# Scarlet paintbrush, eastern paintbrush – *Castilleja coccinea* (L.) Spreng. (Orobanchaceae)

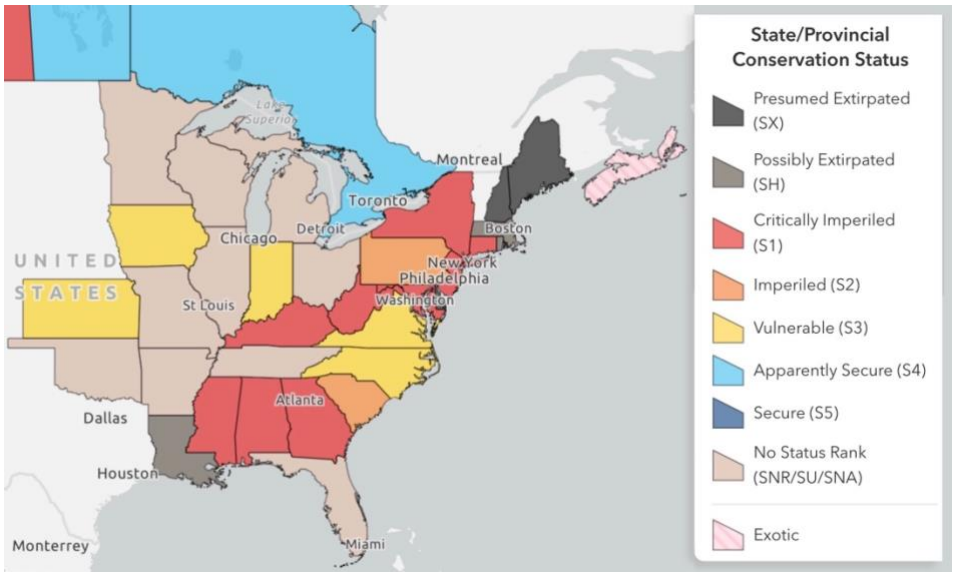
**Current Status in PA Regulations: PT**
**Current PABS Status: PT**
**Proposed Status: PE**
**Coefficient of Conservatism: 9**
**Proposed by: R. Latham, J. Ebert, J. Holt**

**Proposal Summary**

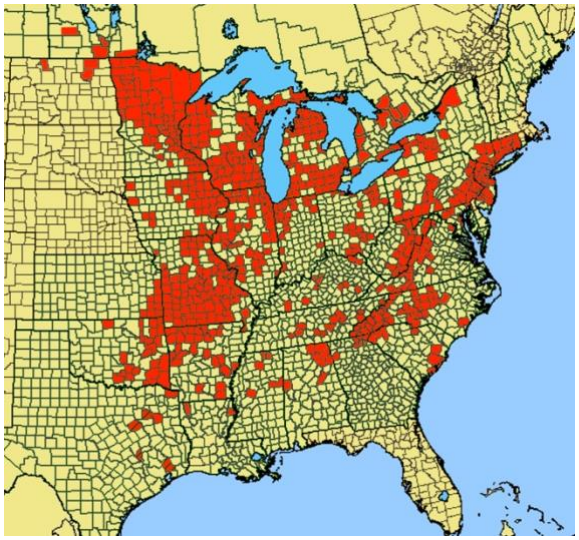
*Castilleja coccinea* is proposed as Pennsylvania Endangered because (1) there are only two extant populations comprising roughly 140 individuals currently known; (2) since 2018, 35 recent historical and nearby habitat-favorable sites were systematically explored and the species was not found in any of them; (3) over time, the loss of entire populations and the decline in numbers within populations seem to indicate an exponential rate of population collapse.

**Habitat**

- *The Plants of Pennsylvania* (Rhoads and Block, 2007): "rare in moist meadows on limestone and diabase."
- *Flora of the Southeastern United States* (Weakley, 2022): "woodlands, fens, barrens, rock outcrops, prairies, hay meadows, wet pastures, grassy openings, usually over mafic rocks."
- *Field Manual of Michigan Flora* (Voss and Reznicek, 2012): "calcareous sandy or gravelly shores, including interdunal flats and conifer thickets; river and stream banks, swamps (especially cedar), occasionally fens; marshy ground, meadows, springy and marly places, crevices and shallow soil at limestone outcrops; moist jack pine and oak scrub."




*Castilleja coccinea* conservation status by state/province (NatureServe)



*Castilleja coccinea* vouchered and "research grade" historical range by county (BONAP; iNaturalist)

**Identification:** Hemiparasitic annual or biennial; leaves and bracts deeply (3-) 5-9-lobed; corolla tube 15-18 mm long; calyx and bracts bright orange-red.

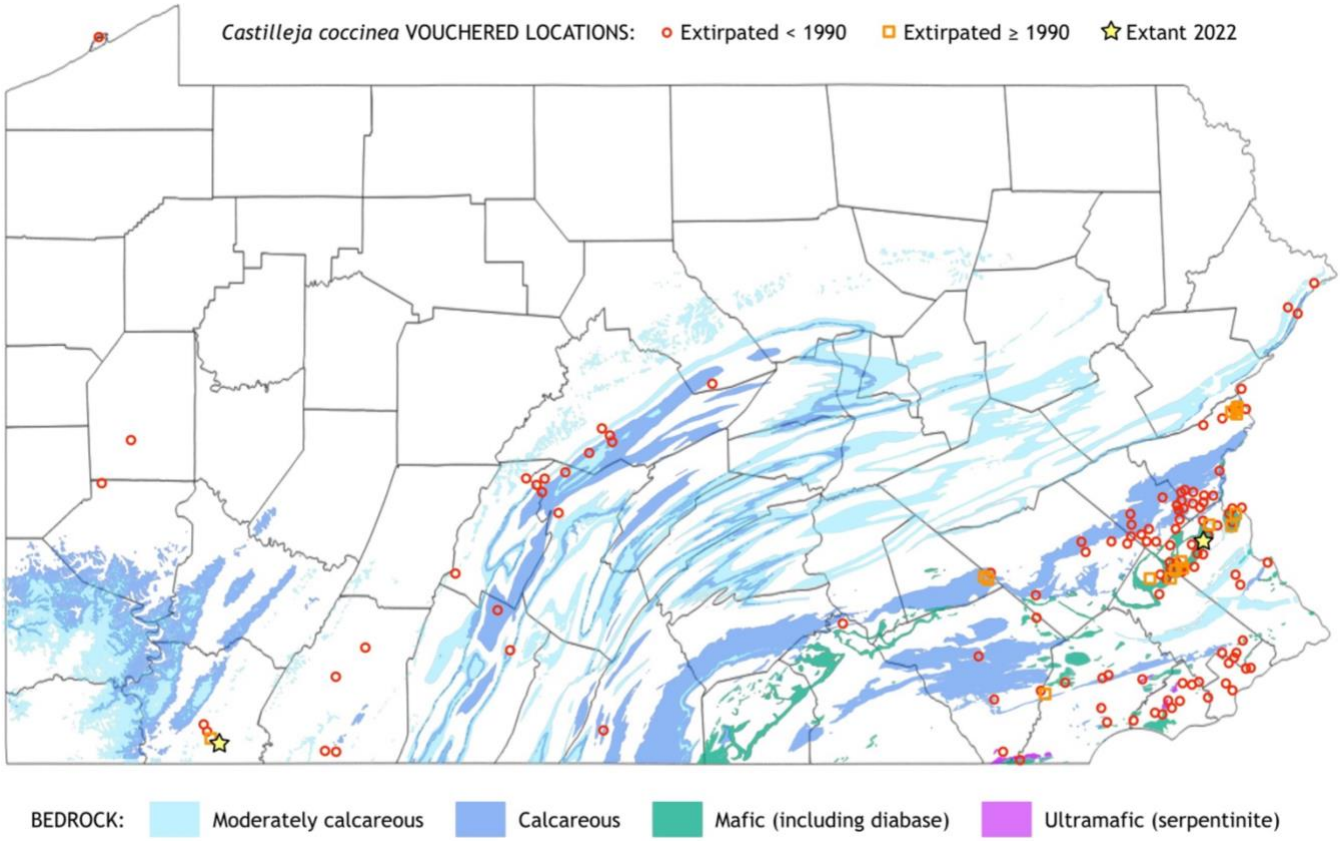
**Global distribution and regional conservation statuses:** A species of the Midwest, Northeast, and mostly northern Southeast, historically in 30 states and 4 provinces (NatureServe); ranked G5 and SX (3 states), SH (3), S1/S1? (9), S2 (2), S3 (5), S4S5 (2), unranked (10).

**Pennsylvania Distribution:**

Extant sites: 2 verified since 2018:

- One population in Fayette County, Hagar Farm, underlain by shale and siltstone, with at last census (2021) roughly 60 individuals in an open field dominated by nonnative $C_3$ grasses and 50 in an adjacent thicket dominated by *Hypericum prolificum*.
- One population in Bucks County, Cobbler Road meadow, underlain by mafic bedrock (diabase), with at last census (2021) 24 individuals in open fields dominated, in rank order by percent cover, by *Arthraxon hispidus* var. *hispidus, Holcus lanatus, Vernonia noveboracensis, Anthoxanthum odoratum, Symphyotrichum puniceum* var. *puniceum, Persicaria sagittata,* and *Sorghastrum nutans*.

Historical sites: well over 100 specimen-based historical occurrences in Biotics (see Table 1 on next page).




Distribution of vouchered *Castilleja coccinea* populations in Pennsylvania by location and time period (Biotics).

**Conservation Concerns**

- Advancing encroachment by highly competitive nonnative invasives, particularly *Microstegium vimineum* and *Arthraxon hispidus* var. *hispidus*, either directly by shading and soil resource competition or indirectly by interfering with *Castilleja coccinea*'s host plants.
- The species' possible dependence on farming traditions that are no longer in practice, especially fallowing.
- Potentially inbreeding depression in isolated, dwindling populations.
- Possibly changes over time in cryptic factors, e.g., atmospheric nitrogen deposition and consequent changes in soil microbial communities.

**Status Justification**

- There are only two extant populations comprising roughly 140 individuals currently known to the *Castilleja coccinea* research team (Table 2).
- Since 2018, 35 recent historical and nearby habitat-favorable sites were explored by members of the *Castilleja coccinea* research team and the species was not found in any of them.
- Over time, the loss of entire populations and the decline in numbers within populations seem to indicate an exponential rate of population collapse.

Table 1. Vouchered occurrences of *Castilleja coccinea* in Pennsylvania, by county and time period of collection.

| county | historical before 1990 | extant 1990–2017 | extant since 2018 |
|---|---|---|---|
| Adams | 1 | | |
| Allegheny | 1 | | |
| Bedford | 1 | | |
| Berks | 1 | | |
| Blair | 1 | | |
| Bucks | 1 | 7 | 1 |
| Butler | 1 | | |
| Centre | 4 | | |
| Chester | 2 | 1 | |
| Clinton | 1 | | |
| Dauphin | 1 | | |
| Delaware | 19 | | |
| Erie | 1 | | |
| Fayette | 1 | 3 | 1 |
| Franklin | 8 | | |
| Huntingdon | 3 | | |
| Lancaster | 7 | | |
| Lebanon | | 3 | |
| Lehigh | 38 | | |
| Monroe | 1 | | |
| Montgomery | 1 | 3 | |
| Northampton | 5 | 10 | |
| Philadelphia | 3 | | |
| Pike | 3 | | |
| Somerset | 4 | | |
| York | 2 | | |
| total | 111 | 27 | 2 |

Table 2. *Castilleja coccinea* research team

| | affiliation | position |
|---|---|---|
| Dr. Claude dePamphilis | Penn State | PI/Director of PAC Herbarium |
| Sarah Chamberlain | Penn State | co-PI/Curator of Herbarium |
| Dr. Uma Venkatesh | Penn State | Assistant Research Professor |
| Paula Ralph | Penn State | Senior Research Technologist |
| Dr. Roger Latham | Continental Conservation | Consulting Ecologist |
| Loree Speedy | Independent | Consulting Botanist |
| Dr. Will Ryan | Nelson Byrd Woltz | Consulting Ecologist |
| Dr. Marcos Caraballo-Ortiz | Temple University | Post-Doctoral Fellow |
| Janet Ebert | Independent | Consulting Botanist |
| Jack Holt | Independent | Consulting Botanist |
| Emma McGuire* | Penn State | Undergraduate Researcher |
| Bowman's Hill Wildflower Reserve | | NGO Partner |

* Supported by an Apes Valentis grant for summer research.

# Mud sedge - *Carex limosa* L.

**Current Status in PA Regulations:** TU
**Current PABS Recommendation (Proposed Status):** PT
**Proposal to VPTC:** PR
**C-value:** 10 (PA, NJ, NY, MI)
**Proposed by:** Claire Ciafré, WPC/PNHP

## Proposal Summary

We are tentatively proposing a status of PR. There are now 36 extant populations in the state, 15-27 of which are of good viability (41-75%). When it was first listed as PT/S2 in 1995 only 15 extant populations were known. It is often overlooked and/or difficult to confirm because it sometimes may produce few to no fruiting spikes in a given year, and because it can be difficult to access on the edges of bog mats. More extant populations may yet be discovered.

On the other hand, our populations are at the southern edge of its range and it will likely be negatively impacted by climate change. It is also prone to being outcompeted, and ongoing development in northeastern Pennsylvania may cause declines. Populations do not seem to be currently declining based on the data available, however ramet counts can be difficult to estimate and most populations have not been assessed enough to confidently detect a trend.

The rank calculator suggests S2S3 or S3 depending on estimates of population size and threat impact.


**Figure 1. Comparison of spikes and pistillate scales.**
Left: Comparison of *Carex paupercula* (left) and *Carex limosa* (right) spikes. Photo by Peter M. Dziuk.

## Identification

*Carex limosa* L. is in Section *Limosae* along with *C. barrattii* Schwein. & Torr. and *C. paupercula* Michx. (syn. *Carex magellanica* Lam. ssp. *irrigua* (Wahlenb.) Hultén), and it sometimes co-occurs with the latter. It differs from the two in having wider pistillate scales (2.0-3.8 mm wide) wider than the perigynia (Weakley 2022). *Carex limosa* can be additionally distinguished from *C. paupercula* by the shape, length, and persistence of pistillate scales. Those of *C. limosa* are bluntly ovate, shorter or equal to the perigynia, and persistent. Those of *C. paupercula* are sharply lanceolate, longer than the perigynia, and fall off before the perigynia mature. *Carex limosa* also has shorter floral bracts: the lowest (present at the base of the lowest pistillate stalk) do not exceed the terminal spike while the floral bracts of *C. paupercula* are longer than the terminal spike. The fruiting stems of *C. limosa* are also nearly leafless while those of *C. paupercula* are leafy (Minnesota Wildflowers 2023).

## Identification ctd.

*Carex limosa* is rhizomatous and may not produce fruiting culms every year. It can be easily overlooked in this state, and confident identification may be difficult. The dense, yellow hairs on the roots can be used to distinguish it from most other species of *Carex,* though it shares this trait with *C. paupercula*, which tends to be found in fruit more reliably. *Carex limosa* also tends to have canaliculate, blue-tinted leaves while *C. paupercula* leaves are flatter and not blue-green (Olivero 1994).

*Carex limosa* rarely hybridizes with *C. paupercula* (*C. x connectens* Holmb.); this hybrid was originally described from a specimen collected in Scandinavia (Holmberg 1929) has been found in Michigan (Reznicek et al. 2011) and Canada (Kartesz 2014). No hybrids involving this species have been found in Pennsylvania. *Carex limosa* has also been documented to hybridize with other *Carex* species in section *Limosae* (Holmberg 1929), but other potential parents are unlikely to co-occur with it here.


**Figure 2. Root hairs.**
Distinctive yellow hairs on the roots of *C. limosa* (also present on *C. paupercula*). Photo by Kathy Chayka.

## Habitat

Throughout its range it inhabits permanently inundated hollows, pools, and margins in bogs (Olivero 1994, Sotek 2010, Schwarzer and Joshi 2019, Weakley 2022). *Carex limosa* is thought to be a low-competition, pioneer species which facilitates the expansion of bog mats along open water (Olivero 1994, Sotek 2010). Once the open water at a site becomes filled in by vegetation and the low-competition mat margin is lost, the species may not be able to compete and persist (Olivero 1994).

Extant PA populations are reported to be anywhere in area from several square meters to several acres, the latter reflecting a patchy distribution within a bog rather than a single massive colony. As an edge-of-range species it may be 'pickier' about its microhabitat as its ability to compete may decline with latitude (Scwarzer and Joshi 2019).

## Broad-Scale Distribution

*Carex limosa* is a northern temperate species with a circumboreal distribution, occurring in Northern Europe, Asia, and North America. It has declined in much of its global range but is still widespread and stable in the UK, most of Scandinavia, and the Baltic States (Lansdown 2014).

In North America it occurs at high-latitude and/or high-altitude sites. It is ranked as S1-S3 in 13 states, including in PA, where it is currently S2. It is SH in Iowa and Rhode Island, and SX in Delaware.

