

Sisyrinchium fuscatum

Sand-plain Blue-eyed Grass

Iridaceae



Sisyrinchium fuscatum by Margaret Curtain, 2022

Sisyrinchium fuscatum Rare Plant Profile

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

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

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

December, 2024

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

This report should be cited as follows: Dodds, Jill S. 2024. *Sisyrinchium fuscatum* Rare Plant Profile. New Jersey Department of Environmental Protection, State Parks, Forests & Historic Sites, Forests & Natural Lands, Office of Natural Lands Management, New Jersey Natural Heritage Program, Trenton, NJ. 18 pp.

Life History

Sisyrinchium fuscatum (Sand-plain Blue-eyed Grass) is a perennial herb in the iris family. The flowers of blue-eyed grasses are ephemeral and the species are often difficult to distinguish. *S. fuscatum* can be separated from all of the other blue-eyed grasses that occur in New Jersey by its basal leaves, which become fibrous and form persistent tufts. The linear, grass-like leaves are stiff and initially bright green but upon drying they darken considerably, turning olive, brown, or nearly black. The stems are smooth, narrowly winged, and 1.5–5.3 dm in height. *S. fuscatum* typically produces 2–4 floral branches above a leaflike bract, although a small percentage of the plants may be unbranched. The inflorescences are located at the ends of the branches, and they consist of 3–12 flowers enclosed in a pair of large bracts (spathes). Each flower has six blue tepals that are yellow at the base and awned at the tip. The anthers are bright yellow-orange and their filaments are more or less fused. The fruits of *S. fuscatum* are rounded, many-seeded tan capsules that are 2.9–4.3 mm in diameter. (See Bicknell 1899a & 1899b, Britton and Brown 1913, Fernald 1950, Hill 1984, Gleason and Cronquist 1991, Munroe et al. 2014, Cholewa and Henderson 2020).



Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Center: Kelly Omand, 2023. Right: Margaret Curtain, 2022.

In New Jersey, *Sisyrinchium fuscatum* blooms between late May and late June and the fruits typically mature by mid-July (Stone 1911, Hough 1983, NJNHP 2024). At the northern end of its range flowering may continue into early July (Munro et al. 2014) and in the southern states it may begin as early as March or April (Waldrop 2001, Thornhill et al. 2014). However, the individual flowers last for only one day (Knuth 1909). The fruits of *S. fuscatum* may remain on the stems through October (Clarke 2006, Callahan 2021), and empty capsules can often be found on blue-eyed grass plants during the winter (Levine 1995).

The genus *Sisyrinchium* includes numerous species, most of which are native to the Americas. All of the species that occur in New Jersey belong to subgenus *Sisyrinchium* (Inácio et al. 2017).

Sisyrinchium fuscatum is a polyploid species (Mosquin 1970), as are many other members of the genus. Some of the blue-eyed grasses can hybridize but the offspring are likely to be sterile or to produce a very limited number of viable seeds (Ingram 1968). Although *S. fuscatum* is morphologically most similar to *S. angustifolium* and *S. atlanticum*, a DNA analysis by Karst and Wilson (2012) indicated that the species is more closely related to *S. montanum*.

Pollinator Dynamics

No studies of pollination in *Sisyrinchium fuscatum* were found. *Sisyrinchium* flowers are not fragrant (Cholewa and Henderson 2020) but members of the genus use a variety of other strategies to attract pollinators. Some species offer only pollen to visiting insects while others have glandular hairs (trichomes) at the base of their tepals or filament columns. A subset of the latter group, largely restricted to South America, has oil-producing trichomes and those are pollinated by specialist bees. The secretion produced by many of the North American species has not been identified. Both *Sisyrinchium montanum* and *S. angustifolium* have scattered trichomes on their filament columns that produce small blisters of a nectar-like substance. (See Cocucci and Vogel 2001, Rudall et al. 2003, Chauveau et al. 2011, Silvério et al 2012).

Sisyrinchium species that do not produce oil are mainly pollinated by generalist bees (Cocucci and Vogel 2001). Bees observed on other North American blue-eyed grasses include species of *Andrena*, *Augochlora*, *Augochlorella*, *Bombus*, *Dialictus*, *Evylaeus*, *Halictus*, *Lasioglossum*, *Nomada*, and *Osmia*. A number of hoverflies and bee flies also visit *Sisyrinchium* flowers but they are thought to be less effective pollinators (Robertson 1929, Stubbs et al. 1992, Hilty 2020).

The capacity for self-fertilization does not appear to have been examined in *Sisyrinchium fuscatum* but self-compatibility has been reported in related species, including *S. montanum* (East 1940, Mosquin 1970, Henderson 1976). During inclement weather *S. angustifolium* flowers can self-pollinate without even opening (Knuth 1909). Ingram (1968) indicated that self-fertilization was frequent in *S. angustifolium* and that the flowers of *S. montanum* var. *crebrum* were almost entirely self-pollinated.

Seed Dispersal and Establishment

Sisyrinchium fruits usually contain numerous seeds. The seeds of *S. fuscatum* are 1–1.5 mm long, rounded or top-shaped, and have slightly wrinkled surfaces (Cholewa and Henderson 2020). They do not have any special structures to facilitate their distribution so the majority are probably gravity-dispersed. Long-distance dispersal may occasionally be carried out by animals. Seeds of other *Sisyrinchium* species are sometimes consumed by tortoises (MacDonald and Mushinsky 1988) or game birds (Hilty 2020).

