM. 1993. The Vascular Flora of Pennsylvania: Annotated Checklist and Atlas. American Philosophical Society, Philadelphia, PA.

Weakley, A.S., J.C. Ludwig, and J.F. Townsend. 2012. Flora of Virginia. Bland Crowder, ed. Foundation of the Flora of Virginia Project Inc., Richmond. Fort Worth: Botanical Research Institute of Texas Press.

Weakley, A.S. and the Southeastern Flora Team. 2023. *Flora of the Southeastern United States.* University of North Carolina Herbarium, University of North Carolina Botanical Garden, Chapel Hill, North Carolina.

Wherry ET, Fogg JM, Wahl HA. 1979. Atlas of the flora of Pennsylvania. Morris Arboretum of the University of Pennsylvania, Philadelphia, Pa.

Dichanthelium angustifolium (Elliott) Gould (narrowleaf witchgrass)

Syn. *Dichanthelium aciculare* (Desv. ex Poir) ssp. *angustifolium* (Elliott) Freckmann & Lelong

Current Status in PA Regulations: N
Current PABS Status: N
Proposed Status: PX
Coefficient of Conservatism: N/A
Proposed by: Claire Ciafré, PNHP/WPC

Proposal Summary

Dichanthelium angustifolium is proposed as state historic. Its presence in Pennsylvania is documented by a single specimen collected in 1849, and potential for rediscovery seems low but still possible.

Habitat

Sandy pinelands and fields (Hitchcock and Chase 1951, Weakley and Southeastern Flora Team 2023).

Figure 1. Spikelets and gestalt of *D. angustifolium*. Photos by Eric Ungberg, taken in the Carolinas.

Identification

The habit of *D. angustifolium* is its most immediately identifiable feature: it has proportionately long, narrow leaves (similar to *D. linearifolium* or *D. depauperatum*) which are not basally disposed. It is thus most similar to *Dichanthelium* ×*bicknellii,* a hybrid involving *D. linearifolium* or *D.* depauperatum, but its leaves do not get progressively larger up the stem and its spikelets are distinctly obovate. Its spikelets are 2.2-2.8 mm long and it has no visible ligule.

Dichanthelium angustifolium is the only member of section *Angustifolia* expected to occur in Pennsylvania. It is similar to *D. aciculare*, which occurs in New Jersey and has previously been treated as a subspecies of *D. aciculare* (in the broad sense). It differs from *D. aciculare* in having longer and wider leaves which are longitudinally wrinkled (similar to tall fescue leaves in texture), larger spikelets, and spreading panicle branches.

Global distribution and regional conservation statuses

Pennsylvania is at the northern edge of the range of *D. angustifolium,* where it appears to be limited to the Coastal Plain and Piedmont. It is historic (SH) in Delaware and in New Jersey (as *D. acuminatum* sensu lato; NatureServe 2024). Reports of it in Maryland appear to be false (Knapp and Naczi 2021).

It is more common further south, where it also rarely occurs in interior physiographic regions such as the Ridge and Valley and Interior Low Plateau. It is currently secure (S5) in Virginia, rare (S3) in Kentucky, and endangered (S1) in Tennessee (where it is tracked as *D. aciculare* sensu lato; NatureServe 2024). It was previously reported for Missouri (Ladd and Thomas 2015) but that occurrence has since been redetermined as a closely related species, *D. neuranthum* (Thomas 2017). It occurs in the rest of the southeastern states from North Carolina to Arkansas and east Texas. Its status has not been determined for any of these states except in Florida, where it is ranked as secure (S5) as *D. aciculare* sensu lato (NatureServe 2024).

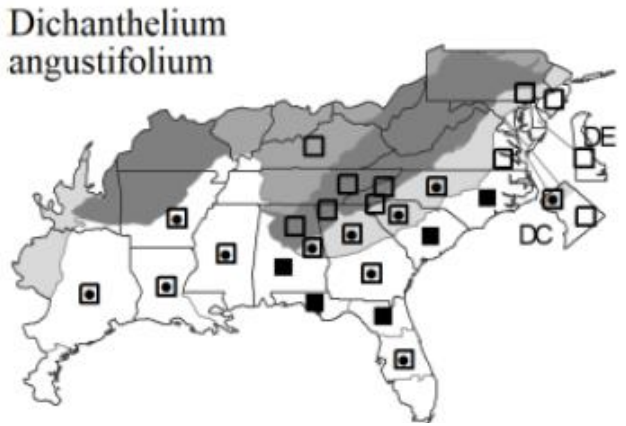


Figure 2. Distribution of *D. angustifolium* in the southeastern United States. Open squares: rare; dotted squares: uncommon; filled squares: common. Weakley and Southeastern Flora Team 2023.

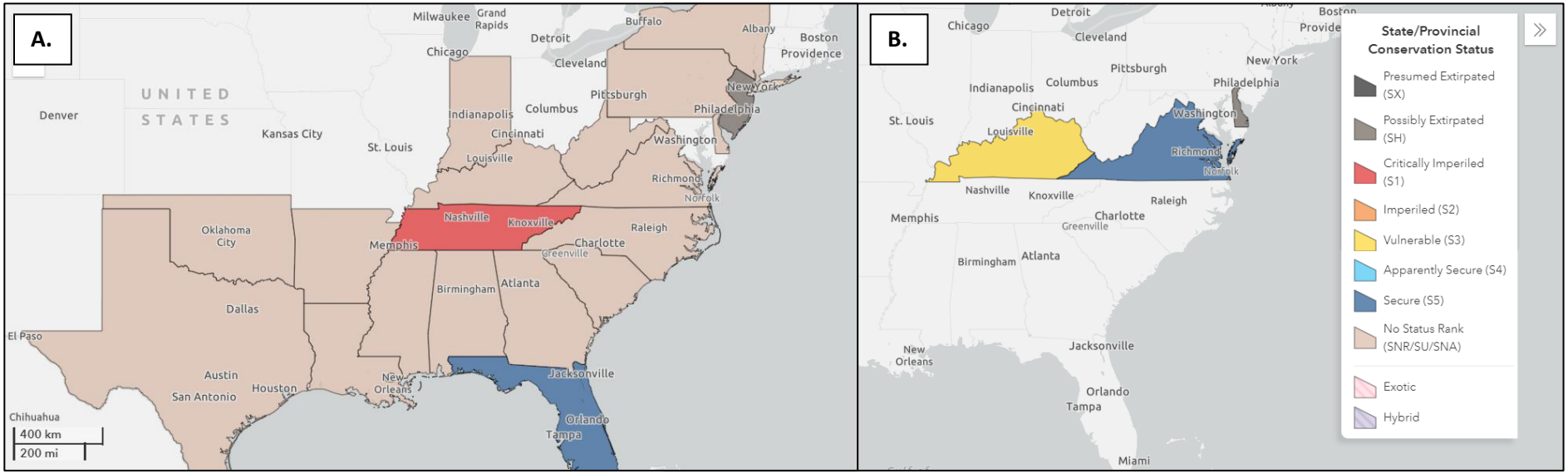


Figure 3. State ranks of *D. aciculare* sensu lato (A) and *D. aciculare* ssp. *angustifolium* (B). Not all states rank *D. angustifolium* separately from *D. aciculare* due to taxonomic confusion between the two taxa in the southeast, but not all states have both taxa (e.g. Indiana only has *D. aciculare* ssp. *aciculare*). NatureServe 2024.

Pennsylvania Distribution

In Pennsylvania *D. angustifolium* is known from a single specimen collected from the "[bank] of the Schuylkill River, below Reading" in 1849 by Thomas Porter. The specimen was initially identified as *Panicum depauperatum* Muhl. by Porter, and was later annotated to *P. angustifolium* Ell. by Hitchock and Chase (no year) during their revision of *Panicum*. It seems likely that the locality of this specimen is from the base of Neversink Mountain or nearby; the well-drained soils and open woodlands in this area would have been appropriate habitat for this species, and this habitat would have extended to the banks of the Schuylkill River.

A second digitized specimen is on Symbiota and was databased as being from "Mercer County, Pennsylvania", but the specimen label actually reads "Henderson County, Tenn."

This species is not reported in the Flora of Pennsylvania (Rhoads and Block 2007), though it has been mapped for Pennsylvania in the Flora of the Southeastern United States (Weakley and Southeastern Flora Team 2023) and in Manual of the Grasses of the United States (Hitchcock and Chase 1951). Flora of North America maps *Dichanthelium aciculare* sensu lato to Pennsylvania, but does not indicate whether *D. angustifolium* occurs in the state (Frekmann and LeLong 2003).

Figure 4. *Dichanthelium angustifolium* specimen from Pennsylvania. The specimen is housed at the Philadelphia Academy of Natural Sciences (PH) but its image is available on Symbiota.

Conservation Concerns

Because the exact location of this species is unknown in Pennsylvania, it is unclear whether its only known population might still persist. Significant habitat alteration and destruction along the Schuylkill River has occurred in the past 200 years. However, this species might still persist on Neversink Mountain and/or might be found at other open, well-drained sites in southeastern PA which still harbor barrens flora.

Status Justification

This species has not been documented in Pennsylvania since 1849, and it is considered to be historic in other adjacent states at the northeastern edge of its range. Because habitat is still potentially present near its known locality and elsewhere in the state, and because of past underdocumentation of *Dichanthelium,* it is possible that this species might be rediscovered in Pennsylvania and so a rank of historic (SH) seems appropriate rather than extirpated (SX). Given that there is no legal status for "historic", PX should be assigned.