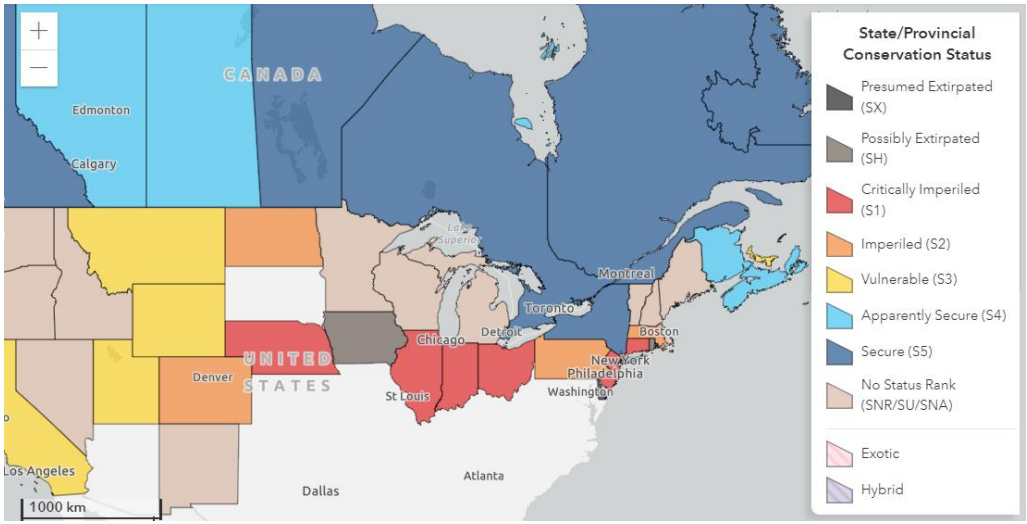



**Figure 3. NatureServe Conservation Status of *Carex limosa* by state/province.** NatureServe 2023.

## Local Distribution

Populations in PA occur at the southern margin of its eastern range. PA's populations are mostly in the northeast, but two sites are in the northwest and there is one extant site in south-central part of the state.

In a European common garden experiment, plants from the southern edge of its range had lower spike weight and lower seed mass than plants collected from northern Europe. Importantly, these traits did not correlate with genetic diversity (Schwarzer and Joshi 2019). Furthermore, a meta-analysis of clonal plant species suggests that it is common for populations at range margins to prioritize clonal growth over sexual reproduction (Silvertown 2008). One potential reason for this could be that southern populations undergo greater competition with fewer opportunities for successful seedling establishment. There may also be physiological limitations on sexual reproduction for this species. However, deleterious mutations accumulated during prolonged clonal persistence may also be a cause (Schwarzer and Joshi 2019).

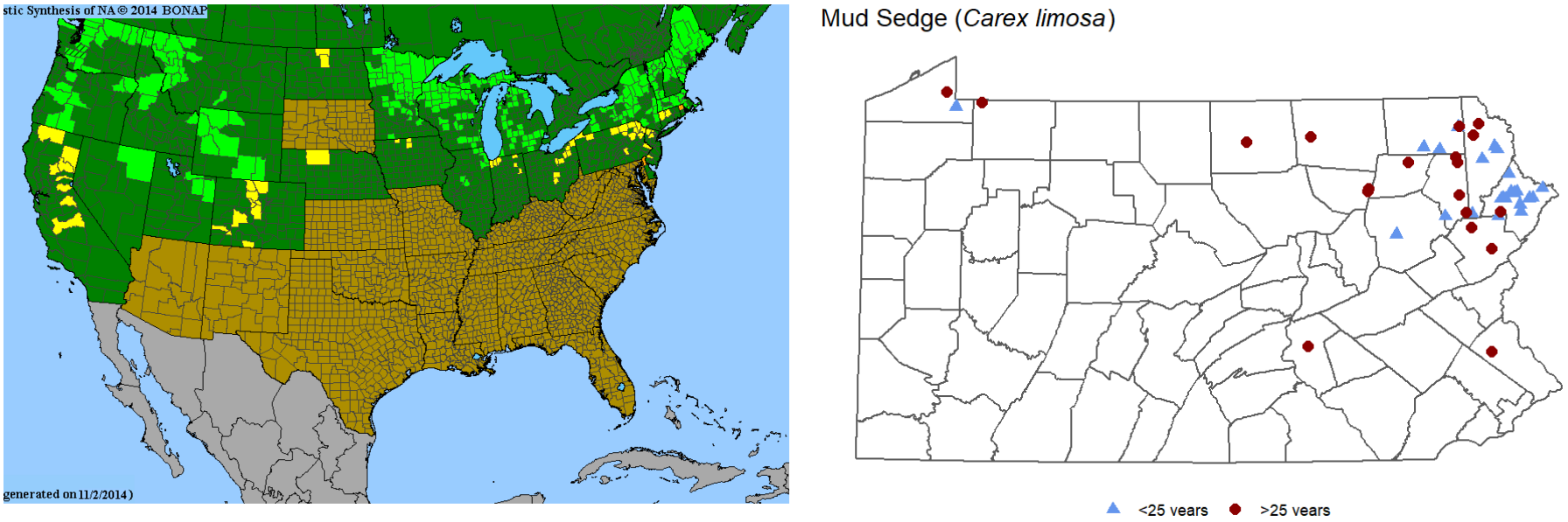



**Figure 4. Range of *Carex limosa* in North America and in Pennsylvania.**
Left: BONAP county distribution. Kartesz 2014.
Right: Pennsylvania occurrences in Biotics. PNHP 2023.

## Conservation Concerns

Genetic Diversity

*C. limosa* is a clonal species that sometimes produces few flowering stems in Pennsylvania. This has also been documented in European populations but does not seem to negatively impact genetic diversity there (Schwarzer and Joshi 2019), but among- and within-population genetic diversity for this species has not been studied in North America. Poor genetic diversity could mean this species is less adaptable to change. Additionally, reduced sexual reproduction limits the potential for dispersal to cope with climate change or habitat shifts.

Nutrification

Runoff from nearby farms, logging, removal of forest buffers, and leaks from cabin septic systems may be contributing to nutrient inflow in some populations. *Carex limosa* may not persist at sites where it cannot compete with other species due to increased nutrient input. The introduction and dominance of species such as *Typha* and *Phragmites* in these situations is also a concern.

Hydrological Alteration

Beaver dams are the most frequently cited threat in field surveys. Anthropogenic alterations (dams, hydrological connection of lakes, increased runoff from impermeable surfaces) cause similar issues and are increasing in frequency as more vacation homes are built in NE PA. Research in Europe suggests that lowering of the water table is a greater threat to this species than elevating the water table, however (see climate change below).

Climate Change

The 2013 Climate Change Vulnerability Index (CCVI) analysis suggests that this species is Extremely Vulnerable to climate change impacts, albeit with low confidence (WPC 2013). This species is limited to a specific microhabitat prone to hydrological change. A wetter climate may increase its available microhabitat, however climate instability and/or drought may move or eliminate its microhabitat. Increases in temperatures also seem likely to negatively impact this species based on lower rates of sexual reproduction at southern latitudes in Europe (Schwarzer and Joshi 2019). The ability of this species to persist and reproduce clonally (either by selfing or by rhizomatous spread) may cause a lag in observed decline.

**Rank Calculator Summary**

A rank of S2S3 is suggested by the rank calculator when a conservative population estimate of 95-4,418 (based on estimating the number of genets at 1-10% of ramet estimates) is used. However, ramet counts can be a better indicator for available habitat and liklihood of localized, stochastic events impacting part of all of the population. The rank calculator suggests a rank of S3 when a population estimate of 9,480-44,180 (based on ramet estimates) is used. These ranks are generated when a High threat assessment is applied.

| | | RANK CATEGORY | COMMENTS |
|---|---|---|---|
| RARITY | Range Extent | F = 20,000-200,000 sq km (~8,000-80,000 sq mi) | Minimum convex polygon of extant points covers 39,380 sq km; MCP of all points covers 46,004 sq km. |
| | Area of Occupancy: 4 km2 grid cells | E = 26-125 4-km2 grid cells | 42 grid cells occupied by extant populations (2 with 2 populations in a cell; 5 with a single split between 2 cells; 1 with a single population split between 4 cells). |
| | Number of Occurrences | C = 21 - 80 | 42 known occurrences, 36 extant. |
| | Population Size* | EF = 2500 - 100,000 individuals | Estimated 9,480-44,180 ramets; genet count cannot be accurately assessed. |
| | Good Viability/Ecological Integrity: # of occurrences | D = Some (13-40) occurrences with excellent or good viability or ecological integrity | 15 AB or B occurrences; 8 BC occurrences, 4 E's; range of 13-40 includes conservative count of 15 (AB's and B's), but also includes optimistic count of 27 (AB, B, BC, and E). One B may be an F. 8 C's, 1 D. |
| | Environmental Specificity (opt.) | A = Very narrow. Specialist or community with key requirements scarce | This species only occurs in bogs, and requires low-competition microhabitat within these systems. |
| THREAT | Assigned Overall Threat Impact | B = High | Greatest threats include hydrological alteration, nutrification, and climate change. Low genetic diversity does not seem to negatively impact this species. |
| TRENDS | Short-term Trend | G = Relatively Stable (<=10% change) | No recent confirmed losses; populations easily overlooked when not in fruit. |
| | Long-term Trend | F = Decline of 10 - 30% | Change from 42 to 36 occurences is a 23.8% decline |

| | |
|---|---|
| Calculated Rank | S3 |
| Assigned Rank** | S3 |
| Rank Adjustment Reasons | N/A |
| Assigned Rank Reasons | This rank reflects the large number of extant populations, many of which are likely secure, while also taking a high threat due to nutrification, hydrological alteration, and climate change into account. |

**Status Justification**

The large number of apparently stable, extant populations (36) suggests a rank of S3/PR. The species is at the southern limit of the North American range in Pennsylvania; the species does not appear to suffer from reduced genetic diversity, even at the southern edge of its range, in Europe, Seventeen (of 34) extant populations are protected, and most if not all extant populations co-occur with other listed bog species.

**Literature Cited**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Silvertown J. 2008. The evolutionary maintenance of sexual reproduction: evidence from the ecological distribution of asexual reproduction in clonal plants. International Journal of Plant Sciences 169:157-168.

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Weakley A.S. and Southeastern Flora Team. 2022. Flora of the southeastern United States. April 24, 2022. University of North Carolina Herbarium, North Carolina Botanical Garden.

Western Pennsylvania Conservancy. 2013. Long term monitoring of ecological health of Pennsylvania's high-elevation wetlands. Report submitted to U.S. Environmental Protection Agency, Pennsylvania Department of Conservation and Natural Resources, and Pennsylvania Wild Resource Program. 30pp.

# Little barley – *Critesion pusillum* (Nutt.) A.Leve (≡ *Hordeum pusillum* Nutt.)

**Current Status in PA Regulations: PX**
**Current PABS Recommendation (Proposed Status): PX**
**Proposal to VPTC: N**
**Current NS Conservation Rank: G5SH**
**Coefficient of Conservatism: 0**
**Proposed by: Steve Grund, WPC/PNHP**

Matt Lavin

**Proposal Summary**
This species may well be extant in Pennsylvania, but habitat data, paucity of specimens over time, and declarations of non-native status in many eastern North American subnational jurisdictions (states) leads me to conclude that it likely is not native to Pennsylvania.

**Habitat**

- Specimen labels and Rhoads and Klein (1993): Road banks.
- Weakley: Roadsides, fields, pastures, ditches, disturbed areas (Weakley & Southeastern Flora Team 2022).
- FNA: open grasslands, pastures, and the borders of marshes, and in disturbed places such as roadsides and waste places, often in alkaline soil (von Bothmer et al 2007).

**Biology and Life History**
Annual tufted grass, highly tolerant of disturbance.

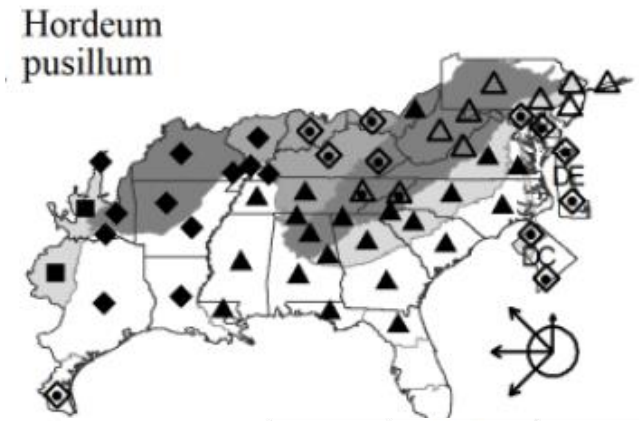
## Pennsylvania Distribution

Four records from four mostly non-contiguous counties: Bedford, Perry, Montgomery, and Bucks. The oldest is the Bucks County dot from Rhoads and Klein (1993). Tim Block (pers comm) reports that the dot is based on a Bassett specimen supposedly at PH, but although SEINet shows four sheets of Bassett material at PH from Bucks County from 1896; none of those are grasses, so the existence and identification of the specimen cannot presently be confirmed. The Bedford County collection (Henry, s.n. 1952, CM) was collected "along RT. 30". An online search revealed a moderately recent specimen (Norlan C. Henderson 95162, Pennsylvania, Perry County, Roadside, along u.s. #11 & 15, at Susquenita, 28 May 1995, MO). The most recent collection is Ebert and Holt, s.n., Montgomery County, Elkins Park, …site of raised building converted to meadow, in with planted "meadow" species…, 11 June 2006, MOAR.

**North America distribution and regional native statuses**
This species is widespread across North America and beyond. Kartesz (2023, see map) has deemed it to be non-native in more states than indicated by the ranks applied by Heritage Programs, including Pennsylvania (I think). Weakley adds even more states to the exotic category, and calls it "maybe exotic" in the remainder of the area east of the Mississippi, stating "Probably restricted to west of the Mississippi River a few centuries ago, but now present (and in many areas common) throughout a broad portion of the United States, from ME west to WA south to n. FL, s. TX, CA, and Mexico" (Weakley & SE Flora Team 2022). On the other hand, in FNA states "It is native, widespread, and often common in much of the Flora region (von Bothmer et al 2007). Whether that should read

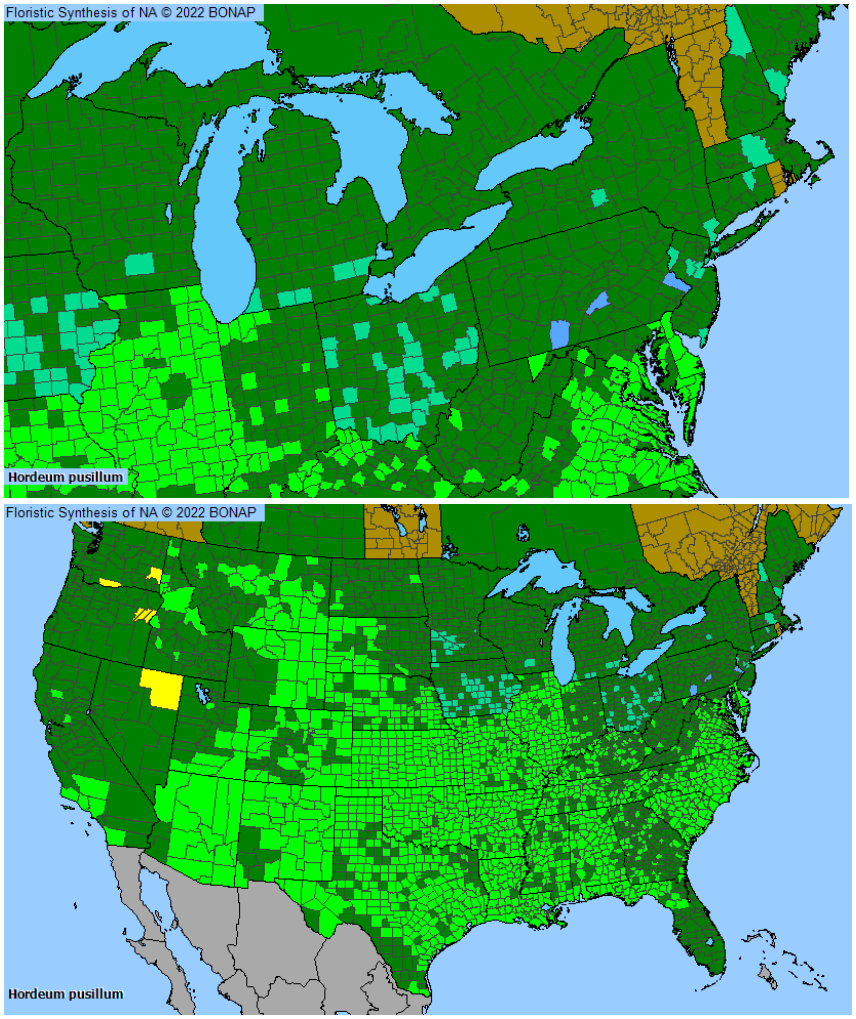
“native everywhere it occurs in North America” or it allows for introduced in part is not entirely clear, but since they do not say anything about it being non-native eastward it may be presumed they meant the former.