No information was found regarding the germination requirements of *Sisyrinchium fuscatum* and it is unclear how long the seeds can persist once they have been dispersed. Williams (2013) recorded *S. angustifolium* in the seed bank at a Pennsylvania site, and a yellow-flowered South American species (*S. graminifolium*) emerged from soil samples that were collected during a

seed bank study but the possibility that it had regenerated from rhizome fragments could not be ruled out (Alvarez et al. 2006). Roberts and Tsujita (1990) indicated that *Sisyrinchium angustifolium* seeds that were dispersed during the late summer typically germinated during November or December, although Blake (1935) had previously reported that germination rates in the species were improved by a period of stratification. *S. angustifolium* plants can reach reproductive maturity during their first year but the initiation of floral development appears to be governed by day length—a ten-week period of short days (defined as 10 hours or less) is required (Roberts 1990, Roberts and Tsujita 1992, Roberts et al. 1992). The presence of mycorrhizae has been reported in some other North American blue-eyed grasses, including *Sisyrinchium atlanticum* and *S. montanum* (Wang and Qiu 2006, Gould et al. 2013).

Habitat

As its common names suggest, *Sisyrinchium fuscatum* is almost exclusively found on sandy substrates in the coastal plain (Ingram 1964). The sites are usually dry to xeric and relatively open, and they may include sandhills, ridges, or dunes (Coddington and Field 1978, Coulter 1981, Hough 1983, Hill 1984, Angelo and Boufford 2000, Patterson et al. 2005, Rhoads and Block 2007, Munro et al. 2014, Moore et al. 2016, NJNHP 2024). Sand-plain Blue-eyed Grass has occasionally been recorded in sites that are periodically wet such as the edges of intermittent ponds (NJNHP 2024, Weakley et al. 2024) or alluvial habitats (Waldrop 2001), and some locations may even be characterized as moist or marshy (Cholewa and Henderson 2020).

Sisyrinchium fuscatum is generally intolerant of shading (Weakley et al. 2024) and the species is most abundant in sandplain grassland habitats (Dunwiddie et al. 1996, Sorrie and Dunwiddie 1996, Beattie et al. 2017, Poulos et al. 2019). However it can also grow in open woodlands or shrub thickets, particularly in gaps or near edges. Characteristic woody associates include pines, oaks and ericaceous shrubs (Burnham 1913, Dunwiddie et al. 1996, Terry 2005, Carbyn et al. 2006, Clarke 2006, Sorrie et al. 2006, Jenkins and McMillan 2009, Knapp et al. 2011, Thornhill et al. 2014, NJNHP 2024, Weakley et al. 2024). When Harper (1995) studied the effects of expanding *Gaylussacia baccata* clones on nearby vegetation in a sandplain grassland, *S. fuscatum* was only found near the outer perimeter of the shrubs.

Some of the open sites where *Sisyrinchium fuscatum* has been recorded were originally created by anthropogenic activity. Examples include old fields, cemeteries, fire lanes, railroad corridors, and the edges of roads, bridle paths, or footpaths (Ingram 1964, Greller 1989, Patterson et al. 2005, Clarke 2006, Zomlefer et al. 2012, Thornhill et al. 2014, NJNHP 2024). However, *S. fuscatum* does not seem to colonize such sites rapidly following the initial disturbances: It is generally more likely to become established after some time has passed (Patterson et al. 2005, Clark 2006, Clarke and Patterson 2007). Studies of vegetation in Massachusetts fire lanes indicated that *S. fuscatum* was more likely to be associated with high litter depth and graminoid cover and less likely to be associated with mosses, lichens, or bare soil (Clarke 2006). Sand-plain Blue-eyed Grass failed to establish during a three-year period after seeds collected from a grassland where it was present were introduced at a newly cleared site (Lezberg et al. 2006). That result may support the idea that conditions do not become suitable for the species' for a

certain period of time after a disturbance, although the authors noted that *S. fuscatum* seeds might have been absent from the planting mix as a result of the collection process or timing.

Wetland Indicator Status

The U. S. Army Corps of Engineers divided the country into a number of regions for use with the National Wetlands Plant List and portions of New Jersey fall into three different regions (Figure 1). *Sisyrinchium fuscatum* has more than one wetland indicator status within the state. In the Atlantic and Gulf Coastal Plain region, Sand-plain Blue-eyed Grass is an upland species, meaning that it almost never occurs in wetlands. In the rest of the state it is a facultative upland species, meaning that it usually occurs in nonwetlands but may occur in wetlands (U. S. Army Corps of Engineers 2020).

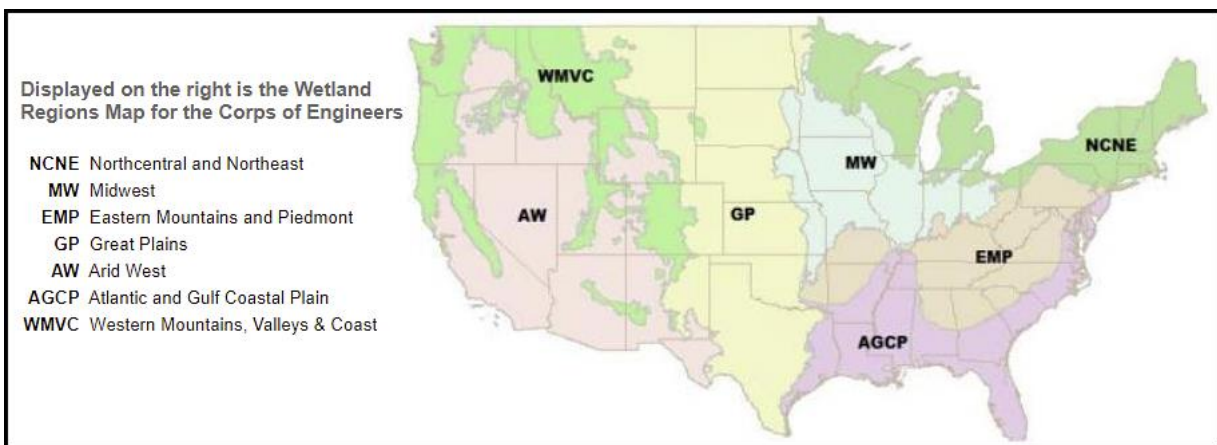


Figure 1. Mainland U. S. wetland regions, adapted from U. S. Army Corps of Engineers (2020).