Literature Cited

Ladd D. and J.R. Thomas. 2015. Ecological checklist of the Missouri flora for Floristic Quality Assessment. Phytoneuron 2015-12: 1-274.

Freckmann, R. W., and M. G. LeLong. 2003. Dichanthelium. In: Flora of North America north of Mexico. 25:406–451.

Hitchcock, A.S., and A. Chase. 1951. Manual of the grasses of the United States, 2nd ed. DoverPublications, Inc., New York, New York.

Knapp W.M. and R.F.C. Naczi. 2021. Vascular plants of Maryland, USA: A comprehensive account of the state's botanical diversity. Smithsonian Contributions to Botany 113: 1–151.

NatureServe. 2024. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at http://explorer.natureserve.org (Accessed: March 15, 2024).

Rhoads, A.F. and T.A. Block. 2007. The Plants of Pennsylvania: An illustrated manual. Philadelphia: University of Pennsylvania Press.

Thomas, J.R. 2017. New additions, vouchers of old additions, and a new combination (Dichanthelium inflatum) for the Missouri flora. Missouriensis 34: 4-19.

Weakley A.S. and Southeastern Flora Team. 2023. Flora of the southeastern United States. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, U.S.A.

Dichanthelium villosissimum (Nash) Freckmann (white-haired witchgrass)

Syn. *D. ovale* ssp. *villosissimum* (Nash) Frekmann & LeLong

Current Status in PA Regulations: TU
Current PABS Status: SNR
Proposed Status: PT
Coefficient of Conservatism: 5 (PA), 6 (NJ, MO)
Proposed by: Claire Ciafré, PNHP/WPC

Figure 1. *Dichanthelium villosissimum*. Habit (left) taken by Nathan Aaron in Missouri; culm (right) taken by Vanessa Voelker in Indiana.

Proposal Summary

Dichanthelium villosissimum is proposed as Pennsylvania Threatened (PT). The rank suggested by the Rank Calculator, S1/S2, supports this decision. There are 4-15 known extant populations in the state, and it is probable that more populations will be found, and its historic localities may be rediscovered. However, this species is a barrens specialist and may be in decline due to soil enrichment and fire suppression.

Taxonomy

Dichanthelium villosissimum was previously tracked in PA as *D. villosissimum* var. *villosissimum* but was changed to *D. villosissimum* in 2018. The Flora of the Southeastern United States includes it as *Dichanthelium villosissimum* var. *villosissimum.* The only other variety, *D. villosissimum* var. *praecocius* (a Midwestern tallgrass prairie obligate), is not known from Pennsylvania and is extremely unlikely to occur here. While only *D. villosissimum* will be given a legal status, both the species and its variety (var. *villosissimum*) will be given a rank. Other states are variable in whether they rank this taxon as a species, variety, or both.

Dichanthelium villosissimum is considered to be a member of the *D. ovale* species complex, and it is a variety of *D. ovale* in Flora of North America (Freckmann and LeLong 2003); some states also track this taxon under that name. In PA, the only other known member of this complex is *D. commonsianum* (*D. ovale* var. *addisonii* in FSUS, *D. ovale* ssp. *pseudopubescens* in FNA). In a recently published phylogeny of the genus (Appendix 1), specimens identified as members of the *D. ovale* complex were mixed with other species/complexes in the phylogeny so thoroughly that the authors “refrain[ed] from considering any major taxonomic changes or species recognition for infraspecific taxa as currently circumscribed until further work illuminates relationships in this complex” (Majure et al. 2023) and serious concerns have been raised about the quality of that study. While more work clearly needs to be done in the complex, Thomas 2015 makes a good argument for the recognition of *D. villosissimum* as a species in his revision of *Dichanthelium* section *Lanuginosa* and thus we are proposing it as such.

Identification

Dichanthelium villosissimum is a member of section *Lanuginosa,* whose members are small-fruited, have long ligules, and typically some form of pubescence on its sheaths, leaves, and/or internodes. It can be distinguished from other members of the section by its particularly long, dense pubescence on the sheaths and vernal leaves, often appearing to be somewhat bearded at the nodes. The descending pubescence on the sheaths can make the culms resemble tarantula legs.

Dichanthelium villosissimum is one of few species that has a "double" ligule: a short (0.5-1 mm long) ligule backed by a longer (1-5 mm long) pseudoligule (Fig. 2b, Fig. 3). Two other species in PA can have a double ligule: *D. commonsianum* (=*D. ovale* var. *addisonii* in FSUS) and *D. columbianum.* It differs from both in having longer (>3 mm long), villose hairs on the sheath (Fig. 2a or 2b) rather than pilose and/or puberulent hairs (Fig. 2c or 2d). The directionality of the sheath hairs may also be helpful in separating *D. villosissimum* from *D. commonsianum*, as they tend to be descending in the former and ascending in the latter*,* however they may be spreading in either species and some overlap may occur.

Dichanthelium villosissimum may also be confused for *D. lanuginosum* (=*D. acuminatum* var. *fasciculatum* in FSUS) as it's the most common and widespread member of *Lanuginosa,* however its ligule is a single row of hairs (Fig. 2a) and its sheath hairs (and leaf hairs, if present) are shorter. *Dichanthelium meridionale* may also appear similar as it can have very long sheath and leaf pubescence, but it also only has a single ligule.

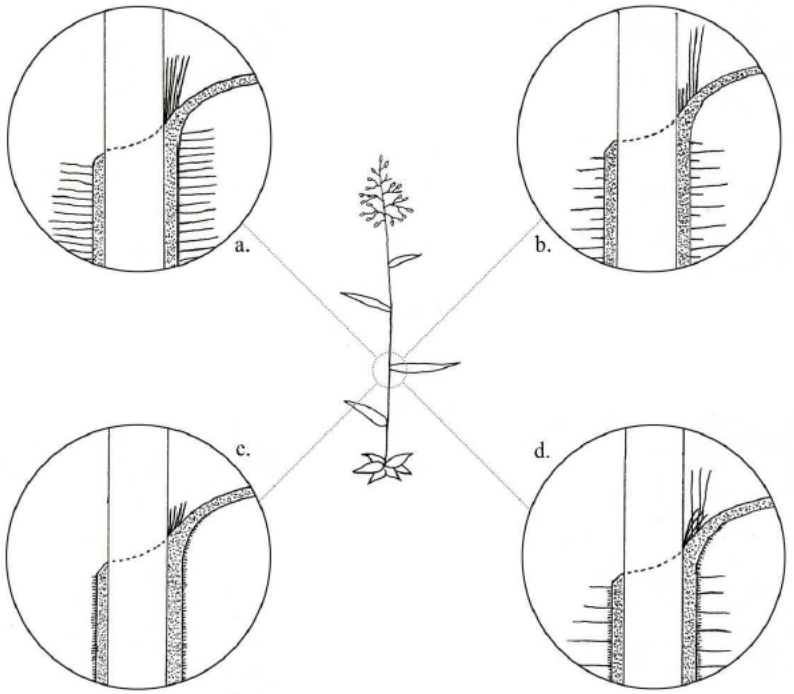


Figure 2. Examples of ligule and pubescence types in Section *Lanuginosa*. *Dichanthelium villosissimum* combines the ligule in example b and the sheath pubescence in examples a and b. Figure reproduced with permission from Thomas 2015.

Figure 3. Comparison of a double and single ligule. Photos are of *D. commonsianum,* with a double ligule (left) and *D. lanuginosum,* with a single ligule (right) taken by Claire Ciafré.

Global distribution and regional conservation statuses

Dichanthelium villosissimum is found throughout the eastern United States from Massachusetts, Quebec, and Minnesota south to Texas and Florida (and into Mexico and South America) (Fig. 4). It is considered historic (SH) in Massachusetts and Rhode Island (GoBotany 2024), and it is endangered (S1) in Maryland (Knapp and Naczi 2021), New York, and Kansas. It is threatened (S2) in Ohio, and it is rare (S3) in Illinois, Kentucky, and Florida. It is secure or apparently secure in most other coastal states, including New Jersey, Delaware, West Virginia, Virginia, North Carolina, and South Carolina, however it has not been ranked throughout most of its range.

NatureServe maps *D. villosissimum* from Maine but it has not been reported to occur there by any other resource, and there are no digitized specimens identified as *D. villosissimum* from there (two specimens identified as *D. ovale* are online but are definitely not *D. villosissimum*).