Of the four Pennsylvania records, one is likely from a seed mix, two are from roadsides, and we have no habitat data for the fourth. The dates are spread over 110 years with no two collections from less than 11 years apart. That does not eliminate the possibility of native status, but it is strongly suggestive. Compellingly, it describes a species that is not in need of regulatory protection.




| | Native | Maybe Exotic | Exotic |
|---|---|---|---|
| Waif, persistent, or questionably naturalized | n/a | * | * |
| Rare | □ | ◇ | △ |
| Uncommon | ▣ | ◈ | ◬ |
| Common | ■ | ◆ | ▲ |

Distribution, relative abundance, and native statuses by state and region from the Flora of the Southeastern United States (Weakley & SE Flora Team 2022)




North American Distribution of *Critesion pusillum*, zoomed in on top map to show Kartez’s colors indicating native or introduced. The blue color indicates “vanished” (Kartesz 2023)

**Status Justification**

Ruderal habitat, paucity of specimens from scattered dates, all geographically distant, and indications that the species might not be native anywhere east of the Mississippi adds up to compelling evidence that this species is not part of the native flora of Pennsylvania, or even if one believes that it might be, it is not in need of regulatory protection.

**Literature Cited**


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

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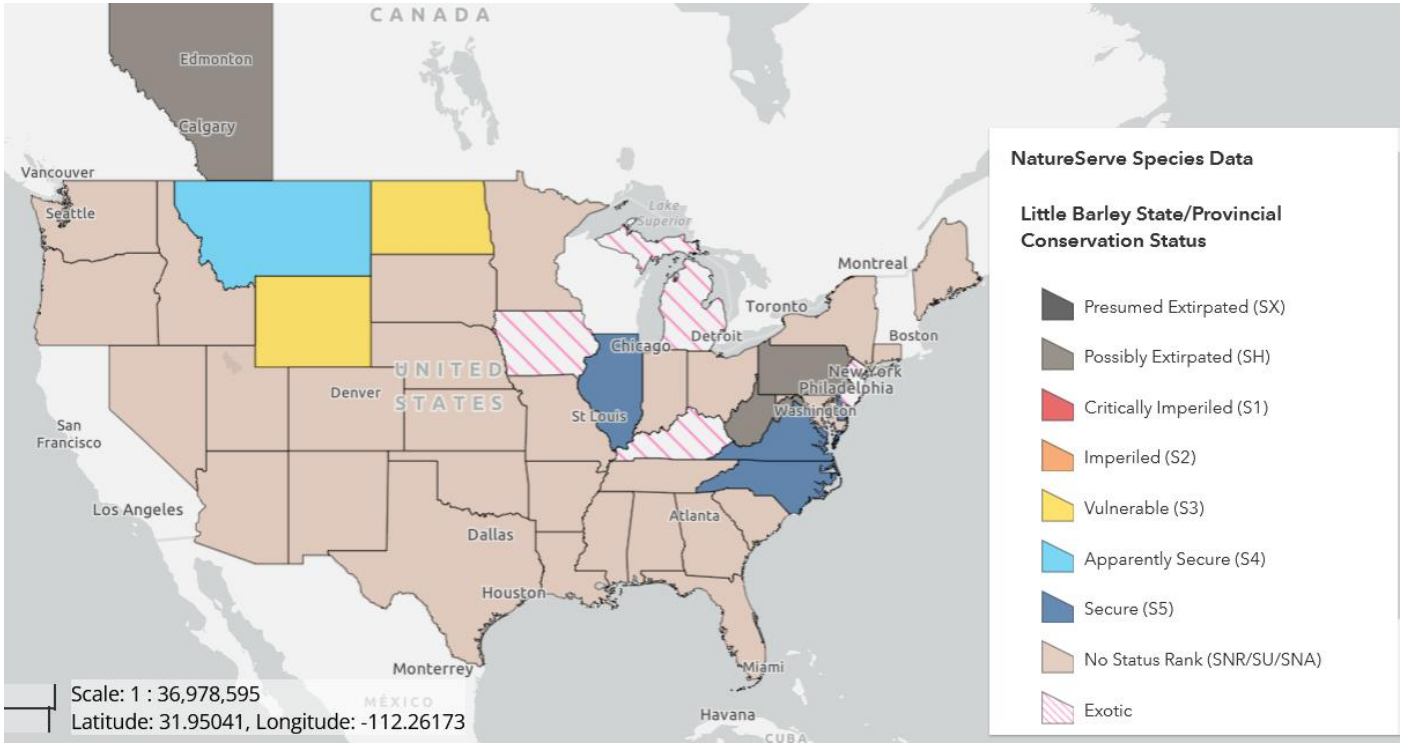

# Tall tick-trefoil - Desmodium glabellum (Michx.) DC.

**Current Status in PA Regulations: TU**
**Current PABS Recommendation (Proposed Status): PE**
**Proposal to VPTC: PR**
**Proposed by:** Rachel, Steve, Claire

**Proposal Summary**
*Desmodium glabellum* has been considered the rarer of the two wide-leaved elements of the Paniculatum complex (*D. glabellum* and *D. perplexum*) and has been proposed as Endangered in the state. Recent research by Thomas (2020) identified new features – notably **not** stem vestiture – by which the two can be identified. We applied this approach to Pennsylvania material and found that it provided greater clarity and consistency in identifying these species. In an extensive review of Pennsylvania material, we found that *D. glabellum* is the more common and more heliophytic of the two species, and it often occurs along roadsides and ROWs. The herbarium record indicates that it has been part of roadside flora for over 100 years. With more than 40 occurrences documented, and a reasonable expectation that more may be found, Endangered is clearly the wrong status for this species. However, this species may be less widespread than in the past and it is threatened by invasive species and inappropriate management (e.g., broadcast herbicide application during the growing season). The rank calculator suggests S3, and we here propose PR.

**Habitat**
We found that in Pennsylvania, *Desmodium glabellum* is a widely distributed species of open- or partly open-canopied conditions that are not extremely wet or extremely dry. The species grows in a broad range of sunny habitats, including those disturbed by humans, and is not geologically picky. Extant locations are associated with serpentine, felsic gneiss, schist, calcareous sandstone, diabase, and dark shale.

Of specimens we reviewed with habitat information on their labels (n=200), various kinds of open conditions (e.g., fields, meadows, barrens, riverscour) were noted for 27% of specimens, while 22% noted partly open conditions (e.g., thickets, woods edges, savanna). Roadsides were mentioned for 26% of specimens, and 41% of specimens indicated some kind of disturbed condition, including roadsides, railroad embankments, old fields, pipeline corridors, and other rights-of-way. Specimens in this latter category were dated 1911 through 2013, suggesting that this species' occurrence in such places is not a newly emerging trend.

In Missouri, Thomas found *D. glabellum* to occur in grasslands, or acidic upland woods. In North and South Carolina, *D. glabellum* has been noted to have a strong association with Piedmont Prairie flora (Davis et al. 2002).

Figure 1. Top: Type specimen of *D. glabellum*. Bottom: typical loment shape

**Identification**
The Paniculatum complex within the genus Desmodium has included from two to five taxa, but delimitation of these taxa has long been challenging (Schubert 1950; Isely 1953, 1983; Ohashi 2013). All have narrow stipules, loments at least somewhat angled below, and either narrow leaves and little hair on the stem

(*Desmodium paniculatum*), or wider leaves and variously hairy stems (a group that has included: *D. dillenii, D. perplexum,* and *D. glabellum*). The latter two of these were previously synonymized under *D. dillenii*, but that name is now considered a junior synonym of *D. glabellum* (Grund 2022).

Until Justin Thomas' recent work (2020), distinguishing the wider leaved, hairy-stemmed taxa hinged on stem hair characters (Rhoads & Block 2007; Voss & Reznicek 2012; Yatskievych 2013; Weakley 2020), though these were difficult to consistently assess. Thomas used a combination of field and specimen-based approaches to derive a set of characters that could be used to separate the two elements, irrespective of stem or leaf vestiture, and sun or shade morphology. These characters are: shape of the loment's ventral margin, phyllopody (gradual reduction in leaf size along the stem) or lack thereof, distribution of leaves into the inflorescence, and leaflet shape. Thomas's characters (Fig. 2) have been incorporated into the recent edition of the Flora of the Southeastern United States (2022). Our *Desmodium* project found these to work well on Pennsylvania material in the field and herbarium.

**Global Distribution**

Because of the long-standing confusion in this group, we do not have good range-wide distribution information. Both *Desmodium glabellum* and *D. paniculatum* are endemic to eastern North America. *Desmodium glabellum* is widespread in Missouri, and likely in Kansas as well (Thomas 2020).

**PA Distribution**

Through the *Desmodium* project, we documented 346 specimens of *D. glabellum*, collected in Pennsylvania from 1831 to 2018. Specimens originated from across the state except for most of the northern tier and parts of the northeast. Annotation changed the identification of 93% of specimens (323 of 346), with 187 (58% of those with changed identification) having been previously identified *as D. perplexum.* Previous to this work, just 12 occurrences of this tracked species were reported to PNHP, with these primarily restricted to the southeast. The Plants of Pennsylvania indicates that this species was considered rare, found in the southeast and the west (Rhoads & Block 2007), and the Vascular Flora of Pennsylvania shows fewer than ten occurrences from Northampton, Berks, Chester, Beaver, Butler, and Erie Counties (Rhoads & Kline 1993).

Field surveys conducted from 2020 to 2022 found nine extant populations, including on rights-of-way (in Chester, Schuylkill, and York Counties), serpentine

**KEY TO THE SPECIES**

Ventral margins of most articles straight to slightly convex (Fig. 1 B); leaves gradually but noticeably reduced in size and petiole length distally along the stem, often with small leaves extending well onto the flowering branches; terminal leaflets lanceolate to broadly ovate (most specimens, especially of full sun habitats, are on the narrow end of this range; see field notes below), broadest nearer the base than the middle…… 1. *Desmodium glabellum*

Ventral margins of most articles concave (Fig. 1 A); leaves mostly all the same size and not or little extending onto the flowering branches (the few leaves that do extend into the inflorescence branches will also be reduced in size but more abruptly so); terminal leaflets narrowly ovate to broadly elliptic-ovate (most specimens are on the wider end of this range), broadest nearer the middle than the base…….. 2. *Desmodium perplexum*

Figure 2. Key from Thomas 2020.

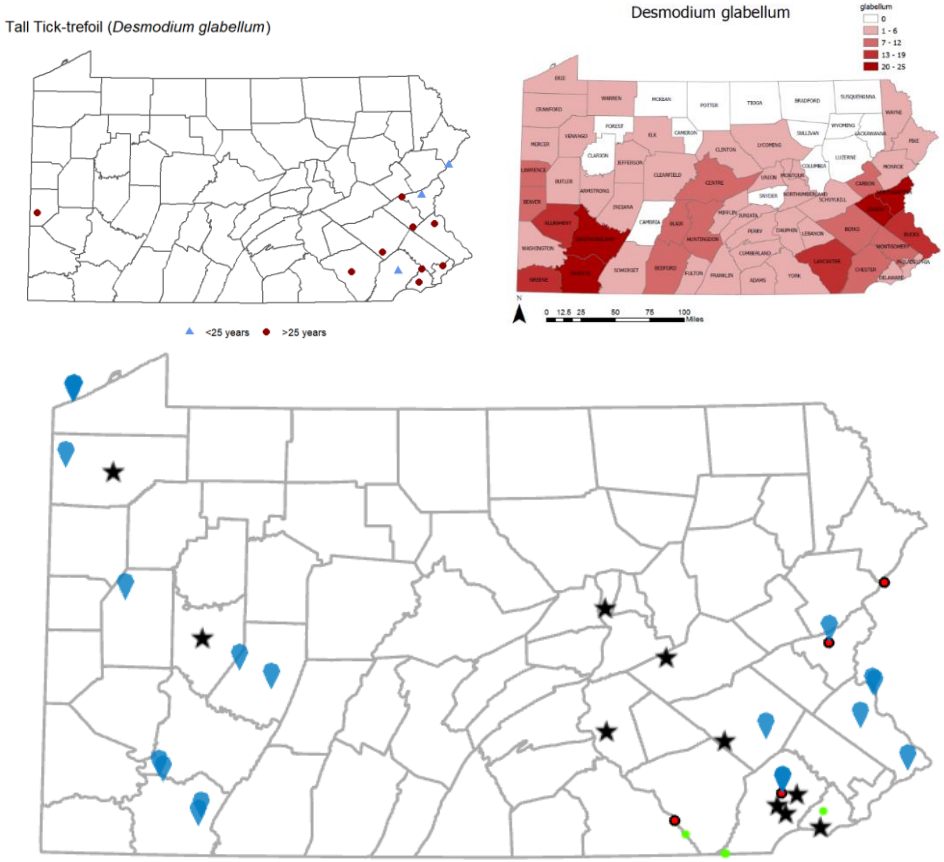


Figure 3. Top left: *D. glabellum* EOs according to Biotics, prior to the completion of the *Desmodium* project. Top right: Number of annotated specimens by county. Bottom: Extant occurrences from herbarium specimens (blue markers), un-vouchered Biotics records (red dots), FIND (green dots), and select verified records from iNaturalist (black stars)

barrens (in Delaware and Chester Counties), meadows and old fields (in Bucks, Delaware, and Monroe Counties), and open-canopied river bluffs (in Lancaster County). Seventeen research grade observations that we further verified were found on iNaturalist from 2021-2022. Nineteen herbarium specimens have been collected since 2000 and may be considered extant. Together, these data indicate that there are at 40-50 extant occurrences in Pennsylvania, and it seems likely that additional locations will be found.

While ROW's provide habitat for this heliophytic species and make sense as a place where we'd see them persisting, seeding into ROW's may also be responsible for at least some occurrences. Jack and Janet found an occurrence, "…growing on disturbed ground…with other forbs that were almost certainly introduced in a seed mix. Ernst Seeds has *Desmodium glabellum* – Ecotype 'Alcona'-Mi in its catalog." We are not positive that what Ernst has is even ID'd correctly, and this seed is not currently offered for sale on their website. We do not know how much of an influence ROW seeding might have on the long-term persistence and spread of this species.

**Conservation concerns**

Management and invasive species

Management of roadsides and ROWs is done with a focus on safety and reducing woody growth. While this general approach has allowed persistence of populations in these places, this management can also be detrimental when conducted in particular ways (e.g., broader-spectrum herbicides distributed by broadcast spraying, management during the growing season). Invasive species are a concurrent management challenge and some likely threaten population persistence.

N-deposition

Nitrogen (N) deposition, which has globally tripled in the last century and continues to be heavy in parts of Pennsylvania, changes plant communities (Simkin et al. 2016) and negatively impact other *Desmodium* species in our region (Skogen et al. 2011). As a result, we think it's likely that the decline we observe up to this point is driven in part by N-deposition, and is likely an ongoing threat to this species, though future severity is difficult to assess.

**Status justification**

With a broad distribution, at least 40-50 extant occurrences, and abundant available habitat on roadsides and ROWs, PE is clearly the wrong status for this species. However, the high assessed threat impact suggests that this species may still need conservation attention. The rank calculator indicates S3, and PR seems like an appropriate status.

Figure 4. Rank calculator summary for *Desmodium glabellum*

| | | | |
|---|---|---|---|
| ***Desmodium glabellum (Michx) D*** | **Proposed by:** Rachel Goad | | |
| **Current PBS Status:** PE | **Habitat:** a broad range of open-canopied to partly shaded habitats, including roadsides and ROWs | | |
| | | CATEGORY | COMMENTS |
| RARITY | **Range Extent** | F = 20,000-200,000 sq km (~8,000-80,000 sq mi) | Range historically covers most of the state, based on herbarium research done. |
| | **Area of Occupancy:** 4 km2 grid cells | **E = 26-125 4-km2 grid cells** | 40-50 extant occurrences are known (based on 45 occurrences compiled from field surveys, via verified iNaturalist observations, and herbarium specimens collected since 2000 with their ID verified). Some included from iNaturalist may be duplicates. |
| | **Number of Occurrences** | CD = 21 - 300 | At least 40-50 extant occurrences known, but the number may be much greater. Lack of accurate data due to long time misunderstanding of this taxon limits our understanding of the upper limit. |
| | **Population Size*** | | |
| | **Good Viability/Ecological Integrity: # of occurrences** | CD = Few to some (4-40) occurrences with good viability | Many occurrences (those from specimens or iNat records) were not rank-able. Two based on field surveys ranked as B or better. I assume that at least 2 if not more of the 40+ E-ranked occurrences would rank as B or better (giving lower bound of 4), but included a buffer. |
| | Environmental Specificity (opt.) | D = Broad. Generalist or community with all key requirements common | Species is able to persist on roadsides and in ROW's. |
| THREATS | **Assigned Overall Threat Impact** | B = High | |
| TRENDS | **Short-term Trend** | G = Relatively Stable (<=10% change) | While it's difficult to assess trend, the continued occurrence of extant populations throughout the state and their ability to persist along roadsides and in ROW's suggests good capacity for adaptation. |
| | **Long-term Trend** | | |
| | **Calculated Rank** | S3 | |
| | **Assigned Rank**** | S3 | |
| | **Rank Adjustment Reasons** | | |
| | **Assigned Rank Reasons** | This rank reflects the persistence of this species in numerous occurrences throughout the state, its ability to adapt to roadside and ROW habitats and the threat to those habitats of mismanagement and invasive species encroachment. | |

# Perplexing tick-trefoil - *Desmodium perplexum* B.G. Schub.

**Current Status in PA Regulations: N**
**Current PABS Recommendation (Proposed Status): N**
**Proposal to VPTC: Field species**
**C of C: 4 (perplexum); 8 (glabellum)**

**Proposal Summary**
This species has never been tracked and was long considered more common than *Desmodium glabellum*. The *Desmodium* project revealed that it is the less common of the two elements, and that it tends to occur in more shaded habitats. That said, like *D. glabellum*, it too can occur on ROW's and roadsides, but seems to be less widespread and its distribution more contracted from its historic range. A thorough review of herbarium material, iNaturalist records, and some field surveys found just 10-12 occurrences extant. However, because of long-standing confusion and lack of data, there remains some uncertainty about the appropriate rank.