USDA Plants Code (USDA, NRCS 2024b)

SIFU2

Coefficient of Conservancy (Walz et al. 2020)

CoC = 8. Criteria for a value of 6 to 8: Native with a narrow range of ecological tolerances and typically associated with a stable community (Faber-Langendoen 2018).

Distribution and Range

The native range of *Sisyrinchium fuscatum* includes parts of the eastern United States, Nova Scotia, and the Bahamas (POWO 2024). The map in Figure 2 depicts the extent of the species in the United States and Canada.

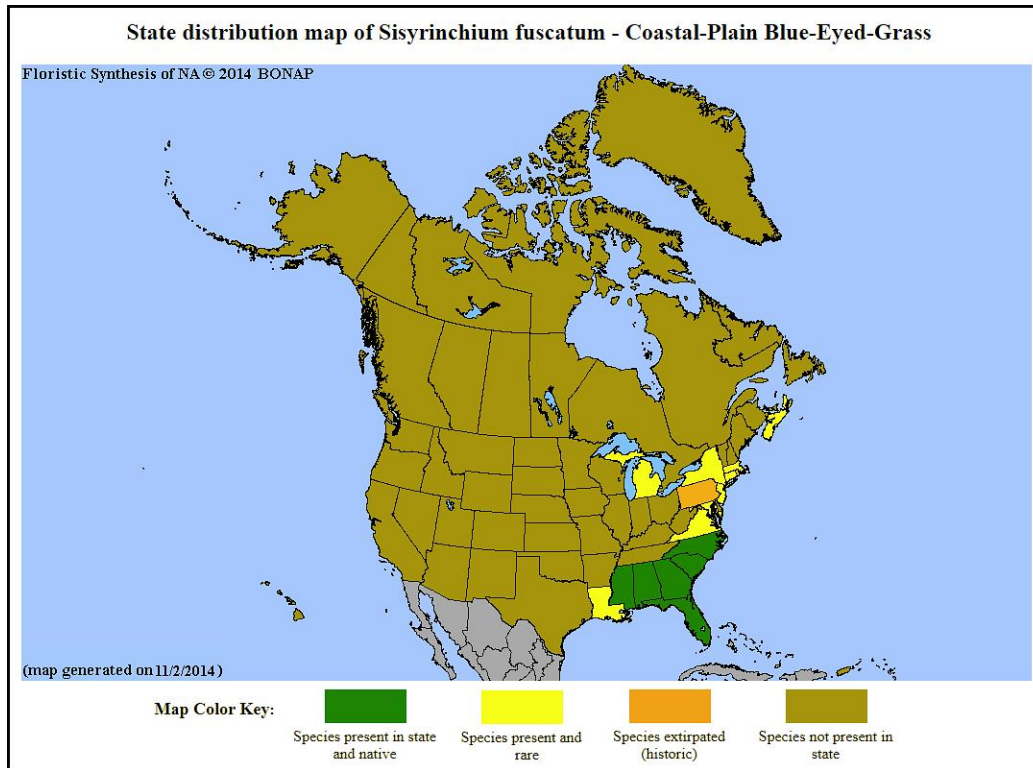


Figure 2. Distribution of *S. fuscatum* in the United States and Canada, adapted from BONAP (Kartesz 2015).

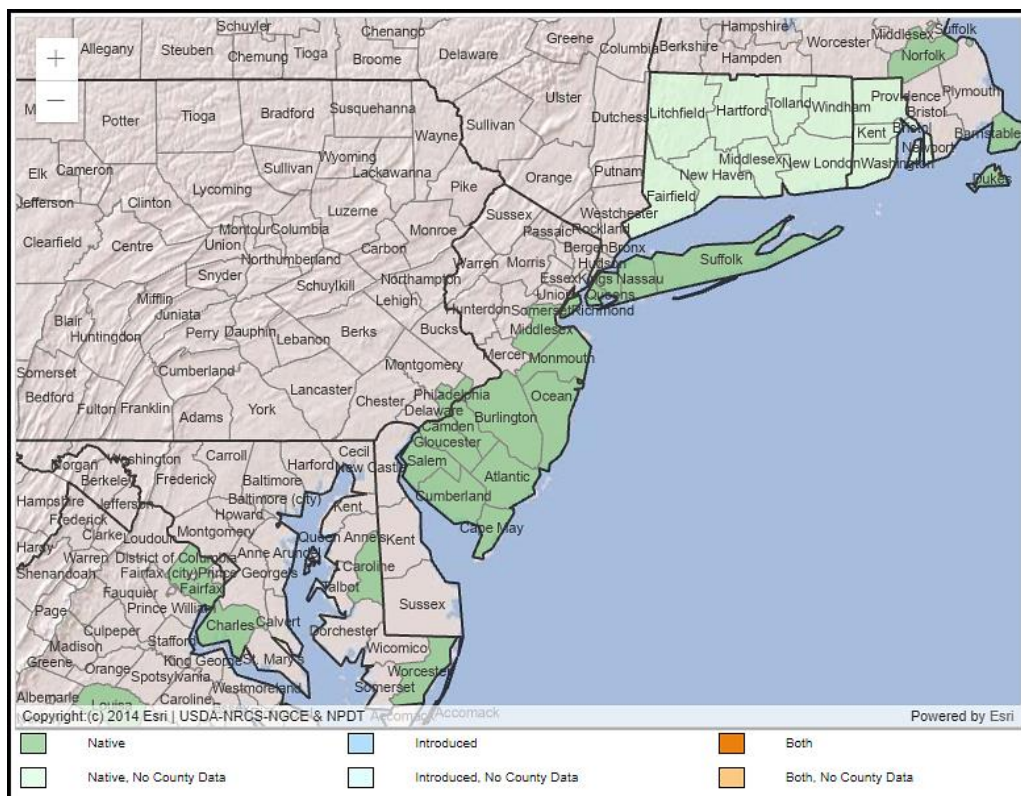


Figure 3. County records of *S. fuscatum* in New Jersey and vicinity (USDA NRCS 2024b).