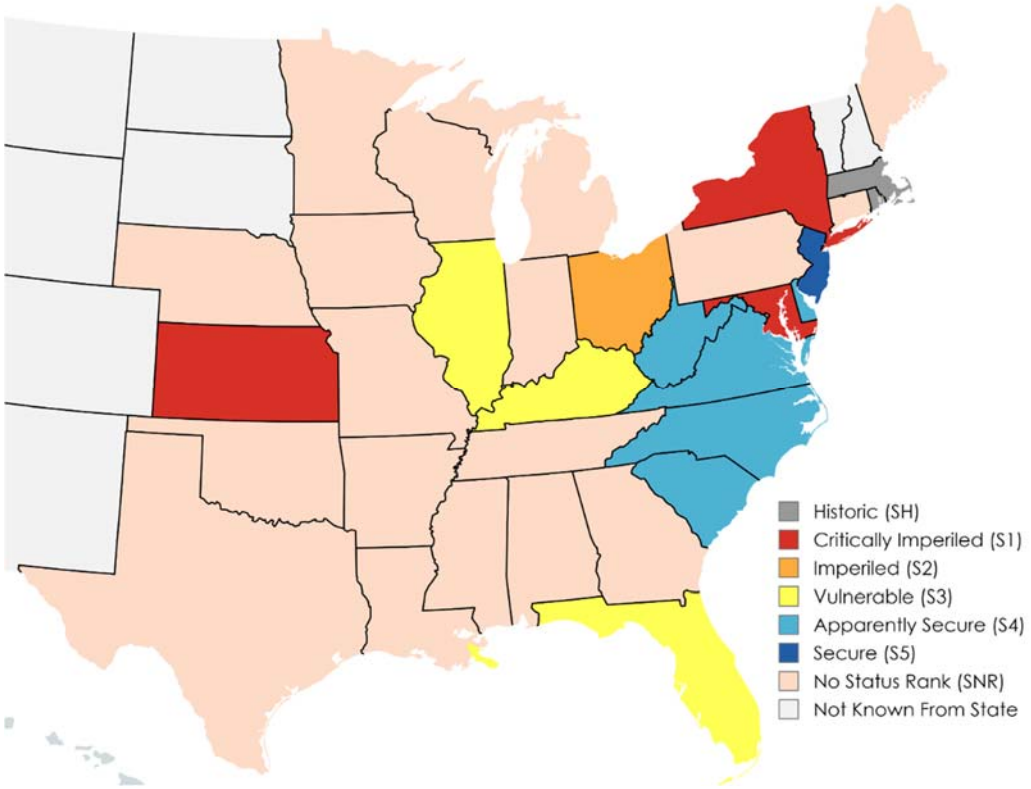


Figure 4. Range and rank of *D. villosissimum* in North America. Map is a composite of ranks for *D. villosissimum* (except in states where only var. *praceocius* is known), *D. villosissimum* var. *villosissimum,* and *D. ovale* var. *villosissimum*. *Dichanthelium villosissimum* additionally occurs in Quebec, Canada, where it is not ranked, as well as in Mexico and South America.

Pennsylvania Distribution

Populations are known from two distinct clusters. One is in the Ridge and Valley, consisting of four historic EOs in Centre County and one extant population in Montour County. The other is in the Northern Piedmont (Chester County), in Serpentine barrens. Specimens not yet processed as EOs or verified by PNHP staff (but largely appear to be from appropriate habitats) suggest six additional populations in Delaware, Northampton, Luzerne, McKean, and Erie Counties.

Habitat

Dichanthelium villosissimum is reported to occur in dry pine or oak-hickory forests, woodlands, or hillsides, typically in sandy and/or acidic, nutrient-poor or "sterile" soil (Hitchcock and Chase 1951, Thomas 2015). This species may also potentially occur in prairies (Weakley and Southeastern Flora Team 2023).

Known occurrences in Pennsylvania suggest an affinity toward calcareous and/or ultramafic woodlands and barrens, as it occurs in serpentine grasslands (and rights of way associated with such habitats), and historic occurrences were collected from dry calcareous woodlands and possibly grasslands in the Ridge and Valley. However, it is unknown whether *D. villosissimum* may occur in other habitats, such as on acidic soils, as it does within the core of its range.

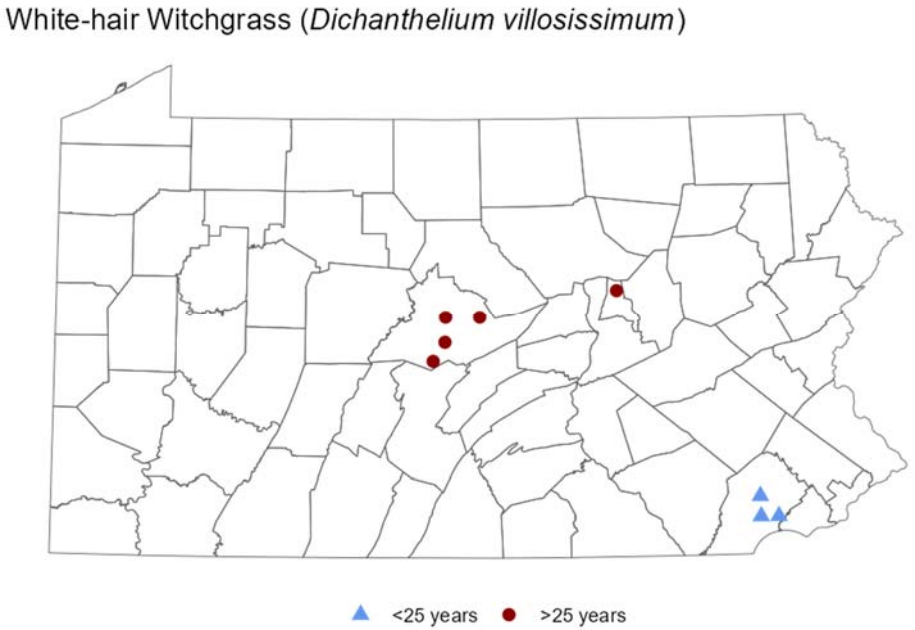


Figure 5. Known occurrences (EOs) of *D. villosissimum* in PA. Map does not include six unconfirmed populations. Extant populations are represented by the blue triangles in Chester County and the red circle in Montour County (last seen/surveyed for in 1994).

Conservation Concerns

As an open woodland/grassland species, *D. villosissimum* benefits from appropriate use of prescribed fire, and closure of such sites and enrichment of soils from nitrogen-rich tree litter (e.g. from maples, rather than oaks and pines) and intraspecific competition seem to be the greatest threat to this species. It is less clear whether *D. villosissimum* benefits from soil scraping periodically used on serpentine barrens and it is unclear how quickly it recovers to such activity. Hybridization with other *Dichanthelium* species and genetic swamping by species like *D. lanuginosum* is a concern when large-scale soil disturbance occurs, however.

Approximately half of the known/potential populations are not on protected land, though no extant sites seem to be immediately at risk for development. Several populations occur within or on the edge of rights of way, and herbicide use in such situations may be a threat if non-specific herbicides are used and/or appropriate habitat is not available adjacent to the maintenance area.

Dichanthelium villosissimum appears to be at or very close to the northern edge of its range in Pennsylvania. Increased rainfall predicted to occur with climate change is likely to be a problem for this dry woodland species, however populations may benefit from higher temperatures as long as their habitats are kept open. There is no known mechanism for long-distance dispersal in any *Dichanthelium* species, so while individuals/population may increase with climate change, the number of populations is unlikely to increase.

As with other technical and less-charismatic taxa, there is a good chance that some populations have been overlooked and/or misidentified as other species. Additional discoveries are likely and have been accounted for in the rank calculator estimates accordingly. However, the barrens habitats where *D. villosissimum* occurs are uncommon and in decline, and it is not likely to found in widespread community types.

Status Justification

Because of the low number of known occurrences (4-15), and high fidelity to specialized barrens habitats/conditions that are known to be limited and in decline in Pennsylvania, a status of S1/S2 is suggested. More populations are likely to be discovered and confirmed, however, so a status of Threatened (PT) is proposed rather than Endangered (PE).

Literature Cited

Freckmann, R. W., and M. G. LeLong. 2003. Dichanthelium. In: Flora of North America north of Mexico. 25:406–451.

GoBotany. 2024. Native Plant Trust: *Dichanthelium ovale*. https://gobotany.nativeplanttrust.org/species/dichanthelium/ovale/ Accessed 22 March 2024.

Hitchcock, A.S., and A. Chase. 1951. Manual of the grasses of the United States, 2nd ed. Dover Publications, Inc., New York, New York.

Knapp W.M. and R.F.C. Naczi. 2021. Vascular plants of Maryland, USA: A comprehensive account of the state's botanical diversity. Smithsonian Contributions to Botany 113: 1–151.

NatureServe. 2024. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at http://explorer.natureserve.org (Accessed: March 15, 2024).