**Habitat**
We found *Desmodium perplexum* to be a species of open woods and edges in Pennsylvania, reported from dry to mesic conditions. Of the specimens we reviewed with habitat information (n=67), 33% note some version of 'woods' on the label, and 27% indicate partly open habitats (e.g., mesic forest margins; dry, open thickets; open, scrubby embankment). Twenty-four percent include mention of disturbed conditions, like roadsides and rights of way. The three earliest of these specimens, from 1911-1920, were all collected in such habitat in Lehigh County by H. W. Pretz ("roadside", "uncultivated slope in field", and "open scrubby roadside"), suggesting that roadsides have long provided habitat for this species. Extant locations have been found on dark shale, schist, and sandstone in the Ridge and Valley and the Northern Piedmont ecoregions. If confirmed, a specimen from York County would add diabase to the list of suitable geological substrates.

In Missouri, Thomas found *D. perplexum* to occur in mesic woodlands and forests, though stated that it can also be found in old-field, clear cut, and slash-burn habitats.

**Identification**
See *D. glabellum* discussion and Figure 2. Ventral margins of loments are concave, leaves largely do not reduce in size up the stem, or extend appreciably into the inflorescence.

Figure 5. Top: *Desmodium perplexum* type specimen. Bottom: Typical loment shape

**Global Distribution**
As with *D. glabellum*, long-time confusion about this taxon has resulted in a lack of good information about its overall distribution. Compared with *D. glabellum, D. perplexum* appears to have a more limited distribution in the Midwest. It is mostly limited to southern eastern Missouri and absent from the prairie regions in the northern and western parts of the state. A similar pattern may occur in Kansas, where *D. perplexum* appears to be limited to the southern Cross Timbers region.

**PA Distribution**

*Desmodium perplexum* has been considered common and broadly distributed across Pennsylvania. Plants of Pennsylvania notes the species as common and found "throughout except at the highest elevations" (Rhoads & Block 2007). The Vascular Flora of Pennsylvania shows extensive occurrences across the state, especially concentrated in the southeast (Rhoads & Klein 1993).

Field work in 2021 confirmed *Desmodium perplexum* in one location, in Northumberland County at the shady edge of a corn field. Verified records from iNaturalist provided two additional observations from Dauphin and Philadelphia Counties. A specimen was collected from a shaded gravel roadside in York County in 2019. If the eight specimens recorded since 2000 are also considered extant, then we know of 11 or 12 extant occurrences in the state, from Bucks, Dauphin, Lancaster, Montgomery, Northampton, Northumberland, Philadelphia, and York.

**Conservation concerns**

The same suite of conservation concerns for *D. glabellum* can be applied to *D. perplexum* – roadside and ROW management can facilitate or significantly threaten the persistence of populations, and invasive species are a widespread threat in these habitats. The impact of nitrogen deposition has likely been to reduce habitat for this and other Desmodium species, though there is a lot of uncertainty in the severity of this as an ongoing threat.

**Status justification**

There is currently much unknown about this species in Pennsylvania, as is apparent from the broad ranges used in the rank calculator (Fig 6), but it still seems to be of conservation concern (S1S3). I will recommend its inclusion in the Watch List and I encourage efforts to collect more data – including ranking of populations.

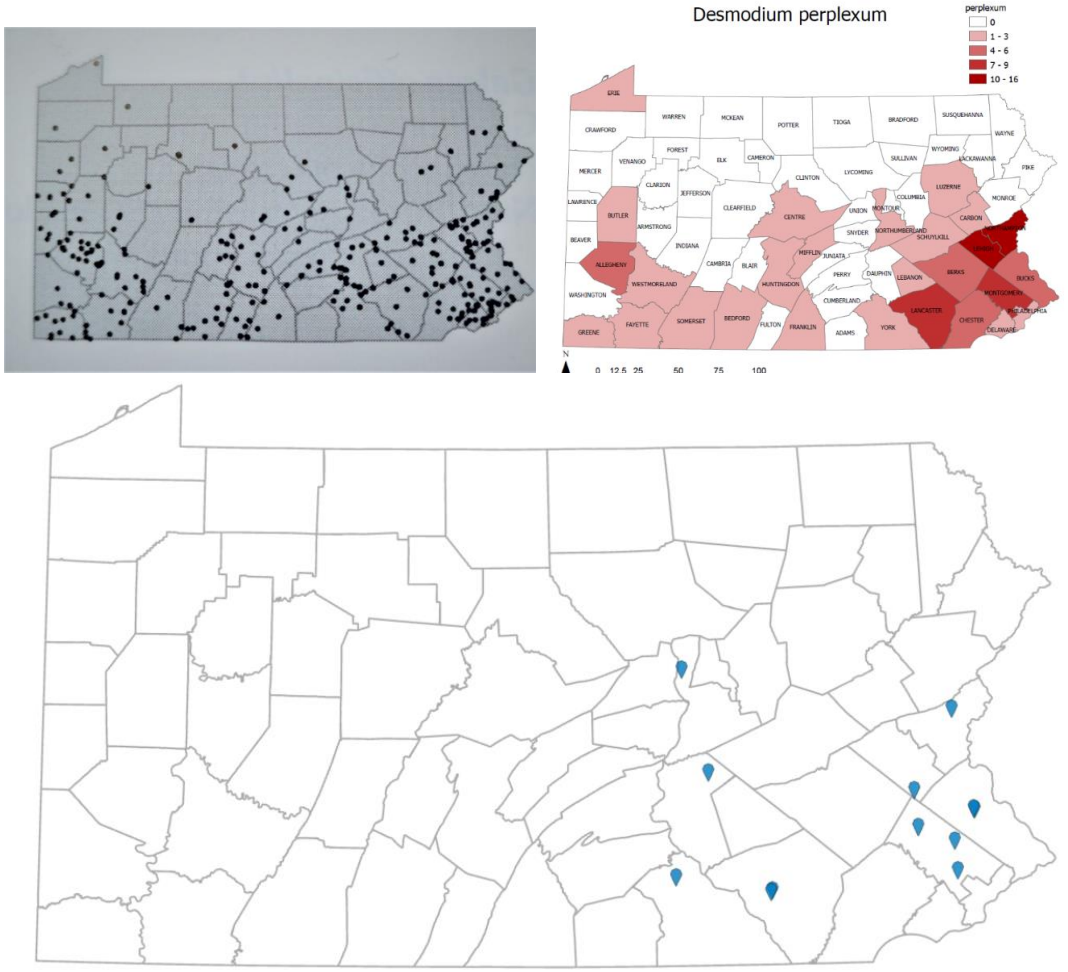


Figure 7. Top left: *Desmodium perplexum* occurrences according to Rhoads and Klein (1993). Top right: Verified *D. perplexum* specimens by county. Bottom: Documented extant locations from herbarium specimens, iNaturalist, and FIND (all with blue markers).

Figure 6. Rank calculator

| | | | |
|---|---|---|---|
| ***Desmodium perplexum* Schuber** | **Proposed by:** Rachel Goad | | |
| **Current PBS Status:** PE | **Habitat:** open and partly shaded habitats, including roadsides and ROWs | | |
| | | CATEGORY | COMMENTS |
| RARITY | Range Extent | DF = 1000-200,000 sq km | Known extant range is 4717 square miles. Historic range is much |
| RARITY | Area of Occupancy: 4 km2 grid cells | **DE = 6-125 4-km2 grid cells** | 12 extant locations known (from FIND, iNaturalist, and Symbiota specimens collected since 2000). These intersect eleven 2km2 grid |
| RARITY | Number of Occurrences | BC = 6 - 80 | 12 extant locations known. Additional undocumented occurrences |
| RARITY | Population Size* | | |
| RARITY | Good Viability/Ecological Integrity: # of occurrences | AD = None to some (0-40) occurrences with good viability | None of the known occurrences have been ranked. |
| RARITY | Environmental Specificity (opt.) | | |
| THREATS | Assigned Overall Threat Impact | AC = Very High - Medium | |
| TRENDS | Short-term Trend | | |
| TRENDS | Long-term Trend | | |
| | **Calculated Rank** | **S1S3** | |
| | **Assigned Rank**** | | |

Stiff tick-trefoil - *Desmodium obtusum* (Muhl. ex Willd.) DC.

**Current Status in PA Regulations: N**
**Current PABS Recommendation (Proposed Status): PE, but "under review"**
**Proposal to VPTC: PX**
**C of C: 8**

**Proposal Summary**
This species seems to have always been a relatively rare member of dry woodlands and edges in southeastern Illinois. Habitat loss and other landscape level changes (e.g. disrupted disturbance regimes, nitrogen deposition) have resulted in its apparent extirpation from the state. It should be listed as PX but sought in dry, open, or partly shaded places.

Figure 8. *Desmodium obtusum* specimen

**Habitat**
*Desmodium obtusum* is a plant of dry places in the southeastern US, including from open, sterile woodlands, and along streams and roadsides (Isely, 1998). In Pennsylvania, its habitat has been listed as dry, open woods on sandy soils, primarily in the southeastern part of the state (Rhoads & Block 2007). In Missouri, this species occupies mesic to dry upland forests, glades, upland and sand prairies, stream banks, pastures, and roadsides (Yatskievych 2013).

Habitat for this species has been noted on specimen labels using various descriptors for dry open places. Of 31 specimens with label data, 15 mention dry, open, or 'barren' conditions, including reference to serpentine barrens, barren fields, clearings, and abandoned fields. Others noted more mesic, or shaded habitats, like "moist meadow," "woods," "thicket," "dry wooded slope," and "dry soil on a shaded road bank."

**Identification**
Like the other taxa in the Ciliare group, this species has narrow stipules, 2-3 rounded segments per loment, and relatively small leaflets. *Desmodium obtusum* (Muhl. ex Willd.) DC. is distinguished by its terminal leaflet being longer and narrower than its lateral leaflets, and its mid-stems with uncinate hairs (Weakley & Southeastern Flora Team 2022).

Some have advocated for broader treatment of these taxa, with all three recognized as sometimes distinguishable members of the "*Desmodium ciliare* group" (Isely 1990, 1998), or as varieties of a polymorphic *D. marilandicum* (Ohashi 2013). When reviewing Pennsylvania material, we found this species to be relatively clearly separable from its relatives. Of the 71 specimens we thought were *D. obtusum*, we were able to confidently identify 83% (59). Those that could not be confidently identified were primarily specimens without fruit, or those we could only review digitally. We also found that rare hybrids may be confused for *D. obtusum.* On a field visit to Unionville barrens in 2021 we observed an apparent hybrid of *D. ciliare* and *D.paniculatum* that mimicked the elongated terminal leaflets and fruit shape of *D. obtusum*. Note the smaller, more numerous leaves and relatively short internodal distances in Fig. 9. Both parents were seen growing nearby.

**Global Distribution**
BONAP maps it from Texas to Nebraska and Michigan, and from Florida to Ontario. Weakley maps *D. obtusum* broadly across the southeastern US. The species is ranked G4 and by our neighbors as S1 (MD, DE, and NY), S2 (WV), and S4 (NJ).

**PA Distribution**
We identified 59 specimens of *Desmodium obtusum* from Pennsylvania, collected from 1831 through 1996, with three specimens having no date. These occurrences are clustered primarily in the southeast and central parts of the state. We confirmed the identity of specimens associated with 24 of 33 *Desmodium obtusum* EOs, while one was annotated to *D. ciliare* and one to *D.* cf *nuttallii.* Five EOs had their associated specimens annotated to *D.* cf. *obtusum*. Nineteen specimens were found, and their identification confirmed but are not yet represented in Biotics. One of these may be the most recently documented sighting in the state, having been collected in 1996. Unfortunately, that occurrence has likely been extirpated.

Field work associated with this project did not reveal any extant locations for this species. There are no iNaturalist records from Pennsylvania for *D. obtusum*, and all records in Biotics are considered historic.

**Conservation concerns**
The same conservation concerns as the previous two species apply here as well – management of ROWs and roadsides, invasive species, and Nitrogen deposition are all ongoing threats to the potential occurrence of this species. However, this species seems to have always been rarer in the state and may have lost a greater proportion of its habitat with the heavy urbanization of the southeast.

**Status justification**
This species seems to have disappeared from the state. If it does re-appear, it should be tracked as PE.

Figure 9. *Desmodium ciliare x D. paniculatum* (iNaturalist observation by C. Ciafré).

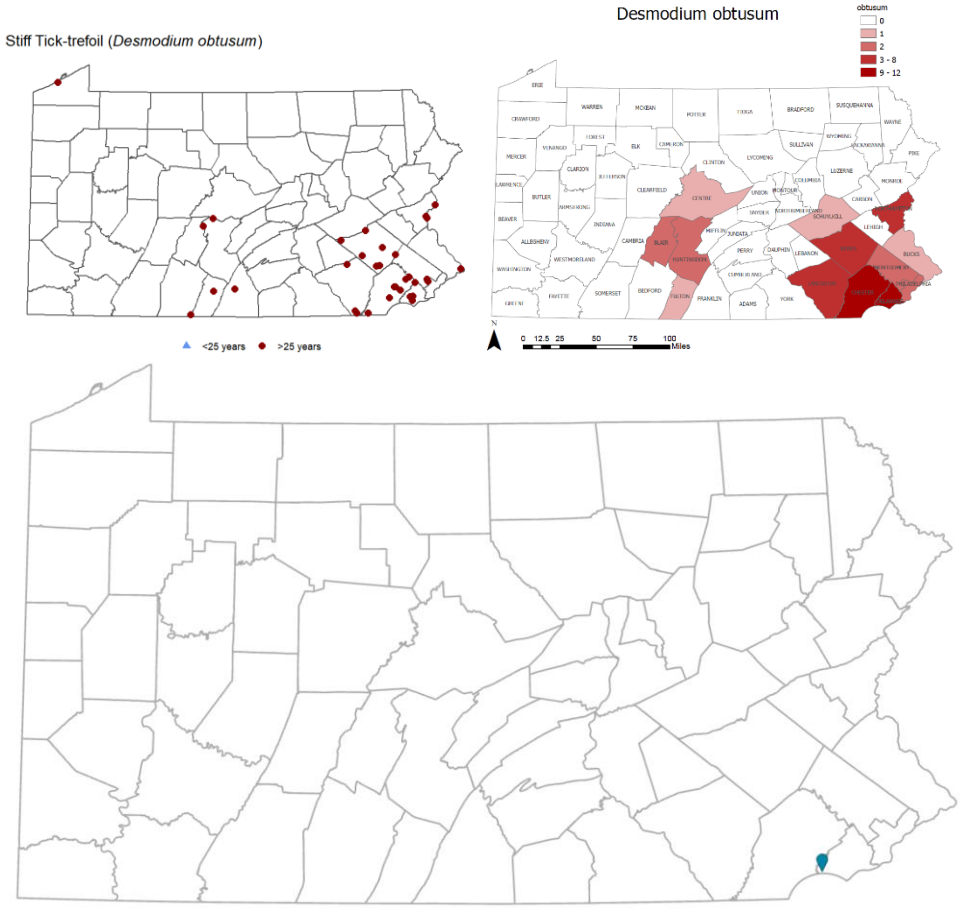


Figure 10 (to right). Top left: *Desmodium obtusum* EOs according to Biotics. Middle: Specimens as annotated by this project, mapped by county. Bottom: Single blue marker indicates the occurrence most recently seen in the state (1996).

# Velvety tick-trefoil - *Desmodium viridiflorum* (L.) DC.

**Current Status in PA Regulations: N**
**Current PABS Recommendation (Proposed Status): PE but "Under Review"**
**Proposal to VPTC: PE**
**C of C: 5**

**Proposal Summary**
This species has been difficult to consistently separate from *D. nuttallii* here at the northern edge of its range where it has apparently always been rare. Our extensive herbarium review found that former records for this species are based on odd specimens of *D. nuttallii*. We were able to locate one extant population in Delaware County on protected land and identify one potentially extant population in Chester County on a ROW, both occurrences very near the coastal plain. This very rare species should be listed as PE.