The USDA PLANTS Database (2024b) shows records of *Sisyrinchium fuscatum* in ten New Jersey counties: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Middlesex, Monmouth, Ocean, and Salem (Figure 3 above). The species has also been documented in Mercer County (NJNHP 2024). The data include historic observations and do not reflect the current distribution of the species.

Conservation Status

Sisyrinchium fuscatum is considered globally secure. The G5? rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats, although the question mark indicates that its status is in need of a review (NatureServe 2024). The map in Figure 4 illustrates the conservation status of *S. fuscatum* on the North American continent. Sand-plain Blue-eyed Grass is vulnerable (moderate risk of extinction) in three states, critically imperiled (very high risk of extinction) in three states, possibly extirpated in Pennsylvania and Rhode Island, and presumed extirpated in Michigan. The species has not been ranked in other districts where it occurs.

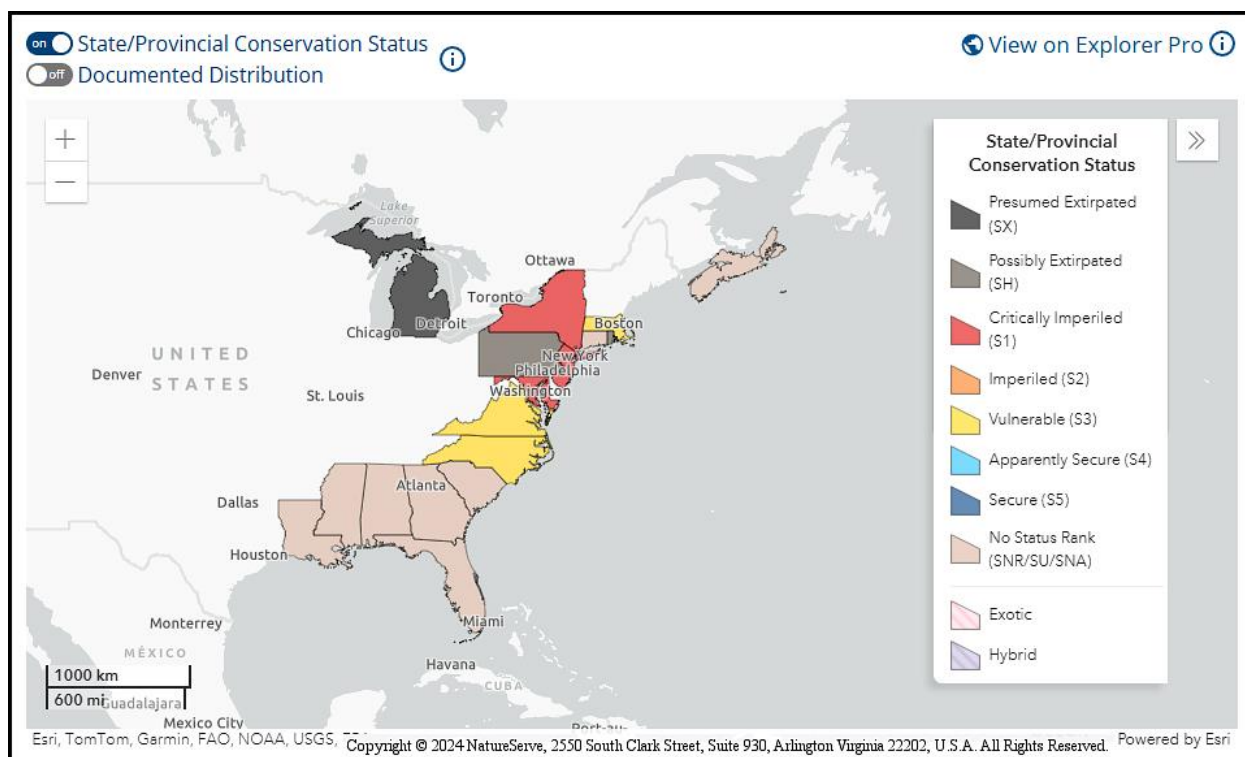


Figure 4. Conservation status of *S. fuscatum* in the United States and Canada, (NatureServe 2024).

New Jersey is one of the states where *Sisyrinchium fuscatum* is critically imperiled (NJNHP 2024). The S1 rank signifies five or fewer occurrences in the state. A species with an S1 rank is typically either restricted to specialized habitats, geographically limited to a small area of the state, or significantly reduced in number from its previous status. *S. fuscatum* has also been

assigned a regional status code of HL, signifying that the species is eligible for protection under the jurisdiction of the Highlands Preservation Area (NJNHP 2010).

Sisyrinchium fuscatum was once found throughout southern New Jersey. Stone (1911) noted that it was not very abundant, although Taylor (1915) reported that it was relatively common in several of the central counties. Hough (1983) said that *S. fuscatum* had most often been found on the inner coastal plain, but indicated that records from many of the counties where it had been documented were more than 50 years old. At the beginning of the twenty-first century Sandplain Blue-eyed Grass was ranked as S2 in the state (NJNHP 2001) so the downgrade to S1 was fairly recent. One of the 44 populations tracked by the Natural Heritage Program is currently listed as extant and two others have an uncertain status, but the vast majority are ranked as historical or extirpated (NJNHP 2024). Some additional occurrences may still be present in Cumberland County (Moore et al. 2016).

Threats

Although some trash was observed in the vicinity of one New Jersey *Sisyrinchium fuscatum* population no particular threat to the plants was noted. The recent loss of another occurrence may have been attributable to inadvertent damage that occurred when nearby fallen tree was removed (NJNHP 2024). In New York, the periodic clearing of vegetation to create favorable nesting habitat for rare birds was identified as a concern for a population of *S. fuscatum* but the plants persisted at the site (Coulter 1981, Stalter and Lamont 2005).