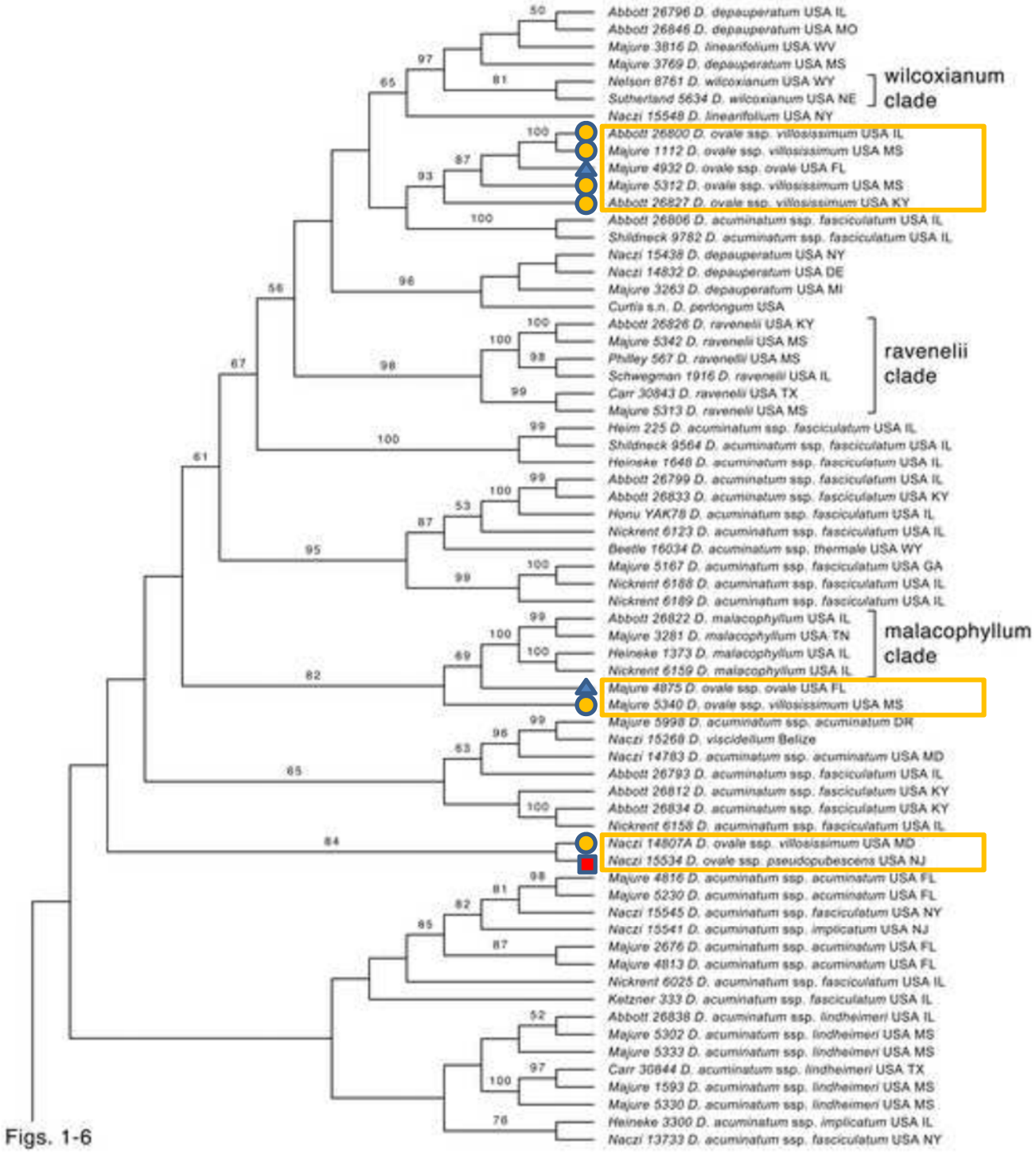
Majure L.C., R.F.C. Naczi, J.R. Abbott, K.R. Wood, J. Valencia-D., G. Stonehouse, K.M. Neubig. 2023. Phylogeny of North American *Dichanthelium* (Panicoideae, Poaceae): testing species limits in one of the most taxonomically complicated group of grasses. International Journal of Plant Sciences, University of Chicago Press. https://doi.org/10.1086/728893

Ladd D. and J.R. Thomas. 2015. Ecological checklist of the Missouri flora for Floristic Quality Assessment. Phytoneuron 2015-12: 1-274.

Rhoads, A.F. and T.A. Block. 2007. The Plants of Pennsylvania: An illustrated manual. Philadelphia: University of Pennsylvania Press.

Thomas, J.R. 2017. New additions, vouchers of old additions, and a new combination (Dichanthelium inflatum) for the Missouri flora. Missouriensis 34: 4-19.

Weakley A.S. and Southeastern Flora Team. 2023. Flora of the southeastern United States. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, U.S.A.



Figs. 1-6

Appendix 1. Subset of Majure et al. Phylogeny of *Dichanthelium*. Specimens identified as members of the *D. ovale* complex (orange rectangles) were recovered within Section *Linearifolia* as well as within Section *Lanuginosa.* Specimens identified as *D. ovale* ssp. *villosissimum* are marked by orange circles.

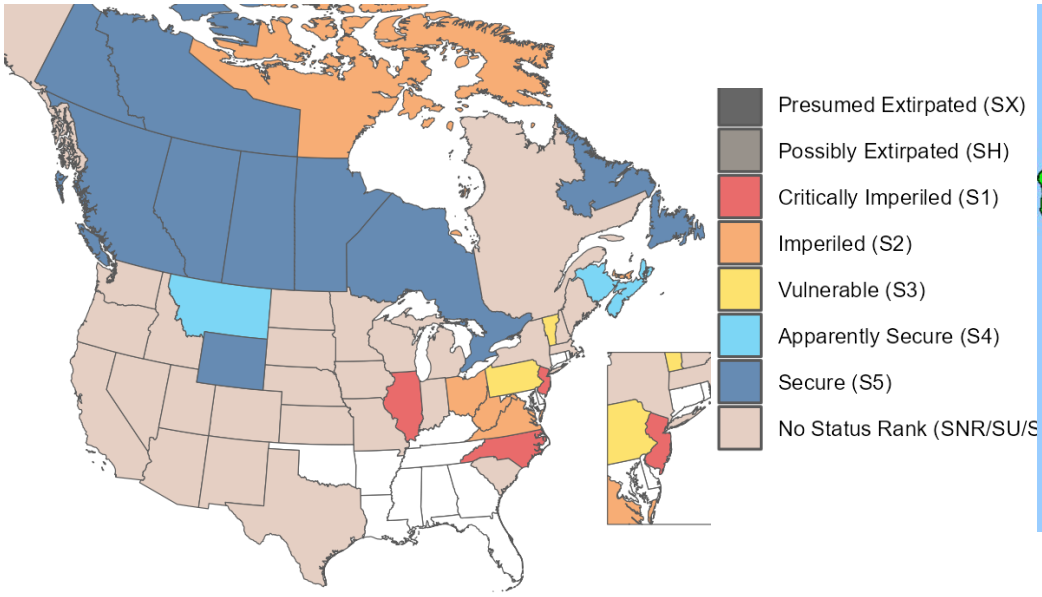
Elymus trachycaulis – slender wheat grass

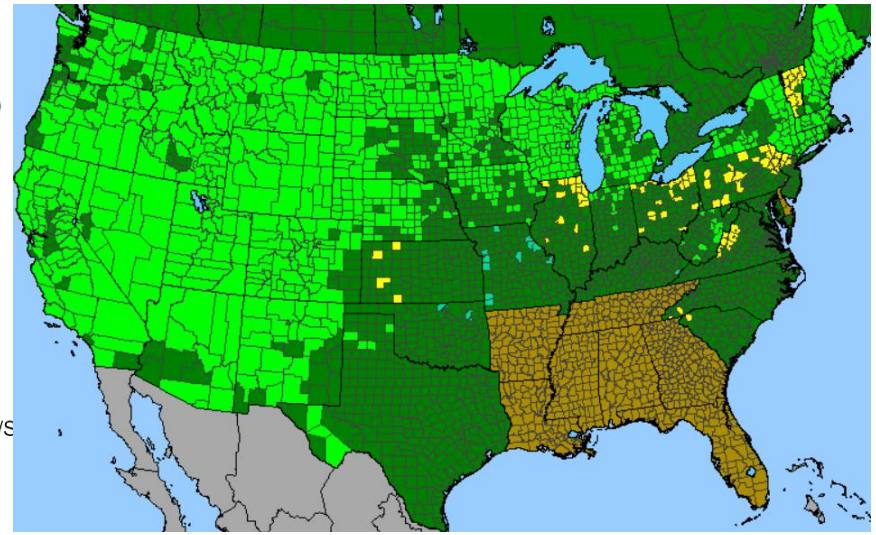
Current Status in PA Regulations: N
Current PABS Status: TU
Proposed Status: PT or PR or TU
Coefficient of Conservatism: 8; 3-10 elsewhere
Proposed by: Jessica McPherson, WPC/PNHP
Overview

The appropriate status for this taxon is uncertain and up for discussion. As it currently has no legal status but a PABS status of TU, it is either something that is a priority to assign legal status to in order to give it protection, or something that doesn't require urgent action if sentiment is more in the direction of it not needing legal protection. The decision is complicated by the species' affinity for ROW and roadside habitats, in addition to a smaller number of sites at natural barrens.

North American Distribution & Global / Regional Conservation Concerns

This species has a broad range in Western North America; in the east, the southern edge of its range seems significantly further north. Aside from higher-elevation areas in the mountains to the south, Pennsylvania is at the southern edge of its range.

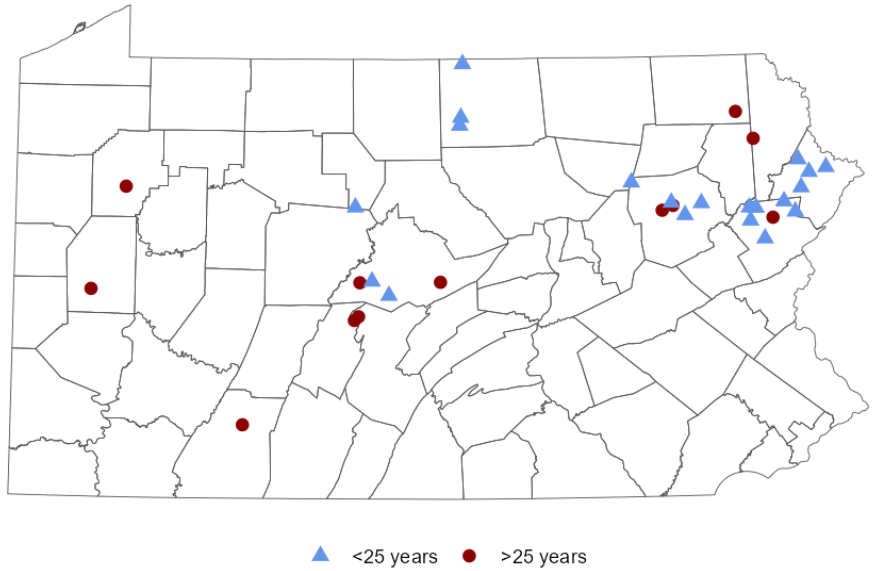




Pennsylvania Distribution

The historic range is broader than the currently known range. Currently it is mostly in Northeastern PA, with a few central populations.