**Habitat**
Schubert (1950) notes that *D. nuttallii* is an inland species, while *D. viridiflorum* occurs primarily on the southeastern coastal plain. *Desmodium viridiflorum* has been noted to have a strong association with Piedmont Prairie flora in North and South Carolina (Davis et al. 2002).

**Identification**
*Desmodium viridiflorum* and *D. nuttallii* both have leaves densely villous on their lower surfaces, stems densely pubescent, and loments with 2-5 segments. *Desmodium nuttallii* has narrower leaflets (longer than wide) with loments usually downwardly curved, and segments either rounded below or somewhat angled. *Desmodium viridiflorum* has wider leaves (approaching as long as wide) with straight loments. The latter also has larger segments, and up to 5 segments per loment (Weakley & Southeastern Flora Team 2022).

While modern treatments agree that *Desmodium viridiflorum* and *D. nuttallii* are separate entities, there can be considerable confusion in distinguishing these taxa (e.g., D'Arcy 1969). Mature, fruiting material is necessary for accurate identification (Schubert 1950; Isely 1953; Raveill 2006; Weakley & Southeastern Flora Team 2022). The ratio of length to width of terminal leaflets can work to distinguish these species in the extremes (see Krings 2004), but considerable overlap in leaf dimensions occurs. In the absence of fruit, confident identification is not always possible (Yatskievych 2013).

We found ~30 Pennsylvania specimens that initially appeared to have morphology somewhat intermediate between *Desmodium viridiflorum* and *D. nuttallii*. These specimens have terminal leaflets relatively wide (lower length to width ratios than typical *D. nuttallii*), and those with fruits often have segments somewhat angled below (Fig 12). Nine of these had been previously

Figure 11. Images of *Desmodium viridiflorum* from the extant Delaware Co. occurrence as seen in 2021. Photos by C. Ciafré.

identified as *D. viridiflorum*. A subset of these specimens were vegetative or had under-developed fruits and so could not be confidently identified.

With further examination and comparison with out-of-state material of *D. nuttallii* and *D. viridiflorum*, these "intermediate" specimens were largely found to have leaflets and loments within the range of variation expected for *D. nuttallii* (see Yatskievych 2013; Weakley & Southeastern Flora Team 2022). The fruits, while having segments somewhat angled below, are more consistent with *D. nuttallii* than *D. viridiflorum,* with loments downward curving, and segments smaller, on average, than *D. viridiflorum*. Such specimens were found from Berks (1913-1941), Chester (1992), Delaware (1862-1910), Lancaster (1938), Monroe (1889), Northampton (1889-1898), and Philadelphia (1902) counties. It may be that the angularness of some fruits has to do with incomplete or abnormal development of seed at the edge of this species' range.

**Global Distribution**

This species ranges from Pennsylvania and New Jersey to Florida and Texas (Kartesz 2015; Weakley & Southeastern Flora Team 2022). NatureServe ranks it as G5, with our neighboring states considering it S2 (NJ), and S4 (DE, MD).

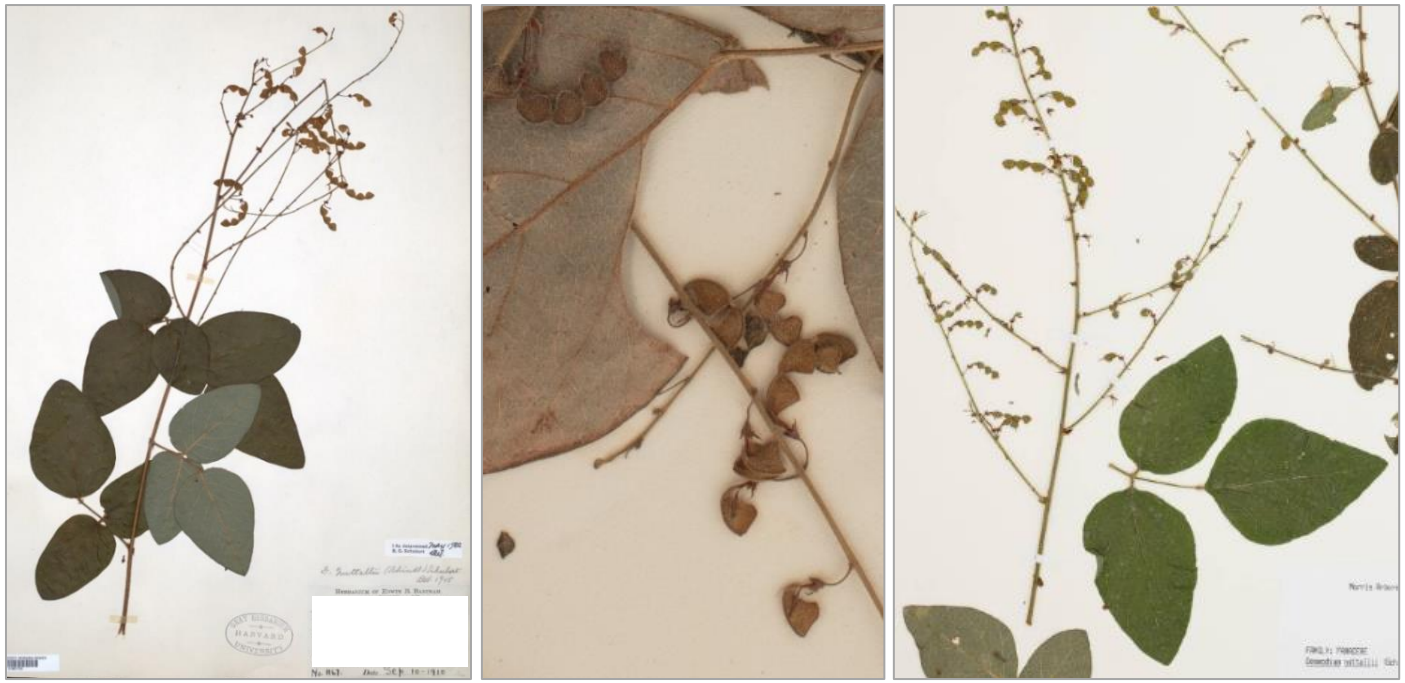

Figure 12. **"**Intermediate" *Desmodium* specimens, the center and left representing odd *D. nuttallii* previously considered to be *D. viridiflorum*. Left: *D. nuttallii* with segments angled below and terminal leaflets relatively wide. Center: A close-up of angled fruits in still down-curving loments on one of these odd specimens. Right: *Desmodium nuttallii* or *viridiflorum* from the extant Chester County occurrence.

**PA Distribution**

Schubert (1950) mapped only *Desmodium nuttallii* to Pennsylvania, attributing it to Northampton and Delaware counties, and noted *D. viridiflorum* as a species of the coastal plain. In Pennsylvania, both taxa have been more recently attributed to the state (Rhoads & Kline 1993; Rhoads & Block 2007; Weakley & Southeastern Flora Team 2022).

While the previous occurrences have all been redetermined, we found one extant occurrence in Delaware county on protected land. There is also one potential occurrence extant in Chester County on a powerline ROW (see Fig 12). Notably, we know of no specimens indicating that this species was present in the state (prior to potentially 1992). There may be additional specimens that do document its occurrence that we have not yet found. The extant location(s) we have noted are in good condition and should be considered naturally occurring and worthy of conservation protection. Both locations are vouchered, though the Delaware Co. voucher has not yet been deposited.

**Conservation concerns**

The single, confidently identified extant population is on protected land, with landowners interested in conservation measures. The potential occurrence is on a ROW, that would be subject to threats detailed for species above – mismanagement and invasive species encroachment. The impact of nitrogen deposition has likely been to reduce habitat for this and other Desmodium species, though there is a lot of uncertainty in the severity of this as an ongoing threat.

**Status justification**

With just 1 or 2 known occurrences in the state, and most of the coastal plain (where this species is apparently most at-home) has been heavily developed in Pennsylvania. This very rare species should be listed as PE.

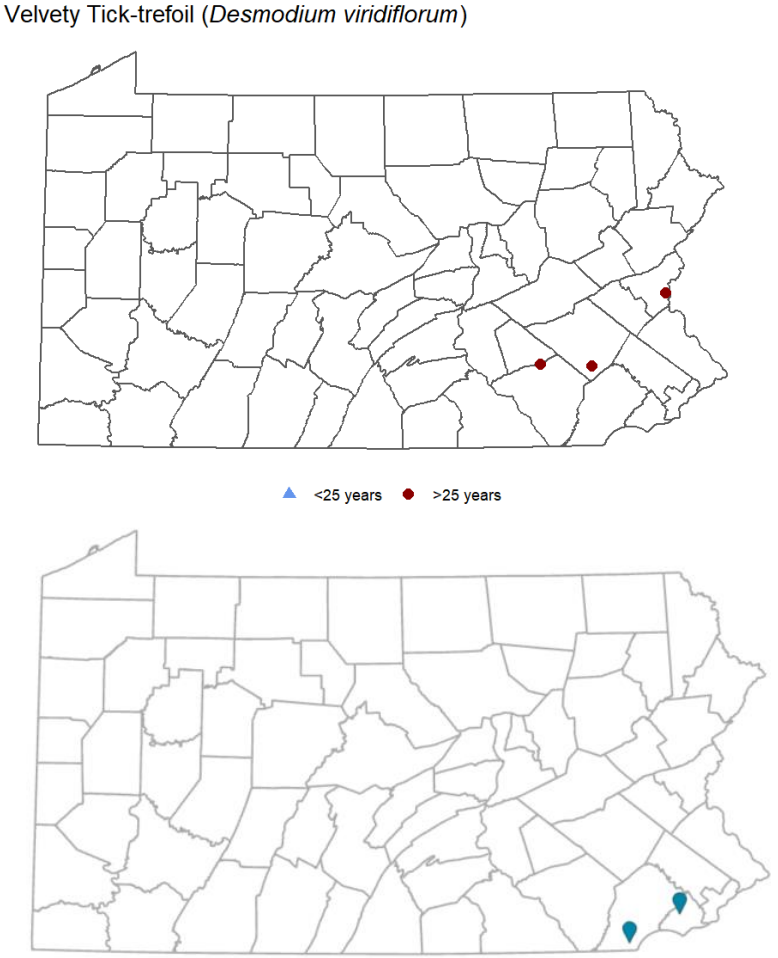


Figure 13. Top: *Desmodium viridiflorum* EOs according to Biotics, prior to the completion of the Desmodium project. Bottom: One occurrence of confidently ID'd *D. viridiflorum* (Delaware Co) and one potential *D. viridiflorum* (Chester Co.)

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# Woodland cudweed – *Omalotheca sylvatica* (L.) Schultz-Bi. & F.W. Scultz (≡ *Gnaphalium sylvaticum* L.)

**Current Status in PA Regulations: N**
**Current PABS Recommendation (Proposed Status): TU (UEN)**
**Proposal to VPTC: N**
**Current NS Conservation Rank: G4G5SH**
**Proposed by: Steve Grund, WPC/PNHP**

*Omalotheca sylvatica*
Don Cameron, Go Botany

**Proposal Summary**

This is a circumboreal, disturbance adapted (but not necessarily disturbance dependent) species that has been documented in Pennsylvania only once, in 1941, considerably south of any other reports, and probably should not be considered native to Pennsylvania, and may reasonably be treated as a waif here.

**Habitat**

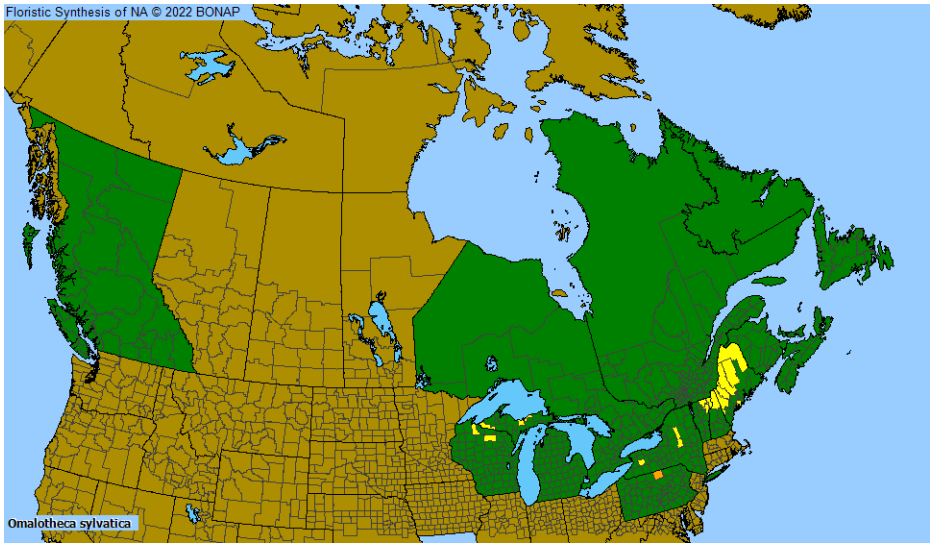
- The Pennsylvania specimen: Dry north-facing hillside
- Go Botany: roadsides, logging roads, forest clearings and fields. Anthropogenic (man-made or disturbed habitats), meadows and fields, shores of rivers or lakes
- Flora of North America: Open woods, boggy woods, rocky slopes, clearings, fields, borders of woods, roadsides, muddy banks, disturbed sites

**Biology and Life History**

Perennial, rhizomatous herb in the Asteraceae. Possibly both pollinated and dispersed by wind.

## Pennsylvania Distribution

*Omalotheca sylvatica* has been collected only once in Pennsylvania, in Tioga County (Carroll Wood 1154, 17 September 1941, PH). I know of no iNaturalist records or other documentation of this species in Pennsylvania.




North American distribution of *Omalotheca sylvatica* (Kartesz 2023)

**NE North America distribution and regional conservation statuses**

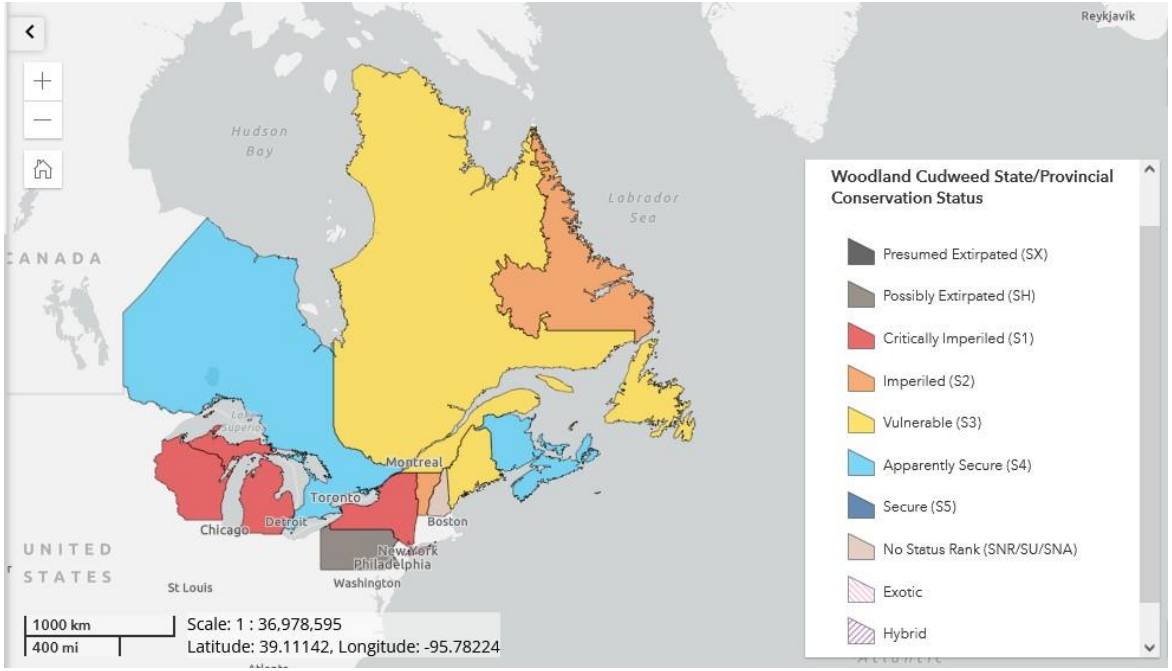
There are a few isolated stations in New York. New Hampshire has deemed it unrankable, perhaps because the native status of at least some occurrences has been called into question. It is nowhere common in North America, and it is possibly not native to the continent (Nesom 2006).

**Global Distribution**

*Omalocheca sylvatica* is primarily a European and northeastern Asiatic species. It is disjunct in Japan and the Kamchatka Peninsula; I do not know whether it is considered native there. In British Columbia it is treated as non-native (NatureServe 2023).

**Status Justification**

The evidence for this species in Pennsylvania consists of a single specimen from 1941. Because this is a disjunct record of a species that is considered to be introduced elsewhere, it seems likely that it is not native in Pennsylvania.