Since *Sisyrinchium fuscatum* is essentially a sun obligate (Weakley et al. 2024), canopy closure is likely to threaten established populations. Forbs that thrive in grasslands generally benefit from disturbances that maintain open conditions, including burning, grazing, or mowing (Patterson et al. 2005, Beattie et al. 2017, Poulos et al. 2019). Positive responses to both fire and mowing have been reported for *S. fuscatum* (Dunwiddie 1998, Clarke 2006). If more than three years pass between management activities, woody plants begin to proliferate at the expense of the herbs that favor open sandplain habitats (Poulos et al. 2019). While no reports of threats to *S. fuscatum* from invasive plants were found, the species' apparent sensitivity to competition from native flora suggests that introduced plants might also imperil certain populations.

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Sisyrinchium fuscatum* populations to climate change. The species was assigned a rank from NatureServe's Climate Change Vulnerability Index using the associated tool (Version 3.02) to estimate its exposure, sensitivity, and adaptive capacity to changing climatic conditions in accordance with the guidelines described by Young et al. (2016) and the state climatic computations by Ring et al. (2013). Based on available data *S. fuscatum* was assessed as Moderately Vulnerable, meaning that it is likely to show some decrease in abundance or range extent in New Jersey by 2050.

The only population of *Sisyrinchium fuscatum* currently listed as extant by the New Jersey Natural Heritage Program is situated on the outer coastal plain. The site where that occurrence is located has already experienced periodic flooding and storm surge events, and its vulnerability is likely be amplified by sea level rise as the climate continues to warm (NJ Adapt 2024). The plants will probably be exposed to increasing amounts of soil salinity. However, additional *S. fuscatum* populations in the state that are not currently recorded as extant by the Natural Heritage Program might be less susceptible to the effects of rising seas.

Other local changes resulting from shifting climactic conditions, such as rising temperatures and altered precipitation patterns (Hill et al. 2020), may also affect *Sisyrinchium fuscatum* although the outcomes are harder to project due to gaps in information regarding its environmental tolerances. The ability of the blue-eyed grass to withstand extreme conditions (e.g. inundation or drought) does not appear to have been studied. Nevertheless, the species can be expected to adjust to some climactic changes. *S. fuscatum* is one of the few plants capable of growing in microhabitats known as frost bottoms, which experience greater fluctuations in temperature than the surrounding areas and may be subject to freezing at any given time of year (Patterson et al. 2005). Since the species is frost-tolerant, low temperatures have probably not defined the northern edge of its range (Clarke 2006) so it may have some capacity for northward range expansion. The distribution of Sand-plain Blue-eyed Grass in the United States suggests that the species will also be able to adapt to higher temperatures in New Jersey.

Invasive plants are projected to become an even greater threat to native communities in the northeast as a result of climate change (Bellard et al. 2013, Salva and Bradley 2023) and—depending on the growth form and habitat preferences of the new introductions—that could increase the vulnerability of *S. fuscatum* in New Jersey. The opportunities for *S. fuscatum* to colonize new sites as old ones become unsuitable are limited by the species' narrow habitat requirements and seemingly poor dispersal capabilities.

Management Summary and Recommendations

An updated status assessment is needed for *Sisyrinchium fuscatum* in New Jersey. Site evaluations should be completed for the populations that have been reported in Cumberland County, and an effort should be made to search for some of the numerous historic collection sites that were never relocated. Regular monitoring of the documented extant occurrence is also recommended due to evidence of frequent human activity in the area.

One of the primary management goals identified for *Sisyrinchium fuscatum* in Canada was to increase the amount of information available about the species (ECAPC 2010). In order to develop a meaningful conservation plan for *S. fuscatum* anywhere in its range, research is needed to address unresolved taxonomic issues and to obtain baseline information regarding self-compatibility, seed longevity, germination requirements, mycorrhizal associations, and competitive abilities. Long-term strategies for extant populations will probably include activities to maintain open canopy conditions at the sites where they occur. There is evidence that fire, mowing, or a combination of both can be beneficial to *S. fuscatum* populations but additional details regarding the optimal timing, intensity, and frequency of interventions would be useful.

Synonyms

The accepted botanical name of the species is *Sisyrinchium fuscatum* E. P. Bicknell. Some orthographic variants, synonyms, and common names are listed below (Cholewa and Henderson 2020, ITIS 2024, POWO 2024, USDA NRCS 2024b). Bicknell (1899a & 1899b) described *S. fuscatum* from specimens that were collected in the southern United States but he identified comparable plants in New York and New Jersey as *S. arenicola*. Ward (1999) listed twelve of the names published by Bicknell during 1899 as synonyms but he thought that the name *Sisyrinchium arenicola* should be prioritized. Weakley et al. (2024) treated *S. arenicola* and *S. rufipes* as distinct species rather than synonyms of *S. fuscatum*, although they noted that there are still some unresolved taxonomic issues within the genus.

Botanical Synonyms

Sisyrinchium arenicola E. P. Bicknell
Sisyrinchium farwellii E. P. Bicknell
Sisyrinchium incrustatum E. P. Bicknell
Sisyrinchium rufipes E. P. Bicknell
Sisyrinchium tenellum E. P. Bicknell

Common Names

Sand Plain Blue-eyed Grass
Coastal Plain Blue-eyed Grass

References

Alvarez, M., C. Ramírez, H. Figueroa, and C. San Martín. 2006. Seed banks in an inundation gradient of two grasslands in the 10th Region (Chile) and their relationship with the plant cover. *Feddes Repertorium* 117(7–8): 571–586.

Angelo, Ray, and David E. Boufford. 2000. Atlas of the flora of New England: Monocots except Poaceae and Cyperaceae. *Rhodora*: 102(909): 1–119.