Slender Wheatgrass (*Elymus trachycaulus*)



Habitat

- Pennsylvania: 6-7 populations on natural barrens; steep, open, dry habitats. Of the natural barrens habitats, 4 appear acidic while 3 are calcareous. 14 sites on right-of-ways or road edges; dry, open, and usually steep. (PNHP data).
- Flora of Virginia: Dry, open oak or oak-hickory forests and shale woodlands; usually on gentle upper slopes or crests of shale, sandstone, or metasiltstone ridges. Rare in the mountains(Weakley, Ludwig, and Townsend 2012).
- GoBotany: gravelly and ledgy river shores, cliffs and talus slopes, as well as open areas near the coast, and a range of wetlands.
- Michigan flora: Widespread, but perhaps most often in dry or rocky forests and savannas (oak, jack pine, hickory), sand barrens, shores, and dunes; also recorded for fens and tamarack swamps; sometimes along roadsides and in other disturbed places (Reznicek, Voss, and Walters 2011).
- FSUS: Glades and barrens, over serpentine, etc (Weakley and Southeastern Flora Team 2023)

Extant locations

- 21 extant populations known. Total number of individuals in the state: 800-1000. Most populations are small; there are 4 with several hundred plants, 1 with 50-100, 7 with 11-50 plants, 7 with 1-10 plants, 2 with no population estimate. Three of the below-50-individual sites noted more plants were likely to be found at the site.

Historical Locations

Historical locations might persist in natural barrens, but are likely to be highly vulnerable to succession outside of that kind of habitat, and most are probably no longer present.

Conservation Concerns

The major threats to this taxon are succession and invasion of the open habitats it requires.

Status Evaluation

The appropriate status for this species is highly dependent on how many more populations exist in anthropogenic open habitats such as rights-of-way and roadsides. In the rank calculator, entering the numbers only for known occurrences calculates S2. If range ranks (the current data extending into the next larger

range) for: number of occurrences, area of occupancy, and population size, it goes to S2S3. It stays at S2 range ranks are assigned for only two of those three factors.

Many similar species that utilize early successional disturbance habitats and require sparse competition have undergone a paradoxical decline. The habitats are simultaneously abundant and scarce, as roadsides and ROWs abound in Pennsylvania, but they are becoming much altered by aggressive vegetation management practices and invasion of non-native species.

This species may also be impacted by climate change; increasing moisture and temperatures could be factors in future habitat suitability. It is currently known from the coldest region of the state.

Literature Cited

Pennsylvania Natural Heritage Program biotics database. 2024.

Reznicek, A.A., E.G. Voss, and B. S. Walters. 2011. "Michigan Flora Online." University of Michigan.

Weakley, Alan S., J. Christopher Ludwig, and John F. Townsend. 2012. "Flora of Virginia." Edited by Bland Crowder. *Foundation of the Flora of Virginia Project Inc., Richmond. Fort Worth: Botanical Research Institute of Texas Press.*

Weakley, Alan S., and Southeastern Flora Team. 2023. *Flora of the Southeastern United States*. University of North Carolina Herbarium, North Carolina Botanical Garden. https://fsus.ncbg.unc.edu/.

https://gobotany.nativeplanttrust.org/species/elymus/trachycaulus/ Accessed 3/25/2024.

Iris virginica – southern blue flag

Current Status in PA Regulations: N
Current PABS Status: PE
Proposed Status: PT
Coefficient of Conservatism: 8; 5-6 (7) elsewhere
Proposed by: Jessica McPherson, WPC/PNHP

Iris virginica - Yellow patches on expanded portion of sepal. Photo by B. S. Walters.

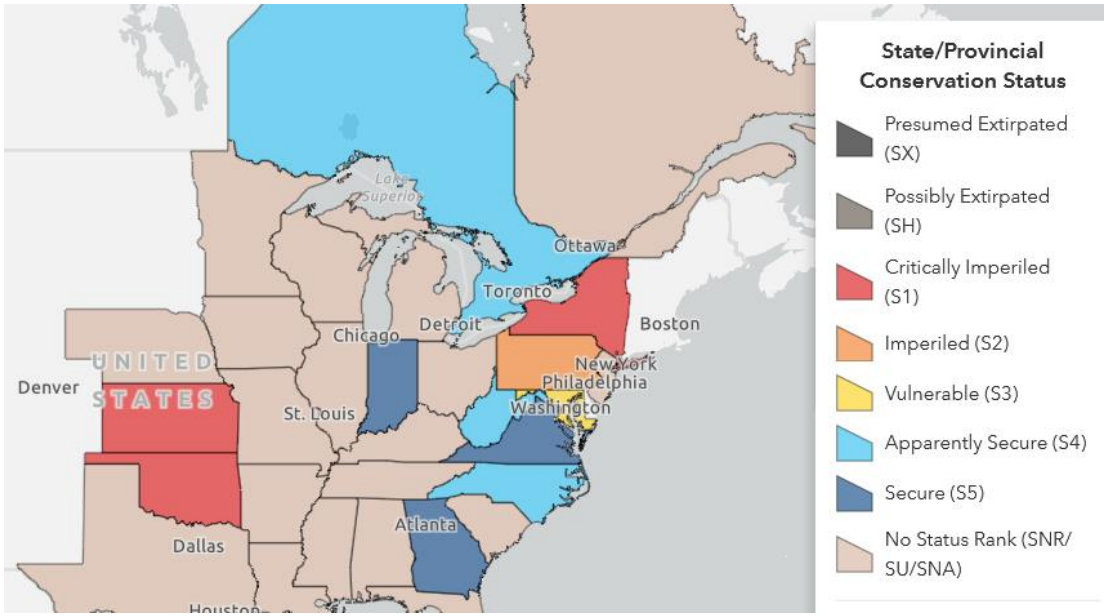
Iris versicolor - Yellow on sepals does not extend to expanded portion. Photo by Alan T. Chartier

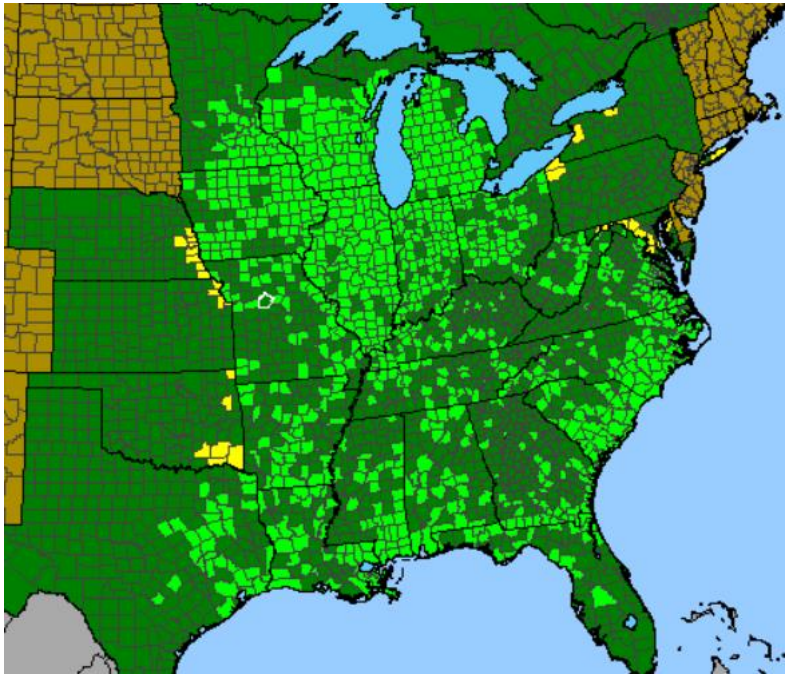
Proposal Summary

The number of populations, the low to moderate threat level most of them face, and the spatial distribution of the species in Pennsylvania are consistent with Pennsylvania Threatened. We propose to change the status from Pennsylvania Endangered to Pennsylvania Threatened.