Subnational conservation statuses of *Omalotheca sylvatica.* Exotic in British Columbia (outside of map). (NatureServe 2023)

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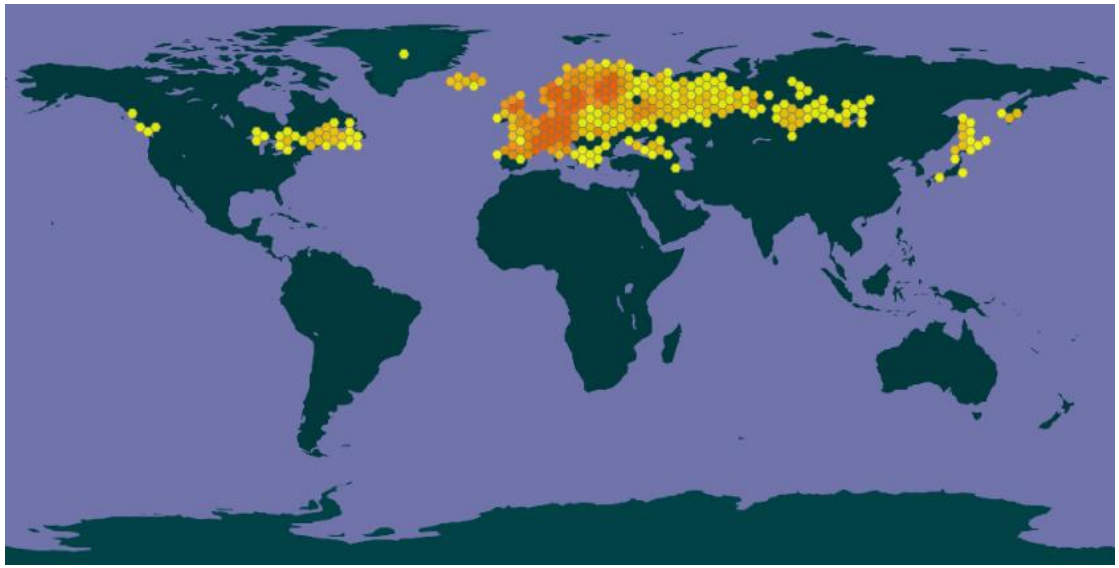


Global distribution of *Omalotheca sylvatica* (GBIF 2023)

# Common camphorweed – *Pluchea camphorata* (L.) DC.


**Current Status in PA Regulations: N**
**Current PABS Recommendation (Proposed Status): N**
**Proposal to VPTC: PX**
**Current NS Conservation Rank: G5SH**
**Coefficient of Conservatism: 7**
**Proposed by: Steve Grund, WPC/PNHP**

**Proposal Summary**

In 1990, *Pluchea camphorata* was recommended for delisting by the VPTC. We have not found any minutes from that meeting, but It looks like the only Pennsylvania specimen people would have known about at that time was collected from Bartram's Garden (B.S. Barton s.n., no date, PH), which would explain why they decided it should be delisted. However, there are two specimens from herbaria that had likely not been searched in preparation for the Atlases (Wherry et al 1978, Rhoads and Kline 1993) or by PNHP (then PNDI). One of those has not been scanned (G. Smith s.n. 1878, BALT), but the transcription of the label data indicates that the locality listed was simply Pennsylvania. The other was collected at Peach Bottom (A.F. Eby s.n., 1892, ILL, det confirmed by Almut Jones), which would be a very plausible range extension.

**Habitat**

- The Peach Bottom specimen: No habitat data
- Weakley: Bottomland sloughs, clay flatwoods, other freshwater wetlands, also weedy in upland areas, particularly in sunny areas and following disturbance (Weakley & the Southeast Flora Team 2022)
- Flora of Virginia: Alluvial swamps (especially in seasonally flooded sloughs), floodplain oxbow ponds, wet clay flatwoods and clearings, ditches, and impoundment shores (Weakley et al 2012)
- Flora of North America: Flatwoods, bottomland channels, other wet or moist freshwater habitats (Nesom 2006)

**Biology and Life History**

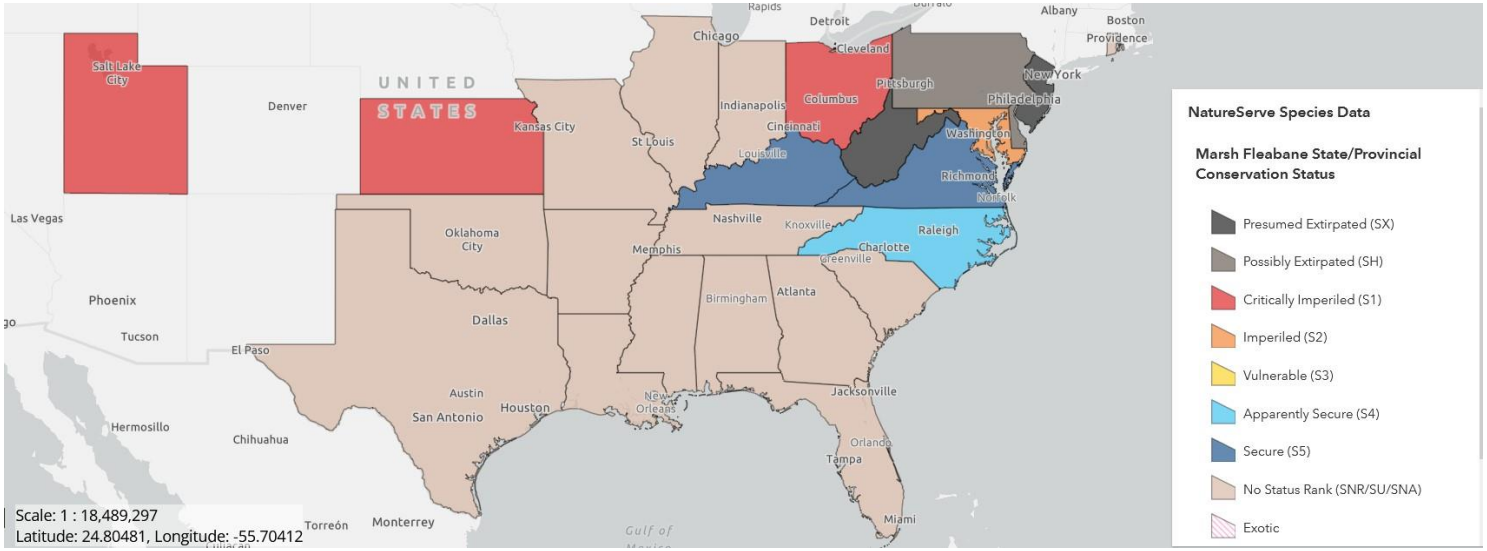
Fibrous-rooted annual or perennial (I'm guessing annual here at the northern limit of its range). The habitats listed above indicate tolerance of (and at least partial dependence on) fluctuating hydrology. Peach Bottom is along the Susquehanna River, and these habitats are likely present in the vicinity.

## Pennsylvania Distribution

The only specimen that likely represents a native Pennsylvania occurrence was collected at Peach Bottom, Lancaster County, on the Susquehanna River where it leaves Pennsylvania.

**Distribution and regional conservation statuses**

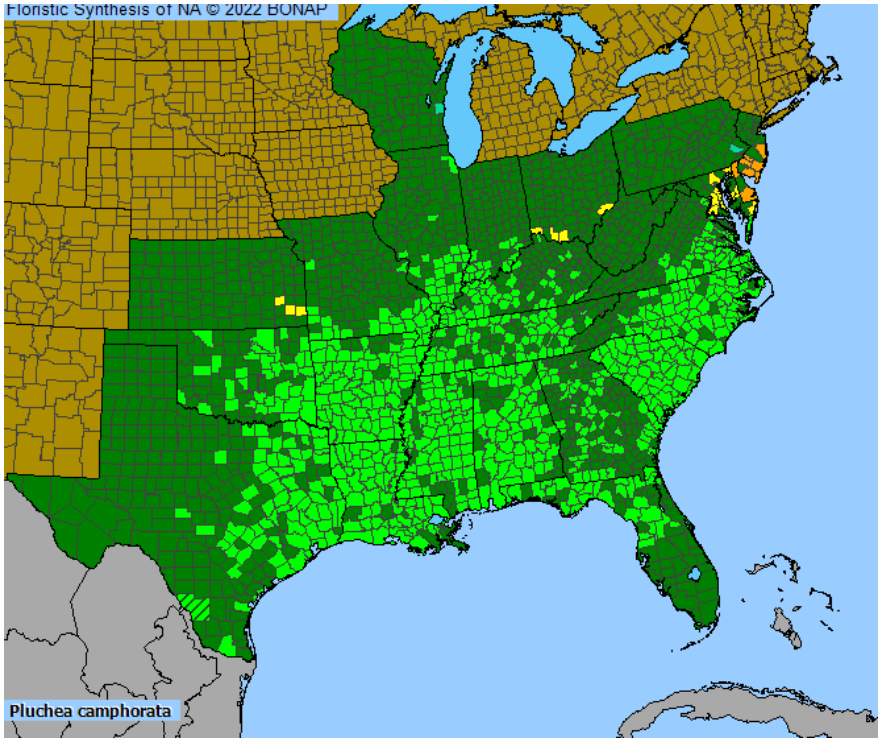
This is a southeastern species that reaches (or historically reached) its northern limit in New Jersey. It has possibly become extirpated in New Jersey, Delaware, and West Virginia, and is Critically Imperiled (S1) in Ohio, Imperiled (S2) in Maryland (NatureServe 2023).




Conservation statuses of *Pluchea camphorata* by state (NatureServe 2023)

**Status Justification**

The only specimen from Pennsylvania that plausibly represents a natural occurrence, and has locational data more precise than "Pennsylvania" is from the lower Susquahanna River near where that river enters Cecil County, Maryland, where this species has also been documented. Because the specimen was collected over a hundred thirty years ago, I suggest we consider it possibly extirpated until Rachel, or Tim Draud, or another of this crowd rediscovers it.




Distribution of *Pluchea camphorata* (Kartesz 2023)

**Literature Cited**


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

NatureServe. 2023. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: 06 March 2023)

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Univ. of Illinois (ILL)
MRS. W. S. MCFATT COLLECTION
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# ***Shumard oak – Quercus shumardii***

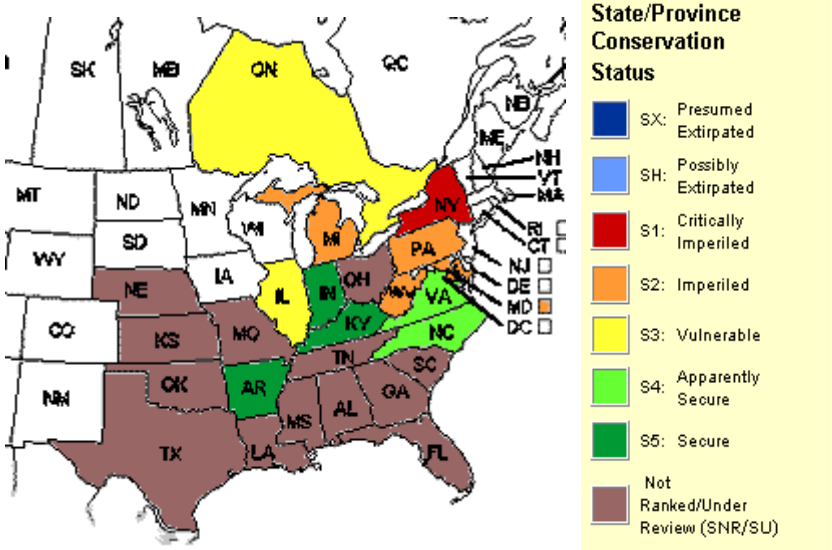
**Current Status in PA Regulations: PE**
**Current PABS Status: PE**
**Proposed Status: PT**
**Coefficient of Conservatism: 7**
**Proposed by: Jessica McPherson, WPC/PNHP**

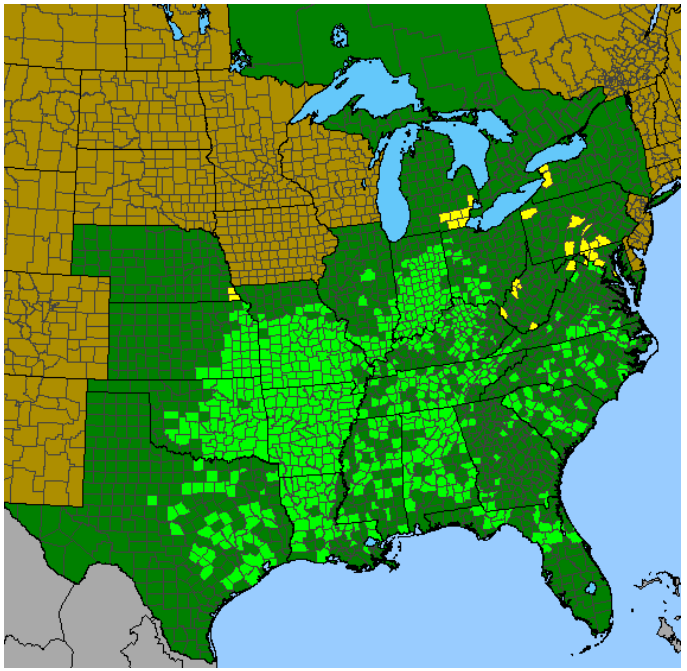

**Overview**

Shumard oak was previously believed to have a very small number of populations in Pennsylvania and classified as Pennsylvania Endangered. Fourteen populations have now been found in the Ridge and Valley. Populations were also documented from Erie and Crawford counties, but based on field visits and review of collections from all sites where it was documented, we believe these to have been identified in error, and that the species is not presently documented from the northwestern region of Pennsylvania. Two populations have been found in county parks in Allegheny County; the settings appear to be unmanaged wild forest, but much material has been introduced into the parks and it is not impossible these populations resulted from some kind of introduction. Additional searches in Allegheny County and surrounding areas have not yielded any new finds.

**Proposed PA Status**

A status of Pennsylvania Threatened is recommended due to low numbers of populations and individuals and limited suitable habitat statewide. There are 13-16 known locations of natural origin, but none consist of large populations, and some consist of very few individuals. It is limited to SC Pennsylvania on calcareous and diabase floodplains, so it unlikely there are many more than the currently documented populations.



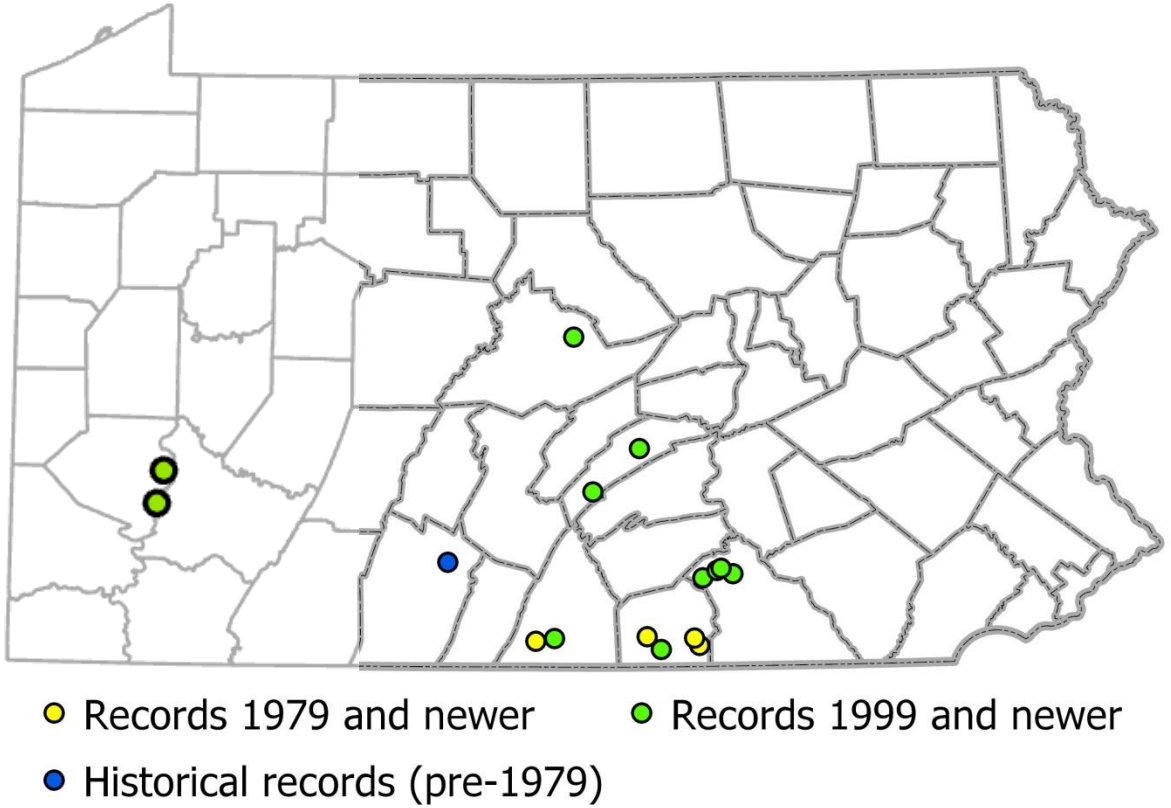



**North American Distribution & Global / Regional Conservation Concerns**

The main portion of this species' range is centered around Arkansas and Missouri; the range extends east to the Atlantic Ocean, but documented occurrences are much more scattered east of the Appalachians. The northern edge of the range is southern Michigan and lake-shore New York. It is ranked S1 in New York, S2 in West Virginia and Maryland, and S4 in Virginia and North Carolina.