Beattie, Karen C., Jennifer M. Karberg, Kelly A. Omand, and Danielle I. O'Dell. 2017. Sheep grazing as a grassland management tool: Lessons learned on Nantucket Island, Massachusetts. *Northeastern Naturalist* 24(Special Issue 8): 45–66.

Bellard, C., W. Thuiller, B. Leroy, P. Genovesi, M. Bakkenes, and F. Courchamp. 2013. Will climate change promote future invasions? *Global Change Biology* 19(12): 3740–3748.

Bicknell, Eugene P. 1899a. Studies in *Sisyrinchium* - I: Sixteen new species from the southern states. *Bulletin of the Torrey Botanical Club* 26(5): 217–231.

Bicknell, Eugene P. 1899b. Studies in *Sisyrinchium* - V: Two new eastern species. *Bulletin of the Torrey Botanical Club* 26(9): 496–499.

Blake, Abigail Kincaid. 1935. Viability and germination of seeds and early life history of prairie plants. *Ecological Monographs* 5(4): 405–460.

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

Burnham, Stewart H. 1913. The flora of the sand barrens of southern Staten Island. *Torrey* 13(11): 249–255.

Callahan, Kipp. 2021. Vascular Flora of Pondberry Bay (Sampson County, North Carolina). Master's Thesis, North Carolina State University, Raleigh, NC. 101 pp.

Carbyn, S., P. M. Catling, S. P. Vander Kloet, and S. Basquill. 2006. An analysis of the vascular flora of Annapolis Heathlands, Nova Scotia. *Canadian Field-Naturalist* 120(3): 351–362.

Chauveau, Olivier, Lilian Eggers, Christian Raquin, Adriano Silvério, Spencer Brown, Arnaud Couloux, Corine Cruaud, Eliane Kaltchuk-Santos, Roxana Yockteng, Tatiana T. Souza-Chies, and Sophie Nadot. 2011. Evolution of oil-producing trichomes in *Sisyrinchium* (Iridaceae): Insights from the first comprehensive phylogenetic analysis of the genus. *Annals of Botany* 107: 1287–312.

Cholewa, Anita F. and Douglass M. Henderson. Page updated November 5, 2020. *Sisyrinchium fuscatum* E. P. Bicknell. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 22+ vols. New York and Oxford. Accessed November 22, 2024 at http://floranorthamerica.org/Sisyrinchium_fuscatum

Clarke, Gretel L. 2006. Distribution of Rare Plants on the Central Plain of Martha's Vineyard: Implications for Conservation and Management. Master's Thesis, University of Massachusetts, Amherst, MA. 105 pp.

Clarke, Gretel L. and William A. Patterson, III. 2007. The distribution of disturbance-dependent rare plants in a coastal Massachusetts sandplain: Implications for conservation and management. *Biological Conservation* 136: 4–16.

Cocucci, Andrea Arístides and Stefan Vogel. 2001. Oil-producing flowers of *Sisyrinchium* species (Iridaceae) and their pollinators in southern South America. *Flora* 196(1): 26–46.

Coddington, Jonathan and Katharine G. Field. 1978. Rare and Endangered Vascular Plant Species in Massachusetts. Report prepared by the New England Botanical Club, Cambridge, MA. 67 pp.

Coulter, Malcolm C. 1981. A flora of Great Gull Island, Long Island Sound, New York. *Bulletin of the Torrey Botanical Club* 108(2): 272–277.

Curtain, Margaret. 2022. Two photos of *Sisyrinchium fuscatum* from Massachusetts. Shared via iNaturalist at <https://www.inaturalist.org/observations/120098865>, licensed by <https://creativecommons.org/licenses/by-nc/4.0/>

- Dunwiddie, Peter W. 1998. Ecological management of sandplain grasslands and coastal heathlands in southeastern Massachusetts. In Teresa L. Pruden and Leonard A. Brennan (eds.), *Fire in Ecosystem Management: Shifting the Paradigm from Suppression to Prescription*. Tall Timbers Fire Ecology Conference Proceedings No. 20, Tall Timbers Research Station, Tallahassee, FL.
- Dunwiddie, Peter W., Robert E. Zaremba, and Karen A. Harper. 1996. A classification of coastal heathlands and sandplain grasslands in Massachusetts. *Rhodora* 98(894): 117–145.
- East, E. M. 1940. The distribution of self-sterility in the flowering plants. *Proceedings of the American Philosophical Society* 82(4): 449–518.
- ECAPC (Environnement Canada et Agence Parcs Canada). 2010. Programme de rétablissement et plan de gestion plurispécifiques pour la flore de la plaine côtière de l'Atlantique au Canada, Série de Programmes de rétablissement de la Loi sur les espèces en péril, Environnement Canada et Agence Parcs Canada, Ottawa. 127 pp.
- Faber-Langendoen, D. 2018. Northeast Regional Floristic Quality Assessment Tools for Wetland Assessments. NatureServe, Arlington, VA. 52 pp.
- Fernald, M. L. 1950. *Gray's Manual of Botany*. Dioscorides Press, Portland, OR. 1632 pp.
- Gleason, H. A. and A. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. Second Edition. The New York Botanical Garden, Bronx, NY. 910 pp.
- Gould, K., S. Wood, and A. Smreciu. 2013. *Sisyrinchium montanum*: Mountain Blue-eyed Grass, Strict Blue-eyed Grass. Revegetation profile prepared for OSRIN (Oil Sands Research and Information Network). Available at <https://era.library.ualberta.ca/items/ceea59c0-291b-4dd3-81ba-6bcb4308146d>
- Greller, Andrew M. 1989. Vascular flora of the Kalbfleisch field research station of the American Museum of Natural History, Suffolk County, Long Island, New York. *Bulletin of the Torrey Botanical Club* 116(2): 174–181.
- Harper, Karen A. 1995. Effect of expanding clones of *Gaylussacia baccata* (Black Huckleberry) on species composition in sandplain grassland on Nantucket Island, Massachusetts. *Bulletin of the Torrey Botanical Club* 122(2): 124–133.
- Henderson, Douglass M. 1976. A biosystematic study of Pacific Northwestern blue-eyed grasses (*Sisyrinchium*, Iridaceae). *Brittonia* 28(2): 149–176.
- Hill, L. Michael. 1984. A floristic and chromosomal study of *Sisyrinchium* (Iridaceae) in Virginia. *Castanea* 49(2): 62–68.