North American Distribution & Global / Regional Conservation Concerns

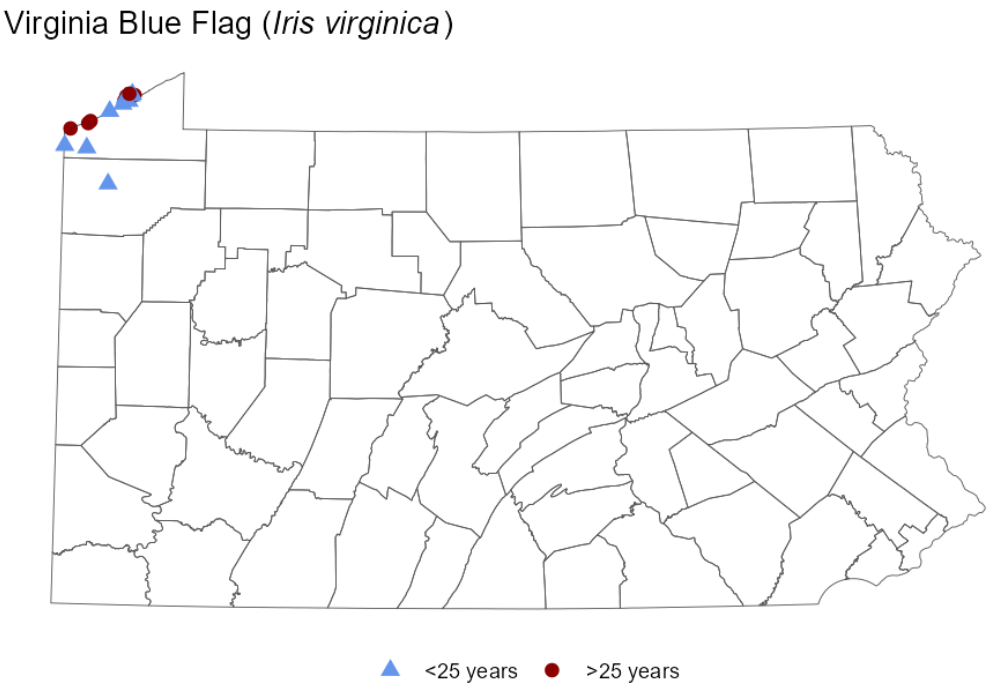
The range of the "southern blue flag" extends to Northern Michigan, but somewhat bizarrely seems to respect the southern border of Pennsylvania. It is present in the Ridge and Valley, Piedmont, and Allegheny Plateau in Maryland and West Virginia but the known distribution stops at the edge of Pennsylvania. S1 in NY, S3 in MD, S4 in WV.





Pennsylvania Distribution

The only part of the state this species is known from is the northwestern glaciated region. The current known range is slightly expanded south from the range of historic records.



Habitat

- Pennsylvania: back channels, pond edges, and semi-open swamp wetlands in the glaciated region (PNHP data).
- Flora of Virginia: Freshwater and oligohaline tidal marshes, tidal swamps, maritime swamps, alluvial swamps, wet flatwoods, floodplain pools, calcareous fens and wet meadows, stream margins, and disturbed wetlands such as ditches and beaver ponds. Frequent to locally common in the Coastal Plain; infrequent to rare inland. (Weakley, Ludwig, and Townsend 2012).
- Michigan flora: Ponds and lake shores, marshes and sedge meadows, ditches, streamsides, river banks and thickets, swamps, and rarely bogs. (Reznicek, Voss, and Walters 2011).

Extant locations

- 14 extant locations. Two additional sites were revisited in 2009 and unable to be relocated. Nine EOs are on Presque Isle. These range from just a few plants in dense invasive cover to 200-300 plants in good habitat. Steve says it is common on the edges of ponds.
- 5 additional sites are in Erie and Crawford (1) counties. One of these sites only had 1 plant seen when it was revisited in 2009. The other four sites were lasted visited 1996-2000; all still appear to have habitat present on aerial photos. They are ranked A (a population of over 400), B (2x, both populations ~30 clumps in decent habitat), and CD (1-20 plants in tenuous habitat).

Historical Locations

There are no “historical” locations in the sense of specimens collected decades ago. The earliest documented site is from 1993. Several sites have not been visited within 25 years, and the condition of plants at this time is unknown.

Conservation Concerns

Several populations are documented from small patches of habitat that are vulnerable to disturbance or habitat conversion. Invasive species, including *Phragmites australis,* are a threat at some sites. It is likely secure at Presque Isle. There are about 4 sites recorded to be in good habitat beyond Presque Isle, but they have not been visited recently to confirm the condition of the plants and habitat.

Identification

This species can be distinguished from Iris versicolor by the patches of yellow that extend into the expanded portion of the sepals. Iris versicolor will have yellow on the sepals, but it does not form patches on the expanded portion of the sepal. Michigan Flora lists a number of other vegetative characters that, considered together, can be useful in identification.

Status Justification

This species is known from a very limited area in NW Pennsylvania. The limited number of extant populations known (13-16), in combination with ongoing threats, leave it vulnerable to becoming in danger of extinction in the state. It is present at the edges of most ponds at Presque Isle, and at a handful of other sites, mostly but not all along Lake Erie. Invasive species compete with it at most if not all sites, but it seems to hold its ground, in part because deer do not compound the invasive species threat as they do with so many of our native plant species. Pennsylvania Threatened is the most appropriate status at this time due to the number of populations and its security at Presque Isle.

Literature Cited

Pennsylvania Natural Heritage Program biotics database. 2024.

Reznicek, A.A., E.G. Voss, and B. S. Walters. 2011. “Michigan Flora Online.” University of Michigan.

Weakley, Alan S., J. Christopher Ludwig, and John F. Townsend. 2012. “Flora of Virginia.” Edited by Bland Crowder. *Foundation of the Flora of Virginia Project Inc., Richmond. Fort Worth: Botanical Research Institute of Texas Press.*

Weakley, Alan S., and Southeastern Flora Team. 2023. *Flora of the Southeastern United States*. University of North Carolina Herbarium, North Carolina Botanical Garden. https://fsus.ncbg.unc.edu/.

Prairie junegrass – *Koeleria macrantha* (=*K. cristata* of Wherry et al and older manuals)

Current Status in PA Regulations: PX
Current PABS Status: PX
Proposal: N
Coefficient of Conservatism: Not evaluated
Proposed by: Steve Grund, WPC/PNHP

Koeleria macrantha along the John Muir Trail in eastern California. Photo by Matt Lavin

Proposal Summary
There are supposedly three specimens of this species from Pennsylvania, but all three have associated uncertainties, which I decided not to investigate unless the VPTC determines that the species at least might be native to Pennsylvania. I make the argument that we should consider this species to not be native to Pennsylvania.

Habitat

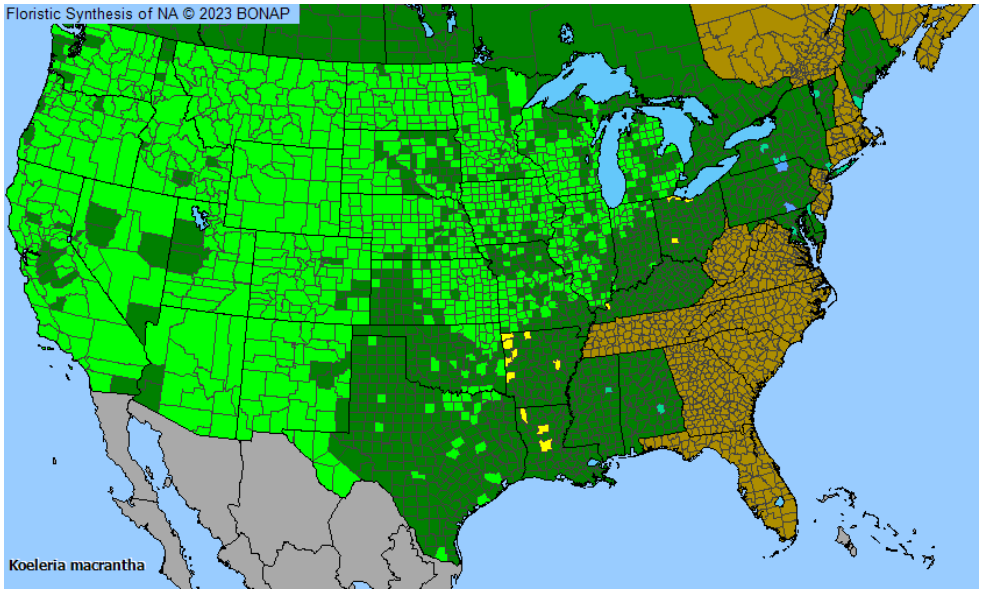
- Michigan Flora: Dry prairies, sand dunes, and jack pine and oak savannas (Voss 1972).
- Ohio DNR: Prairies, open woods, sandy soil; in full sun. (Ohio Department of Natural Resources 2024).
- FSUS: Upland prairies, glades, other habitats (Weakley and Southeastern Flora Team 2022).
- Flora of North America: semi-arid to mesic conditions, on dry prairies or in grassy woods (Flora of North America Editorial Committee 1992).
- Flora Novae Angliae: Anthropogenic (man-made or disturbed habitats), meadows and fields (Haines 2011).

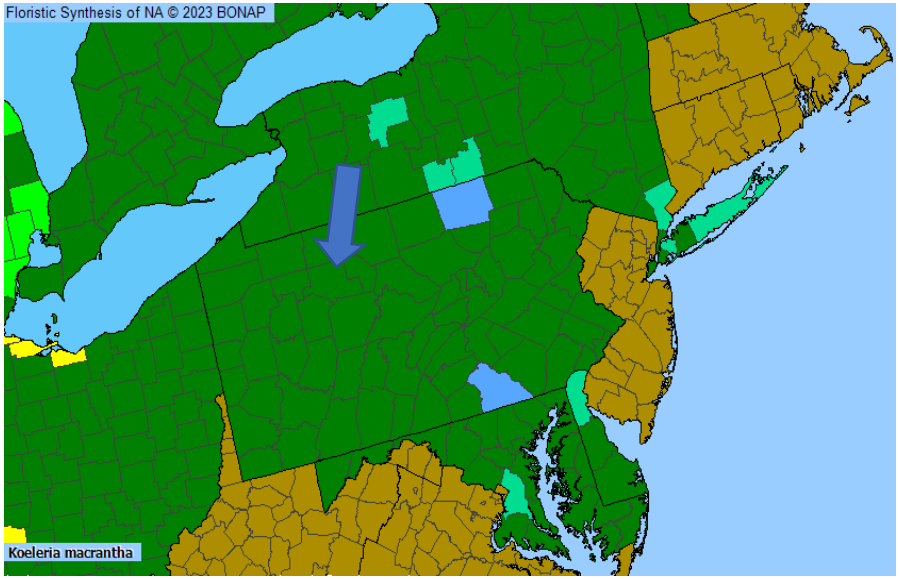
Biology and Life History
Cespitose prairie grass. It resembles *Sphenopholis*, and is sometimes misidentified as such, especially *S. nitida* (Voss 1972, Flora of North America Editorial Committee 1992). The Eurasian representatives are sometimes segregated as *K. cristata*, a name that has also been applied to the entire complex.