**Pennsylvania Distribution**

Most occurrences are clustered in south-central Pennsylvania the Ridge and Valley province. Two locations are in Allegheny County parks.




**Habitat**

Habitat descriptions vary across the range of this species, but tend to include poorly drained floodplains and bottomlands, and rich upland forests, sometimes specified to be calcareous.

- FNA: Mesic slopes and bottoms, stream banks and poorly drained uplands. 0-500 m.
- Flora of Virginia: Well-drained, fertile floodplain forests, alluvial swamps, rich mesic upland forests, dry-mesic to dry forests and woodlands over calcareous and mafic rock. Infrequent in the mountains and Piedmont; rare in the Coastal Plain; locally common in some Ridge and Valley limestone districts.
- Michigan flora: Swamps, often on clay soils, mostly on the Lake Erie and Lake St. Clair lakeplain. Calcareous (Reznicek 2019, personal communication).
- Missouri flora: Mesic to dry upland forests, savannas, edges of glades, tops of bluffs, banks of streams and rivers, and rarely margins of fens.

PA Ridge and Valley: bottomland forest, moist to saturated diabase derived soil in mixed hardwood forest. Along streams or in alluvial areas. Floodplain forest, flat floodplain forest; often with *Quercus palustris*, *Quercus bicolor*, and/or *Fraxinus nigra*; wooded streambanks, lower slopes, wet woods near lake shores. Usually on calcareous or diabase soils. Shade intolerant? Often found on edges.

Allegheny County: Both populations are on edges of calcareous upland forest. Noted further south in Appalachians as a component of mesic to dry calcareous forest types.

**Extant locations**

- 13 known extant sites in Ridge and Valley: most have ~20 plants, one site with 200.
- 2 Allegheny County sites, both in parks: ~50 plants at one, 2 plants plus some hybrid-appearing individuals at the other. These trees are growing in what appears to be native forest and don't show any signs of being planted; however, as many individuals from cultivated stock of a variety of tree species have been introduced to the parks, it's not impossible they have spread from planted material elsewhere. No *Quercus shumardii* has been observed among the landscape plantings in either park.
- Most sites report mature trees present, sometimes a range of sizes from sapling to mature. Two sites report a lack of reproduction in closed-canopy conditions.
- Total number of individuals documented in the state: 564-711.

**Historical Locations**

Remarkably few historical collections, unlikely to yield any new occurrences.

- Two Berkheimer collections at a single Bedford County location from 1957 (Academy) and 1960 (Carnegie), included in biotics as "H"; no one has yet attempted to relocate it.
- 1964 Wherry collection from Swarthmore College Campus
- 1940-07-26 A.G. Shields collection from "Franklin, Mont Alto, SM". IUP herbarium, photo not available online, have not confirmed ID.
- PSU herbarium:
    - 1847 Thomas C. Porter collection from "Franklin, Mercersburg". ID confirmed.
    - Several other specimens returned in search, but all are Quercus stellata (as Tim Block has commented).

**Conservation Concerns**

Near-term threats with potential to eliminate extant individuals or populations are fairly low in both severity and scope, but long-term threats are higher.

Cutting: The biggest active threat is the potential for logging or cutting. Logging is recorded as a potential threat at two occurrences, and a few more are in thin strips of woodland bordering privately held agricultural land. These are contexts where sometimes people decide to alter the landscape and cut trees. At other sites with somewhat fragmented landscapes, incidental losses could occur from management activities if managers are not aware of the trees.

Development: the potential for development is fairly low, as most sites are directly on floodplains of medium to large watercourses.

Hybridization: Three sites (two Ridge and Valley, one Allegheny County) report individuals of hybrid appearance that could not be identified as Shumard oak occurring alongside individuals that appeared to be Shumard oak. *Q. shumardii* hybrids have been documented with at least 12 other oak species; of those, *Q. rubra, Q. palustris,* and *Q. velutina* occur in Pennsylvania. One DNA study of an old-growth forest in Indiana where *Q. rubra*, *Q. shumardii*, and *Q. palustris* occurred together found evidence of fairly extensive hybridization and introgression: "We found high genetic diversity within species but limited genetic differences between species…a neighbor-joining tree revealed that individuals of the different species did not resolve into single-species clusters." (Aldrich et al.

2011). In general, recent research on oak hybridization suggests that over evolutionary time, distinct taxa are maintained despite the ability of many taxa to hybridize, and that hybridization allows evolutionary flexibility through the movement of genetic material that could confer adaptive benefits (Hipp et al. 2019; Lazic et al. 2021; Li et al. 2021). However, the context of small populations of a rare species (*Q. shumardii*) within a matrix of individuals of species much more ubiquitous on the landscape (*Q. rubra, Q. velutina*) may present different challenges to the long-term viability of the rare species. We have not found research addressing this scenario; over the long term, there may be potential for populations with hybridization occurring to be slowly eroded through introgression in future generations.

Shading / Succession: several occurrences note that no reproduction was observed under closed canopy conditions. This species may need gaps, edges, or other high-light situations to reproduce. Current landscape conditions and management at several sites (Gettysburg battlefield, State Gamelands #243, Bald Eagle State Park) does support reproduction. In Missouri, upland populations of *Quercus shumardii* do well with moderate fire, while fire has almost certainly not occurred at any Pennsylvania occurrences in a very long time.

Invasive species & diseases: invasive plant species do not pose a short-term threat to extant individuals or populations because mature trees have canopies above them. However, there are several vigorous invaders of floodplains that could prevent reproduction in the future: Japanese knotweed, Japanese stiltgrass, and wavy-leaf basketgrass. Shumard oak is vulnerable to spongy moth (*Lymantria dispar*), but its habitat is not the typical location for outbreaks in Pennsylvania. Outbreaks are typically worst in higher elevation oak dominated communities, while Shumard oak is found in lower elevation mesic communities not dominated by oaks. It does not appear to be a preferred food of spotted lanternfly. It is in the group of oaks most vulnerable to oak wilt; we have no specific information on its impact on this species, or in prevalence in this species' habitat.

Deer browse: deer browse is not named as a threat in any site assessments, but the chronic state of overbrowse of Pennsylvania's forests is known to inhibit reproduction in other oak species.

Status assignments should be made on the basis on short-term threat rather than long-term threat, and therefore only the relatively low short-term threat level should be considered in assessing the appropriate status at this time. Low threat level in combination with the known population numbers is consistent with a status of Pennsylvania Threatened. However, long term threats should be noted and mitigation considered in management and stewardship efforts.

**Taxonomy**

*Quercus shumardii var. acerifolia:* Justin Thomas has published (Ladd and Thomas 2015) advocating the application of the name *Quercus shumardii var. acerifolia* to the material that had previously been recognized as *var. schneckii*: "an upland entity with more squat leaves and more rounded buds (which tend to be more chestnut than gray)." He reviewed my photos of John's collections, and my collections from Allegheny County, and found no *var. schneckii* among them; this variety has not yet been documented from Pennsylvania. No other varieties are currently recognized.

*Quercus rubra var. borealis*: After reviewing the NW PA specimens previously reported as *Quercus shumardii*, Thomas commented:

> Most of the *Quercus rubra* you have here appear to fall into the *var. borealis* camp. I'm finding in the Midwest that this is probably a worthy split. Our var. *rubra* is more of a mesic calciphile with strikingly contrasting "slopes" on the bark (white and black stripes) that accumulates little to no lichen cover, where var. *borealis* occurs in upland and wet acidic habitats, has less contrast between the bark "slopes" and is often lichen covered (like coccinea is).

Leaves of var. *borealis* tend to be more deeply lobed and bud scales tend to be more pubescent. Some folks (Chicago region for sure) have applied the nothospecies name *Q. x hawkinsiae* for these, as they don't fit *Q. rubra*. Having reviewed material in the field and discussed it with Jerry Wilhelm, we suspect they are really *Q. rubra var. borealis*.

**Status Justification**

It is clear that the current status of Pennsylvania Endangered is not appropriate at this time, as the number of populations and individuals known in the state exceeds what is suitable for that status. With fairly low short-term threat, little loss is anticipated among extant populations. Pennsylvania Threatened is appropriate due to the low number of populations in the state, the low number of total individuals known to the state, and the limited available habitat for the species.

**Identification** (illustrations provided at end of document)

There has been much confusion over how to identify this species, despite its presence in keys for many decades. One issue is that keys have typically emphasized leaf sinus depth, and this is a character that is highly variable on oaks. Red oak sun leaves can have sinuses deep enough to key as *Quercus shumardii*. John Kunsman emphasized the glabrous, uniformly light-grey, almost waxy winter buds as reliable and distinct character; this has certainly been true in my experience, it is well-described in Flora of North America, and Justin Thomas agrees as well.

Furthermore, there are useful differences in leaf shape and color. With the combination of the bud character and these leaf characters, I have found identification to be unambiguous unless hybrids are present at the site. Material I have judged to be hybrid has typically exhibited combinations of features not quite matching any known oaks. John Kunsman and Justin Thomas both say the species is usually reliably distinct and they rarely see hybrids.

***Quercus shumardii***: buds as described in flora of North America – “Terminal buds gray to grayish brown, ovoid or broadly ellipsoid, 4-8 mm, often noticeably 5-angled in cross section, glabrous”. John Kunsman showed me the buds as the best character to look at when he taught me the species; the color is very uniform and there is almost a waxy appearance.

Leaves with sinuses tending to angle straight out, with sides parallel, sometimes lobe tips closing back towards each other at the distal end (forming an oval shape), lobes tending to have more points (generally 4-7). Widest point on leaves 1/8-1/3 down from tip. In life, leaves shiny. Bark furrows pink; in older trees, lower trunk may resemble *Q. rubra*, but pink furrows can still be seen on upper trunk and large branches.

***Quercus rubra*:** buds chestnut brown, often larger and more pointed, often with hairs on the top half, often with scale margins darker than scale centers. Leaves with sinuses angled upwards, with distal end wider (forming a wedge shape). Lobes with fewer points (often 3-5). Widest point on leaves 1/3-1/2 of the way down from the tip. In life, leaves dull. Bark furrows grey to occasionally a bit of orange, never pink.

Acorns: per Justin Thomas, “Keys often use the acorn cup characters (for the vars. of *shumardii* too) but they do not work. I've found that cup depth is a consequence of acorn/tree size in that big trees have big acorns which make shallow cups and little trees make little acorns with deep cups.” In my experience acorns are variable; you can’t use them to confirm ID on their own, but you can check to confirm acorn morphology is plausible for *shumardii* and not obviously something else, ie black oak or pin oak.

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***Quercus shumardii* Buckl**
**Current PBS Status:** PE

**Proposed by:** Jessica McPherson

**Habitat:** medium-to-large floodplains and poorly drained bottomlands, usually on calcium or diabase. Calcareous upland in Allegheny County.

| | | CATEGORY | COMMENTS |
|---|---|---|---|
| RARITY | **Range Extent** | | |
| | **Area of Occupancy:** 4 km2 grid cells | **D = 6-25 4-km2 grid cells** | 13-16 known locations, intersecting 25 grid cells. 4 multipart EOs intersecting multiple grid cells each. |
| | **Number of Occurrences** | B = 6 - 20 | 13-16 known locations (13 + 2 Allegheny county sites with some question about nativity + 1 historic site from 1960). Habitat of medium-to-large floodplains and poorly draind bottomlands on calcium or diabase is limited, unlikely to find very many more occurrences. Very few historic specimens in MidAtlantic Herbaria, unlikely to add any additional native occurrences. (1 historic Berkheimer location in biotics; 3 historic specimens not in biotics: 1964 Wherry collection from Swarthmore College Campus. 1940-07-26 A.G. Shields collection from "Franklin, Mont Alto, SM". IUP herbarium, photo not available online, have not confirmed ID. PSU herbarium has one 1847 Thomas C. Porter collection from "Franklin, Mercersburg". ID confirmed; too old and vague to relocate.) |
| | **Population Size*** | C = 250 - 1,000 individuals | Estimated 564-711 from known biotics sites; almost all included pretty good counts. Allegheny County occurrence included in range; 17-50 individuals. |
| | **Good Viability / Ecol Integrity: # of occurrences** | BC = Very few to few (1-12) occ. w/good viability | 3 ranked B; 3 ranked BC; 1 ranked E. 1 Allegheny Co. occurrence (potentially native, potentially introduced) is ranked AC. |
| THREATS | **Assigned Overall Threat Impact** | CD = Medium - Low | At the current time and over the short-term, the main threat is cutting or logging at a few occurrences where the trees are in narrow habitat bands or past logging has occurred. Over the long term, threat is higher: hybridization was mentioned at two sites (which could dilute the next generation), lack of reproduction mentioned at several sites (due to closed canopy), and almost all sites are in floodplain locations where invasive species may prevent regeneration over several decades, but do not pose a threat to current mature individuals. |
| TRENDS | **Short-term Trend** | | |
| | **Long-term Trend** | | |

**Calculated Rank** S2S3
**Assigned Rank**** S2

**Rank Adjustment Reasons** S2 without threat assignment; S2S3 arises from threat downranking bug. Low threat should not change rank.

**Assigned Rank Reasons** Low numbers of populations and individuals; most populations fairly small, in constrained habitats; habitat has been searched reasonably well. Threat is low over the short term, higher over the long term. Assignment of low to moderate threat triggered downranking from S2 to S2S3, which is an error. All NW specimens were reidentified to other species and previous EOs are not included in this assessment; Q. shumardii is not currently known from NW region.

**Identification:**

Table based on FNA key and species description. Of PA Quercus, only *Q, rubra* and *Q. shumardii* have 7-9 lobes per leaf.

| ***Quercus shumardii*** | ***Quercus rubra*** |
|---|---|
| Bark shallowly ridged with pink furrows, typically less well defined upwards on tree. Large-diameter trees have bark resembling *Q. rubra* on lower trunks, but upper trunks have shallower furrows with pink color. | Deeply ridged with grey to orange furrows, typically very well-defined ridges and furrows |
| Buds light grey to grey-brown, fairly uniform in color, and hairless. Almost waxy in appearance. | Buds red-brown, often with distinct color variation within scales such that individual scales are vividly distinct; sometimes hairy near tip. |
| Leaf sinuses usually extending more than 1/2 distance to midrib | Leaf sinuses usually extending less than 1/2 distance to midrib |
| Leaves extremely shiny on top surface. Stop you in your tracks shiny. | Leaves dull on top surface. |
| Leaves columnar-obovate: upper lobes larger than lower lobes; widest point on leaves 1/8-1/3 down from tip. Upper lobes tend to be distally expanded with many teeth, even approaching compound lobing (I observed usually 4-7 points in PA specimens). | Leaves ovate-triangular: largest lobes near base of leaf, reducing in size upwards; widest point on leaves 1/3-1/2 of the way down from the tip. Upper lobes reduce in size distally with few teeth. (I observed 3-5 on PA specimens) |
| Leaves with sinuses tending to angle straight out, with sides parallel, sometimes lobe tips closing back towards each other at the distal end to form an oval shape. | Leaves with sinuses angled upwards, with distal end wider, forming a wedge shape. |

Above: very shiny Shumard leaves

Below: QS shallowly ridged with pink inner bark


Left - Shumard leaves are columnar/obovate: widest in the top third; sinuses close back around at distal end; largest lobes are nearly compound.

Below – Red oak leaves are ovate/triangular: widest in lower half, sinuses are wedge-shaped and clearly wider at distal end, lobes are not compound. Note that these sun leaves have quite deep sinuses and would key to Shumard based on that character alone.

# *Symphyotrichum dumosum* (L) Nesom (bushy aster)

Figure 1. Inflorescence of *S. dumosum* on a serpentine barren. Photo by C. M. Ciafré.

**Current Status in PA Regulations: N**
**Current PABS Status: PE**
**Proposed Status: PT**
**Coefficient of Conservatism: 3**
**Proposed by: Claire Ciafré, Rachel Goad, Jessica McPherson PNHP/WPC**

**Proposal Summary**

We propose to change the status of *Symphyotrichum dumosum* from Pennsylvania Endangered to Pennsylvania Threatened. The number and security of extant populations suggests that this rank is appropriate.

**Habitat**

In the broad sense, *S. dumosum* inhabits a broad range of open habitats across its large range (Brouillet et al. 2006, Weakley 2020). In Pennsylvania it inhabits serpentine barrens, open woods, moist fields, bogs, and swales (Rhoads and Block 2007).

**Taxonomy**

Several infraspecific taxa have been recognized by some sources (including Weakley 2020). FNA does not recognize varieties but mentions that others have and comments “some of these taxa may deserve a higher rank. More work is needed in the complex, however, before a coherent taxonomy can be achieved” (Brouillet 2006).