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

Hilty, John. 2020. Illinois Wildflowers. Accessed November 26, 2024 at https://www.illinoiswildflowers.info/flower_insects/plants/sbe_grass.htm and https://www.illinoiswildflowers.info/prairie/plant_index.htm

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

Inácio, Camila Dellanhese, Olivier Chauveau, Tatiana T. Souza-Chies, Hervé Sauquet, and Lilian Eggers. 2017. An updated phylogeny and infrageneric classification of the genus *Sisyrinchium* (Iridaceae). *Taxon* 66(6): 1317–1348.

Ingram, Ruth. 1964. The taxonomy and cytology of the genus *Sisyrinchium* (Iridaceae). Doctoral Dissertation, St. Mary's College, Durham, England. 105 pp.

Ingram, Ruth. 1968. Breeding barriers in some species of *Sisyrinchium*. *New Phytologist* 67: 197–204.

ITIS (Integrated Taxonomic Information System). Accessed August 11, 2024 at <http://www.itis.gov>

Jenkins, R. Austin and Patrick D. McMillan. 2009. Vascular flora of Sandhill Research and Education Center, Richland County, South Carolina. *Castanea* 74(2): 168–180.

Karst, Lisa and Carol A. Wilson. 2012. Phylogeny of the new world genus *Sisyrinchium* (Iridaceae) based on analyses of plastid and nuclear DNA sequence data. *Systematic Botany* 37(1): 87–95.

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

Knapp, Wesley M., Robert F. C. Naczi, Wayne D. Longbottom, Charles A. Davis, William A. McAvoy, Christopher T. Frye, Jason W. Harrison, and Peter Stango, III. 2011. Floristic discoveries in Delaware, Maryland, and Virginia. *Phytoneuron* 64: 1–26.

Knuth, Paul. 1909. Handbook of Flower Pollination. Volume 3. Clarendon Press, Oxford. 644 pp.

Levine, Carol. 1995. A Guide to Wildflowers in Winter. Yale University Press, New Haven, CT. 329 pp.

Lezberg, Ann L., Kendra Buresch, Christopher Neill, and Tom Chase. 2006. Mechanical land clearing to promote establishment of coastal sandplain grassland and shrubland communities. *Restoration Ecology* 14(2): 220–232.

MacDonald, L. A. and Henry R. Mushinsky. 1988. Foraging ecology of the Gopher Tortoise, *Gopherus polyphemus*, in a sandhill habitat. *Herpetologica* 44(3): 345–353.

Moore, Gerry, Renée Brecht, and Dale Schweitzer. 2016. Additions and corrections to the checklist of vascular plants of Cumberland County, New Jersey. *Bartonia* 68: 1–59.

Mosquin, Theodore. 1970. Chromosome numbers and a proposal for classification in *Sisyrinchium* (Iridaceae). *Madroño* 20(5): 269–275.

Munro, Marian C., Ruth E. Newell, and Nicholas M. Hill. 2014. Nova Scotia Plants. Nova Scotia Museum. 1493 pp.

NatureServe. 2024. NatureServe Explorer [web application]. NatureServe, Arlington, VA. Accessed November 21, 2024 at <https://explorer.natureserve.org/>

NJ Adapt (New Jersey Climate Change Resource Center). 2024. Interactive map of flood hazard zones, accessed November 30, 2024 at <https://www.njfloodmapper.org/>

NJNHP (New Jersey Natural Heritage Program). 2001. List of Endangered Plant Species and Plant Species of Concern, September 2001. Biotics Database. NatureServe, Arlington, Virginia. Accessed September 18, 2003.

NJNHP (New Jersey Natural Heritage Program). 2010. Explanation of Codes Used in Natural Heritage Reports. Updated March 2010. Available at https://nj.gov/dep/parksandforests/natural/docs/nhpcodes_2010.pdf

NJNHP (New Jersey Natural Heritage Program). 2024. Biotics 5 Database. NatureServe, Arlington, VA. Accessed March 15, 2024.

Omand, Kelly. 2023. Photo of *Sisyrinchium fuscatum* from Massachusetts. Shared via iNaturalist at <https://www.inaturalist.org/observations/165108616>, licensed by <https://creativecommons.org/licenses/by-nc/4.0/>

Patterson, William A. III, Gretel L. Clarke, Sarah A. Haggerty, Paul R. Sievert, and Matthew J. Kely. 2005. Wildland Fuel Management Options for the Central Plains of Martha's Vineyard: Impacts on Fuel Loads, Fire Behavior and Rare Plant and Insect Species. Report RFR# DEM705, prepared for the Massachusetts Department of Conservation and Recreation. 140 pp.

Poulos, Helen Mills, Rachael S. Freeman, Jennifer M. Karberg, Karen C. Beattie, Danielle I. O'Dell, and Kelly A. Omand. 2019. Effects of mowing and prescribed fire on plant community structure and function in rare coastal sandplains, Nantucket Island, MA, USA. *Environmental Management* 65(1): 111–121.

POWO. 2024. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Accessed August 11, 2024 at <http://www.plantsoftheworldonline.org/>

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

Ring, Richard M., Elizabeth A. Spencer, and Kathleen Strakosch Walz. 2013. Vulnerability of 70 Plant Species of Greatest Conservation Need to Climate Change in New Jersey. New York Natural Heritage Program, Albany, NY and New Jersey Natural Heritage Program, Department of Environmental Protection, Office of Natural Lands Management, Trenton, NJ, for NatureServe #DDCF-0F-001a, Arlington, VA. 38 pp.