Pennsylvania Distribution
The 1912 specimen at the North Museum states “backwoods” as the habitat. The data we have does not include collector or identifier, and the collection is not at SEINet. The locality is given as “just north of Lineboro, MD”, and the “Line” in that name is the Mason and Dixon Line, so there is only a slight chance that the collection is not from York County, Pennsylvania. When the data was recorded in 1984, it was noted “The identification of this specimen should be checked”.

The 1836 John Carey specimen at the Gray Herbarium does not come up online at SEINet or CNH. The only J. Carey collections from Pennsylvania in 1836 are the lectotype for *Oxalis grandis*, and *Lilium superbum* (both at NY) and *Panicum scoparium* (MO), from the same site, Wysox Mountain, Bradford County, and also collected in July 1836, so the date and locality are not likely in error. No grass specimens at SEINet collected by Carey with Wysox in the locality field. If the committee decides the species could be native to PA, I will query the staff at GH.

The third specimen is at Kent State, collected by Almon Rood, and I am awaiting a response for a request for label data and a scan if there is one. All we have is Elk County. Rood collected in Elk County from 1928 to 1958.





Distribution and regional conservation statuses

This is a Eurasian and western North American species that extends eastward to Michigan, NW Ohio, and south to Louisiana. East of that Kartesz maps it as introduced (or, in the case of Pennsylvania, “vanished”). It is not considered native in New York (NatureServe), New England (GoBotany), Delaware (Delaware Species Conservation and Research Program), or Maryland (Maryland Biodiversity Project).

Status Justification

Documentation of this species in Pennsylvania comes from 3 specimens, collected in 1836, 1912, and from sometime between 1928 and 1958, in mutually distant counties. The species is considered native to our west, but sporadically introduced to our north, south, and east. Evidence of introduction is from rare encounters, no repeated collections from any area, and disjuncture from the main range. Our specimens lack good habitat data, but botanists in adjacent states (except Ohio, likely on the eastern edge of the native range) have concluded that the species is not native.

Literature Cited

Flora of North America Editorial Committee, ed. 1993. Flora of North America North of Mexico, 25+ vols. Oxford Univ. Press, New York.
Haines, A. 2011. Flora Novae Angliae. Yale University Press

Kartesz, J.T. 2023. Synthesis of the North American Flora, Version 2.0. Build – 1.0.8260.21237, Database – 25 January 2023.

NatureServe. 2024. NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: 12 March 2024)

Ohio Department of Natural Resources. https://ohiodnr.gov/discover-and-learn/plants-trees/flowering-plants/june-grass. Accessed 12 March 2024.

Voss, E.G. 1972. *Michigan Flora. Part I, Gymnosperms and Monocots*. Cranbrook Institute of Science and University of Michigan Herbarium.

Weakley, A.S. and the Southeastern Flora Team. 2022. *Flora of the Southeastern United States.* University of North Carolina Herbarium, University of North Carolina Botanical Garden, Chapel Hill, North Carolina.

Appalachian Beardtongue

Penstemon canescens (Britton) Britton

Current Status in PA Regulations: TU
Current PABS Status: PR
Proposed Status: PR
Coefficient of Conservatism: 7
Proposed by: Scott Schuette, WPC/PNHP

Proposal Summary

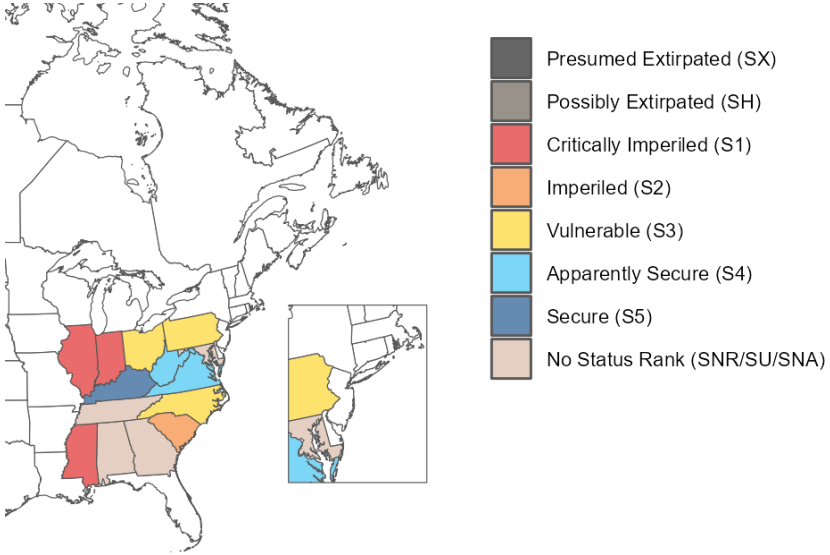
There are a good number of extant records of *Penstemon canescens* throughout the shale barrens and shale woodlands in the Ridge and Valley. There are an equal number of historic records from the same general areas as our extant ones.

We are confident that the 30 extant occurrences represent the majority of the state population for this species and it's likely that more will be found during field surveys in the barrens, woodlands, and roadsides. Although the species is threatened by a number of related factors, *Penstemon canescens* seems relatively stable in the state, albeit on the rare end of the spectrum. We are proposing the species be given a status of Pennsylvania Rare.

Habitat: woodlands, glades, forest edges, rocky woodlands, roadsides (Weakley 2020); dry, rocky wooded slopes (Rhoads & Block 2007). Often encountered on our shale barrens and roadsides with dry shale slopes

ID concerns: Requires ID during anthesis. This is a distinct species, but can be misidentified if found too early during flower development and anthesis as *P. hirsutus*. The couplet in both Weakley and RB that separate the two species is whether the corolla throat/tube is closed or open. *Penstemon canescens* is closed early in development and becomes clearly open at anthesis, while *P. hirsutus* appears open at the mouth of the corolla, but the throat is closed due to the upward arching of the tube.

Global distribution and regional conservation statuses



Pennsylvania is the northern edge of range for this species and the species is restricted to the Ridge and Valley province within the state. It's currently considered vulnerable in the state (NatureServe 2022).

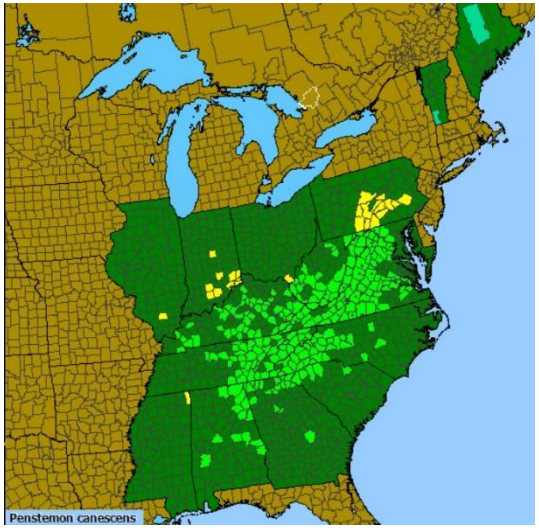
Pennsylvania Distribution

Extant locations

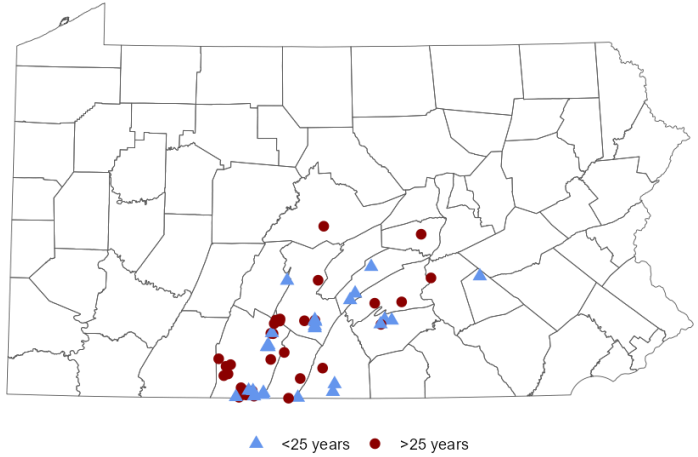
There are 30 extant EOs with the following breakdown into EO ranks (12E), (2C), (5BC), (9B), and (2AB) ranked occurrences. The EOs ranked as AB and B, account for 2200 – 3250 of the total population (3500 – 5000) in in the state. The BC and C ranked EOs account for an additional 875 – 1035 individuals

Historical Locations

There are 29 historic EOs. At least one of the E ranked occurrences actually updates one of the historic occurrences, but the Biotics data still need some cleaning up to reflect survey efforts in the last 10 years.