We reviewed all 89 specimen scans available through MidAtlantic Herbaria, including material from PH, MOAR, CM, NY, MCA, CHRB, PAC; 6 specimens were listed but could not be viewed. The dates and locations suggest these 6 specimens do not represent any as-yet-undocumented extant locations. In their typical forms, the varieties are strikingly distinct (see images at end of proposal). However, intermediate forms do occur. Most Pennsylvania material can be keyed to var. strictior or var. dumosum, although some specimens are intermediate, and a few are distinctively odd. About 5% of material (4 of 89 specimens) was intermediate, and 5% more resembled one variety more but had some intermediate features (5 of 89 specimens, see detail below). Weakley (2020) lists only var. strictior for Pennsylvania, but this seems clearly in error. BONAP previously separated the varieties and listed only var. strictior for PA (shown in web version of map, from 2014), but now combines the varieties.

The Weakley key is somewhat hard to use. The characters we found most helpful were:

| Character | *Var. dumosum* | *Var. strictior* |
|---|---|---|
| Bract shape | Obtuse to obtuse-with-mucro; oblong | Acute, lanceolate to oblanceolate |
| Bract size | Small | Larger |
| Bract arrangement | Mostly uniform in size along branches | Proximal bracts notably larger than distal bracts |
| Inflorescence shape | Irregular in shape, with many perpendicular branches; heads diffuse due to length and spread of branches | Generally pyramidal, with ascending branches. Heads crowed, especially distally, due to convergence of branches. |

All *S. dumosum* appear to have distinctively long, narrow-rectangular-ish leaf areolae; this is useful to distinguish other species. *S. lanceolatum* (which has shorter leaf areolae and more leaf teeth), can sometimes produce bract arrangements that would key to *S. dumosum*, although the bract shape and inflorescence shape don't match.

Contrast in leaf areolae – S. lanceolatum, left, S. dumosum, right

<u>Specimen review results:</u>

- 35 dumosum (clearly identifiable, good match to type specimens)
- 4 dumosum-ish (most characters align with dumosum)
- 5 dumosum? (there's something odd or hard to ID about it)
- 1 dumosum-ish intermediate (characters clearly intermediate, although overall more like dumosum)
- 4 intermediates
- 5 strictior-ish intermediates (characters clearly intermediate, although overall more like strictior)
- 3 strictior-ish (most characters align with strictior)
- 3 strictior? (there's something odd or hard to ID about it)
- 10 strictior (clearly identifiable, good match to type specimens)
- 3 that should be reviewed for var. subulifolium (a variety with lanceolate bracts but leggier inflorescences; known from NJ).
- 4 that didn't match either variety, didn't look like the other intermediates (they had extremely narrow, lanceolate bracts, while most intermediates had long oval-ish bracts, intermediate in shape between the two varieties), and did look like each other.
    - Two recent, one from Presque Isle and one from Goat Hill barrens (Chester Co). Two from 1800s, Chester and Berks counties.

- Theories for what these are - funny forms or top-pulls of strictior? Some weird intermediates? Our own variety?
- 9 that are probably a different species (including the Butler County specimen).

**Global distribution and regional conservation statuses**

This species occurs throughout the eastern United States and southeastern Canada (Figure 2). It is currently listed as presumed extirpated from Iowa, possibly extirpated from Maine, critically imperiled in Pennsylvania, imperiled in Ohio and Ontario, and vulnerable in New York and Florida (Figure 3).

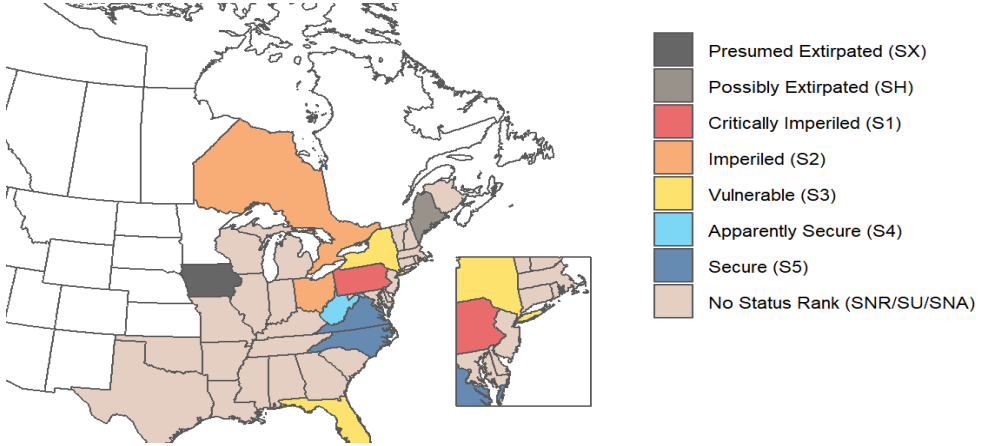


Figure 3. NatureServe (2021) subnational statuses for *Symphyotrichum dumosum.*

**Pennsylvania Distribution**

var. *strictior:*

- Extant sites: Only 1 recent "classic *strictior*" that strongly resemble the type collection, at Presque Isle.
- Historic range: Presque Isle, Berks, Bucks, Montgomery, and Delaware. The things I called strictior-ish are from Erie, Berks, Lehigh, Chester, and Bucks.
- Habitat: none on serpentine sites! Of course, Weakley lists “Woodlands and glades over mafic rock” as the habitat for this variety.
- Proposed status at variety level: **PE**, because only 1 extant population and clear contraction of historic range.

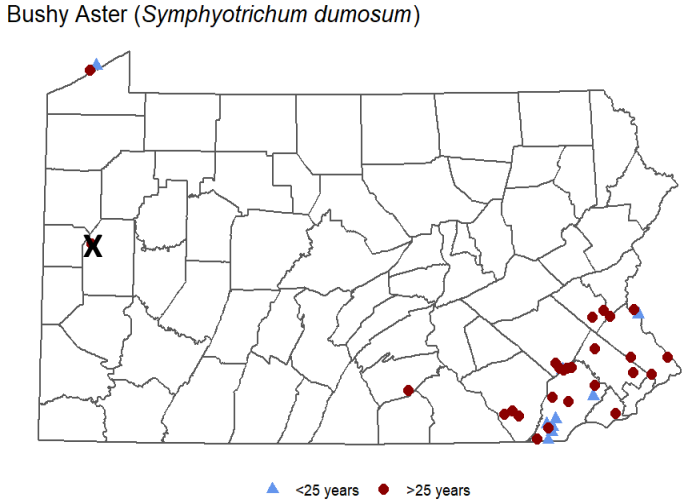


Figure 4. Distribution occurrences of *Symphyotrichum dumosum* in Pennsylvania.

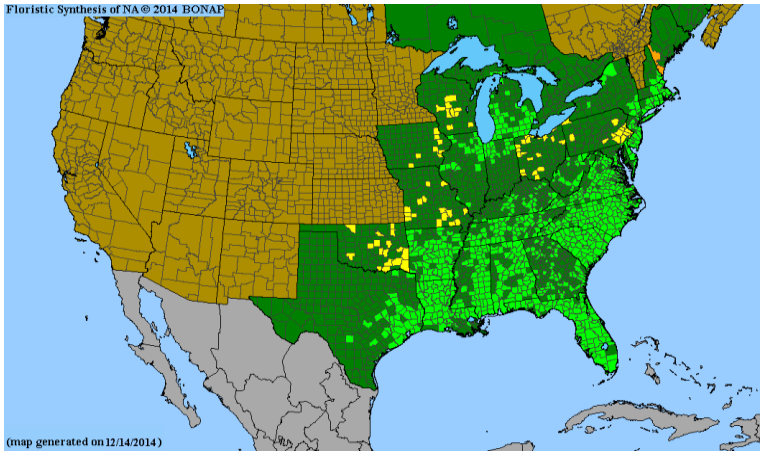


Figure 2. BONAP distribution of *Symphyotrichum dumosum* in the United States (Kartesz 2021).

var. *dumosum:*

- Extant sites: 14 var *dumosum* specimens from the SE, mostly on serpentine. Jack and Janet have several collections that don't say serpentine? Almost all are from Chester; 1 from Bucks (serpentine site, 2 collections but they are duplicates), one from Berks that I thought had awfully *lanceolatum*-ish leaves.
- Historic range: Old *dumosum* specimens are from Chester (mostly), Lancaster (good number), Lebanon, York, Lehigh (all 1 to a few), Cumberland (I think the 1 specimen is a little weird and should be looked at more).
- Habitat: in Biotics, 13 extants include 3 old field sites in near Berks/Chester border; 1 Bucks old field site on hornfels soil; 7 Chester County occurrences are about half on old fields and half on serpentine. Weakley lists habitat as "old fields, disturbed areas, and pastures".
- Proposed status at variety level: **PT**, limited number of populations, threat from succession and habitat loss, and clear contraction of historic range.

**Conservation Concerns**

Thirteen extant EOs are currently known, and the statewide population estimated from these occurrences is 867-2314 plants (genets). There are 20 historic populations, though attempts have not been made to relocate all of them ~~yet~~. Many historic occurrences are in one of the most heavily urbanized parts of Pennsylvania (the southeast). Most existing occurrences are on protected land; most habitats seem to be edaphically maintained and some are managed for biodiversity, however succession and invasion by non-native species are still threats.

**Status Justification**

Extant occurrences are found in two distinct areas of the state, and confined to particular habitat types (e.g., serpentine barrens, Great Lakes sand plain, river scour). In the past it seems like they were also found in early successional meadows, though these habitats have been significantly impacted by succession and invasion and development. Remaining populations are largely constrained to edaphically limited sites (Presque Isle, State line serpentine barrens, lower Susquehanna scour), and many of these are protected from development. However, these occurrences may still be threatened by succession and invasion by exotic species. S2 seems appropriate: its habitat is restricted and threatened by succession. Most remaining populations are on protected land, and many (but not all) of these are receiving management attention. It is imperiled, but not critically so, within the state.

**Literature Cited**

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

Weakley, A. S. 2020. Flora of the southeastern United States. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, North Carolina.

***Symphyotrichum dumosum (L) Nesom*** **Proposed by:** Rachel Goad, Claire Ciafre, Jessica McPherson

**Current PBS Status:** PE **Serpentine barrens, open woods, moist fields, bogs, and swales (Rhoads and Block 2007).**

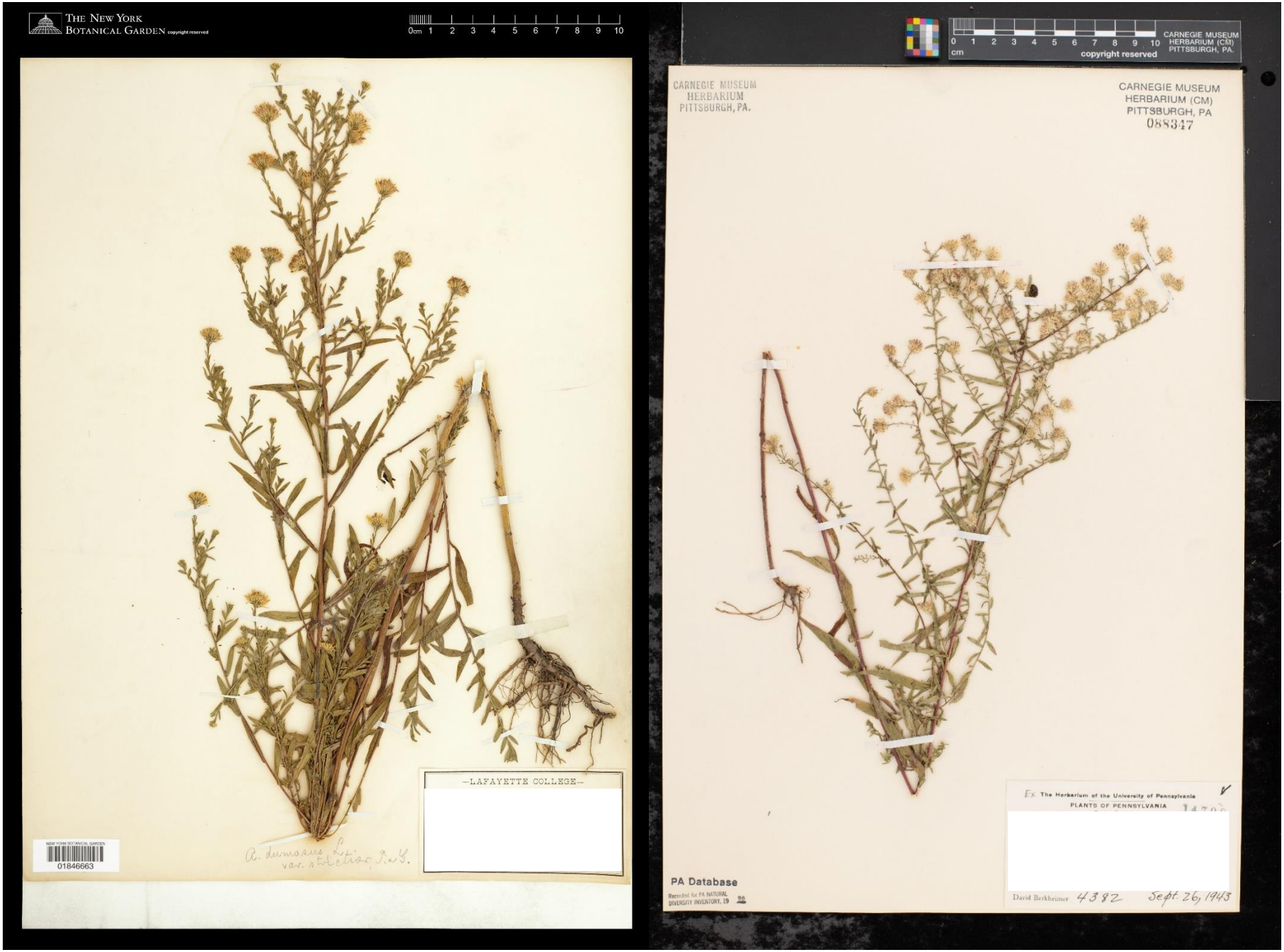
| | | CATEGORY | COMMENTS |
|---|---|---|---|
| RARITY | **Range Extent** | EF = 5000-200,000 sq km (~2000-80,000 sq miles) | Occurrences clustered in the southeast and the far northwest - range reflects large unoccupied area between. |
| | **Area of Occupancy:** 4 km2 grid cells | **DE = 6-125 4-km2 grid cells** | 35 known EOs in Biotics including historics (and using source features) + 2 not yet in Biotics from Goad field work in 2020 and 2021= 41 grid cells. 15 extants = 20 grid cells. Range allows for some uncertainty in whether historics may be re-found. |
| | **Number of Occurrences** | BC = 6 - 80 | At least 15 extant + potentially some historics re-found. |
| | **Population Size*** | CE = 250 - 10,000 individuals | At least 867, at most 2314 plants (genets) estimated in the state. Upper bound of 2500 doesn't include much room for re-locating historics. |
| | **Good Viability/Ecological Integrity: # of occurrences** | BC = Very few to few (1-12) occurrences with good viability | 3 occurrences with ranks of BC or better. One E-ranked occurrence may also be more accurately ranked as B or better. Two new occurrences not yet in Biotics have no rank, but if added, there would still only be 6 occurrences with good viability. |
| | | | |
| THREATS | **Assigned Overall Threat Impact** | B = High | |
| TRENDS | **Short-term Trend** | DE = Decline of 30 - 70% | Two pieces of circumstantial evidence were used here - herbarium specimens and landscape change. Before 1930, there are ~42 specimens, between 1930 and 1990, there are 28. After 1990, there are 19. This decline partly reflects changes in collecting behavior, but also may reflect a decline in occurrences. This is backed up by the second piece of evidence, that many of our known occurrences are in one of the most heavily urbanized parts of Pennsylvania, the southeast. Most existing occurrences there are on protected land, but not all. About half of 19 historic occurrences in the southeast are in areas that are now heavily urbanized (though I didn't re-check how accurate mapping of old specimens might be). 58% of EOs in the southeast are historic, and 29% of these may be due to urbanization. Not all historics have been re-searched for. |
| | **Long-term Trend** | | Did not know how I might assess this. |

**Calculated Rank** **S2?** **Assigned Rank**** **S2**

**Rank Adjustment Reasons:** S2 seems appropriate: its habitat is restricted and threatened by succession. Most remaining populations are on protected land, and many (but not all) of these are receiving management attention. It is imperiled, but not critically so, within the state.

**Assigned Rank Reasons:** Extant occurrences are found in two distinct areas of the state, and confined to particular habitat types (e.g., serpentine barrens, Great Lakes sand plain, river scour). In the past it seems like they were also found in early successional meadows, though these habitats have been significantly impacted by succession and invasion and development. Remaining populations are largely constrained to edaphically limited sites (Presque Isle, State line serpentine barrens, lower Susquehanna scour), and many of these are protected from development. However, these occurrences may still be threatened by succession and invasion by non-native species.

***Typic S. dumosum var. strictior***



*Typic S. dumosum var. dumosum*


A plant with intermediate characters.


Narrow-bract form; perhaps strictior? If so, this is the most recent collection of it outside of Presque Isle.