Roberts, G. L. 1990. Photoperiodic response of *Sisyrinchium bermudiana* L. - A possible new bedding plant. ISHS Acta Horticulturae 272: doi: 10.17660/ActaHortic.1990.272.18.

Roberts, G. L. and M. J. Tsujita. 1992. Inductive cycles required for flowering of *Sisyrinchium bermudiana*. HortScience 27(1): 80.

Roberts, G. L., M. J. Tsujita, and J. Gerrath. 1992. Floral initiation and development in *Sisyrinchium bermudiana*. HortScience 27(1): 73–74.

Robertson, Charles. 1929. Flowers and Insects: Lists of Visitors of Four Hundred and Fifty-three Flowers. Science Press Printing Company, Lancaster, PA. 221 pp.

Rudall, Paula J., John C. Manning, and Peter Goldblatt. 2003. Evolution of floral nectaries in Iridaceae. Annals of the Missouri Botanical Garden 90(4): 613–631.

Salva, Justin D. and Bethany A. Bradley. 2023. High-impact invasive plants expanding into mid-Atlantic states: Identifying priority range-shifting species for monitoring in light of climate change. Invasive Plant Science and Management 16: 197–206.

Silvério, Adriano, Sophie Nadot, Tatiana T. Souza-Chies, and Olivier Chauveau. 2012. Floral rewards in the tribe Sisyrinchieae (Iridaceae): Oil as an alternative to pollen and nectar? Sexual Plant Reproduction 25: 267–279.

Sorrie, Bruce A. and Peter W. Dunwiddie. 1996. The Vascular and Non-vascular Flora of Nantucket, Tuckernuck, and Muskeget Islands. A joint publication of the Massachusetts Audubon Society, the Massachusetts Natural Heritage and Endangered Species Program, the Nantucket Maria Mitchell Association, and The Nature Conservancy. 145 pp.

Sorrie, Bruce A., Janet Bracey Gray, and Philip. J. Crutchfield. 2006. The vascular flora of the Longleaf Pine ecosystem of Fort Bragg and Weymouth Woods, North Carolina. Castanea 71(2): 127–159.

Stalter, Richard and Eric E. Lamont. 2005. The historical and extant flora of Great Gull Island, New York. The Journal of the Torrey Botanical Society 132(4): 628-634.

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

Stubbs, C. S., H. A. Jacobson, E. A. Osgood, and F. A. Drummond. 1992. Alternative forage plants for native (wild) bees associated with lowbush blueberry, *Vaccinium* spp., in Maine. Maine Agricultural Experiment Station, Technical Bulletin 148, University of Maine, Orono, ME. 54 pp.

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

Terry, Michael Austin. 2005. The Vascular Flora of Powhatan County, Virginia. Master's Thesis, University of Richmond, Richmond, VA. 93 pp.

Thornhill, Robert, Alexander Krings, David Lindbo, and Jon Stucky. 2014. Guide to the vascular flora of the savannas and flatwoods of Shaken Creek Preserve and vicinity (Pender & Onslow Counties, North Carolina, U.S.A.). Biodiversity Data Journal 2: e1099.

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

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2024a. *Sisyrinchium fuscatum* illustration from Britton, N. L. and A. Brown, 1913, An illustrated flora of the northern United States, Canada and the British Possessions, 3 vols., Kentucky Native Plant Society, New York, Scanned By Omnitek Inc. Image courtesy of The PLANTS Database (<http://plants.usda.gov>). National Plant Data Team, Greensboro, NC.

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2024b. PLANTS profile for *Sisyrinchium fuscatum* (Coastal Plain Blue-eyed Grass). The PLANTS Database, National Plant Data Team, Greensboro, NC. Accessed November 21, 2024 at <http://plants.usda.gov>

Waldrop, LayLa. 2001. A Floristic Study of the Cane Creek Watershed of the Jocassee Gorges Property, Oconee and Pickens Counties, South Carolina. Master's Thesis, Clemson University, Clemson, South Carolina. 133 pp.

Walz, Kathleen S., Jason L. Hafstad, Linda Kelly, and Karl Anderson. 2020. Floristic Quality Assessment Index for Vascular Plants of New Jersey: Coefficient of Conservancy (CoC) Values for Species and Genera (update to 2017 list). New Jersey Department of Environmental Protection, New Jersey Forest Service, Office of Natural Lands Management, Trenton, NJ.

Wang, B., and Y. L. Qiu. 2006. Phylogenetic distribution and evolution of mycorrhizas in land plants. Mycorrhiza 16(5): 299–363.

Ward, Daniel B. 1999. (1421) Proposal to conserve the name *Sisyrinchium arenicola* (Iridaceae) against eleven competing binomials published by the same author earlier in the same year. *Taxon* 48(3): 583–586.

Weakley, A. S. and Southeastern Flora Team. 2024. Flora of the Southeastern United States. Edition of March 4, 2024. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, NC. 2023 pp.

Williams, Emma C. 2013. A Comparison of Extant Vegetation to the Soil Seed Bank in the Natural Lands Section of the Morris Arboretum. Report completed for the Eli Kirk Price Endowed Flora of Pennsylvania Internship Program, Morris Arboretum Philadelphia, PA. 17 pp.

Young, Bruce E., Elizabeth Byers, Geoff Hammerson, Anne Frances, Leah Oliver, and Amanda Treher. 2016. Guidelines for Using the NatureServe Climate Change Vulnerability Index, Release 3.02, 1 June 2016. NatureServe, Arlington, VA. 65 pp.

Zomlefer, Wendy B., David E. Giannasi, Alex Reynolds, and Karin Heiman. 2012. Vascular plant flora of Chattahoochee River National Recreation Area, a conservation corridor from the Buford Dam to Atlanta, Georgia. *Rhodora* 114(597): 50–102.