Beard-tongue (*Penstemon canescens*)



Conservation Concerns

There are a number of threats to this species due to its propensity to grow in shaley roadside habitats. These habitats are replete with invasive species, there is wanton use of herbicide to control the invasives, and they are occasionally subject to road widening. Other noted threats include clearing for pipelines, livestock grazing, deer browse, and succession from barrens to woodland/forested habitat. All of these threats, combined with the relatively narrow range of good quality habitat, are cause for concern for this species. However, the total population size and number of EOs seem to be relatively stable, albeit well within range of a truly rare species in Pennsylvania.

Status Justification

The rank changes from S3 to S2 depending on whether the threats assessment is rated as high (S3) or very high (S2) in the rank calculator. I chose to use the very high rating due to the nearly half of extant EOs with invasive species cited as a concerning threat in addition to other potential threats including roadside maintenance and deer browse. There are currently 30 extant EOs, but only 16 of these have had population assessments that include numbers of plants and of those 16 there are 11 that have excellent to good viability or are in good landscape context. Until the remaining 14 E-ranked occurrences are assessed, it's difficult to know the true status of this species in PA, but I think it's prudent to assign a range rank of S2S3 until the completion of those assessments. In addition to the EOs in need of full viability assessments, there may be misidentified herbarium specimens that have unopened flowers or are in fruit, which could lead to additional EOs. For these reasons a conservation status of Pennsylvania Rare (PR) is suggested for this species.

Literature Cited

NatureServe. 2022. NatureServe Explorer [web application]. Available from https://explorer.natureserve.org/ (accessed March 20, 2024).
Rhoads AF, Block TA. 2007. The plants of Pennsylvania: an illustrated manual2nd ed. University of Pennsylvania Press, Philadelphia.
Weakley AS. 2020. Flora of the southeastern United States. University of North Carolina Herbarium, North Carolina Botanical Garden.

Rock goldenrod – *Solidago rupestris*

Current Status in PA Regulations: N
Current PABS Status: TU (UXFH)
Proposal: PE
Coefficient of Conservatism: 10
Proposed by: Steve Grund, WPC/PNHP

Solidago rupestris
Photo by Gary Fleming

Proposal Summary

We are now aware of four specimens (five sheets, but one is presumably a duplicate) all verified by John Semple. Additionally, there is an I-naturalist record that John Semple says appears to be *Solidago rupestris*. We thus have a plausible extant occurrence, but not a certain one.

Rachel Goad has spent time searching the lower Susquehanna for this species with no success, including attempting to relocate the I-naturalist record. We have also been keeping an eye out for it in the Youghiogheny Gorge because the habitat is a good fit and there is a very old specimen from one of the headwater tributaries to the Youghiogheny (or perhaps the Cheat, as the locality is obscure enough that the specimen could have collected in either watershed).

We have been focused on this species for 19 years now, and we are confident that it is very rare in Pennsylvania if it is even extant, so we propose a status of Pennsylvania Endangered.

Habitat

- Flora of Virginia: Rocky or sandy, periodically flood-scoured riverside woodlands, cliffs, outcrops, and prairies; occurs on both acidic and calcareous rocks (Weakley et al 2012).
- FSUS: Crevices in rocky, flood-scoured riversides (Weakley and Southeastern Flora Team 2023).
- Flora of North America: semi-arid to mesic conditions, on dry prairies or in grassy woods. (Semple and Cook 2006).

Taxonomy

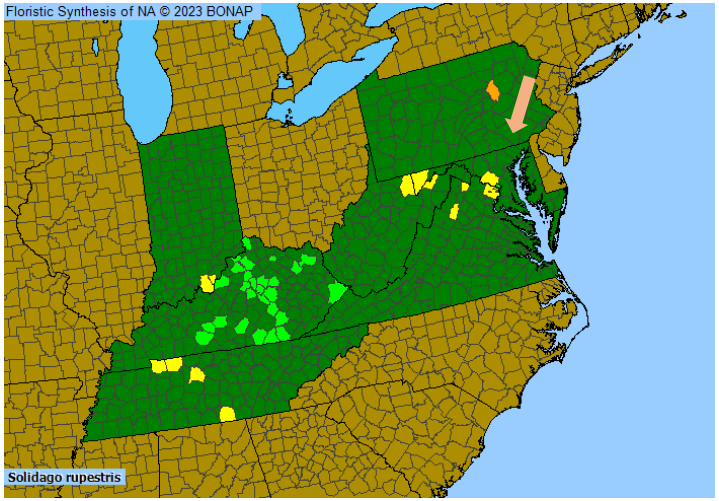
Solidago rupestris is treated in the recent restructuring of *Solidago* (Semple and Beck 2021) in Section *Unilaterales*, Subsection *Triplinerviae*, series *Canadenses.* This places the affinity of *S. rupestris* with *S. canadensis* and *S. altissima* of the species in our region. *Solidago gigantea*, despite the morphological similarity, is under this treatment our only representative of subsect. *Serotinae* (still in the *Unilaterales*). A multivariate study produced results consistent with that classification, finding *S. rupestris* to be more similar to *S. canadensis* than to *S. gigantea*, and more specifically, closest to *S. canadensis* var. *hargeri* (Semple 2023).

Ecology

Solidago rupestris shares ecologically relevant traits with other members of the genus: perennial, and insect pollinated. Edaphic adaptation seems to be the primary ecological specialty of this species within the genus, thriving in rocky or sandy soils that are regularly inundated, including but not limited to riverscour as defined by Estes *et al.* (2023).

Identification

Solidago rupestris is one of a manageable number of the goldenrods in Pennsylvania with three-nerved leaves. The following draws heavily from the Semple papers cited elsewhere. The presence of hairs on the upper stems, which are not glaucous, should readily distinguish this species from *S. gigantea*. *Solidago altissima* is consistently pubescent to the base of the stem, vs. glabrous for *S. rupestris*, but look carefully as in the fall as sometimes *S. altissima* loses much of this stem pubescence. Distinguishing this species from *S. canadensis* can be more challenging. There may be exceptions to any character in the keys, so it is important to read the entire couplets and to examine multiple plants in a population if possible, and multiple heads on a plant if, for instance, assessing the number of ray flowers. Occasional specimens may not be placeable, but overlap in characters implies a less distinctive species than is actually the case. In general, *S. rupestris* is a shorter, less hairy plant with fewer rays, and less toothy, narrower leaves than *S. canadensis.* It is also more restricted to high-quality stream borders and less tolerant of anthropogenic disturbance.



Distribution and regional conservation statuses

This species appears to be most abundant in Kentucky, with stations in Indiana and Tennessee. It is apparently somewhat disjunct from that area to northern Virginia, adjacent areas of West Virginia and Maryland, and north into Pennsylvania along the Susquehanna River. Due to similarity with other goldenrods, most notably *Solidago canadensis*, this range picture may not completely match reality; in particular, the apparent disjuncture might not be real.

Four specimens, the most recent from 1904 (NY, F), from Lancaster and Columbia Counties (one might have been from the York side of the Susquehanna), plus an I-naturalist record that John Semple (pers. comm.) says “appears to be *S. rupestris*, but such images are not the best way to confirm an ident. It comes from a known part of the range for what is becoming an increasingly rare species in the eastern US.”

Status Justification

We added this species as TU in 2005, having recently become aware of a specimen at NY. In the ensuing years, considerable fieldwork has been undertaken on both the Susquehanna and Youghiogheny and some of their tributaries, without succesfully relocating the species. A single I-naturalist record, with a photograph inadequate for positive identification, gives us plausible evidence that the species may well still be extant in Pennsylvania. Extensive herbarium work by John Semple and PHNP staff makes it unlikely (not impossible) that additional specimens will be discovered in herbaria. Pennsylvania Endangered seems to be clearly the appropriate status for this species.

Literature Cited

Estes, D., Tracey, C., Zimmerman, E., Knapp, W., Vanderhorst, J., Singhurst, J. and Witsell, T., 2023. Riverscour Ecosystems of Eastern Unglaciated North America: A Review. *Natural Areas Journal*, 43(3), pp.148-168.

Kartesz, J.T. 2023. Synthesis of the North American Flora, Version 2.0. Build – 1.0.8260.21237, Database – 25 January 2023.

NatureServe. 2024. NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: 12 March 2024).

Semple, J.C. and R.E. Cook. 2006. *Solidago*. In: Flora of North America Editorial Committee, ed. 1993. Flora of North America North of Mexico, 25+ vols. Oxford Univ. Press, New York.

Semple, J.C. and J.B. Beck. 2021. Revised infrageneric classification of Solidago (Asteraceae: Astereae). Phytoneuron 2021- 10: 1–6. Published 26 February 2021.

Semple, J.C. 2023. A multivariate study of Solidago rupestris, S. canadensis, and S. gigantea (Asteraceae: Astereae). Phytoneuron 2023-37: 1–12. Published 31 October 2023.

Weakley, A.S., J.C. Ludwig, and J.F. Townsend. 2012. Flora of Virginia. Bland Crowder, ed. Foundation of the Flora of Virginia Project Inc., Richmond. Fort Worth: Botanical Research Institute of Texas Press.

Weakley, A.S. and the Southeastern Flora Team. 2023. *Flora of the Southeastern United States.* University of North Carolina Herbarium, University of North Carolina Botanical Garden, Chapel Hill, North Carolina.