

***Milium effusum* L.**
Millet Grass



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***Milium effusum* Rare Plant Profile**

New Jersey Department of Environmental Protection
New Jersey Forest Service
Office of Natural Lands Management
New Jersey Natural Heritage Program

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Life History

The best time to see *Milium effusum* is during the flowering period between late May and July (Rhoads & Block 2000). The hemicryptophyte¹ species tends to occur as solitary individuals, however in high light environments patches can occur. While this species can exhibit clonal growth, regeneration by seed is most important for persistence and spread. Flowering of *M. effusum* only occurs when the canopy is not too dense (De Freene 2017). *M. effusum* keeps its foliage visible even through the winter which can help to identify its populations even outside of the flowering period (De Freene 2017).

Pollinator Dynamics

M. effusum is a wind-pollinated species that possesses a high capacity for long distance dispersal. (Brunet 2011, De Freene 2017).

¹ Hemicryptophyte, a herbaceous perennial that produces perennating buds at the surface of the soil, which then are covered by leaf or stem bases.

Seed Dispersal

Grains (seeds) are smooth and ellipsoid in shape, approximately 2 to 3 mm long and 1 mm across (Hilty 2002-2017, De Freene 2017). *Millium effusum* exhibits barochoric dispersal after the seeds easily dislodge themselves from the spikelets. The seeds are dispersed long distances by animals either by attachment to their fur or through ingestion. Seeds are then dispersed distant from the mother plant by being carried on the fur of the animal or through ingestion. Seeds found in the fecal matter of red deer and the European bison proved long distance dispersal with successful germination and an increase in the seed bank of *M. effusum* (Brunet 2011; De Freene 2017).

Habitat

Milium effusum is predominantly found in deciduous and mixed woodlands, that are typically wet to mesic. While the species generally occurs on flat grounds to gentle slopes, it can be found to grow in dense colonies at the base of slopes where the light is less limiting. The species that occurs outside of the United States usually is found in untouched ancient forests. It prefers moist, shady sites but can also tolerate medium shade where the canopy is partially open. This grass develops quickly during the spring, producing flowers only where the canopy is not too dense and occurs as scattered plants rather than in dense colonies. At higher altitudes, *M. effusum* will produce taller vegetation. Since the 20th century, *M. effusum* has been found to occur in previously managed wooded meadows and pastures that are now abandoned (De Freene 2017).

M. effusum prefers soil types ranging from loam, clay-loam and sandy-loam, while also preferring moist, calcareous soils with rich hummus. It is frequently associated with circumneutral or basic bedrock (New England Wild Flower Society 2011-2019). Lower topsoil pH, likely caused by atmospheric deposition², leads to decreased frequency of many woodland herbs, including *M. effusum* (De Freene 2017). An experiment done by (Henrichfreise 1981) showed that seedling biomass and root length are reduced when growing in acidic soils (De Freene 2017).

Species Associates and Mycorrhizal Interactions:

There is no published information available regarding associated species, however they have been noted in occurrence records in the Natural Heritage Biotics Database. One record notes that *Milium effusum* was found in a woodland area dominated by hickory, maple and ash species. The occurrence was found growing slightly upslope in a *Betula lenta* stand, surrounded by *Lindera benzoin*, *Brachylectru erectum*, *Phegopteris hexagonoptera*, and *Allium tricoccum*. While some studies suggest that *M. effusum* has no associations with mycorrhizal fungi, others have proven it has colonized with vesicles of

² Atmospheric deposition, is when particles, gases and aerosols move from the atmosphere to earth's surface.

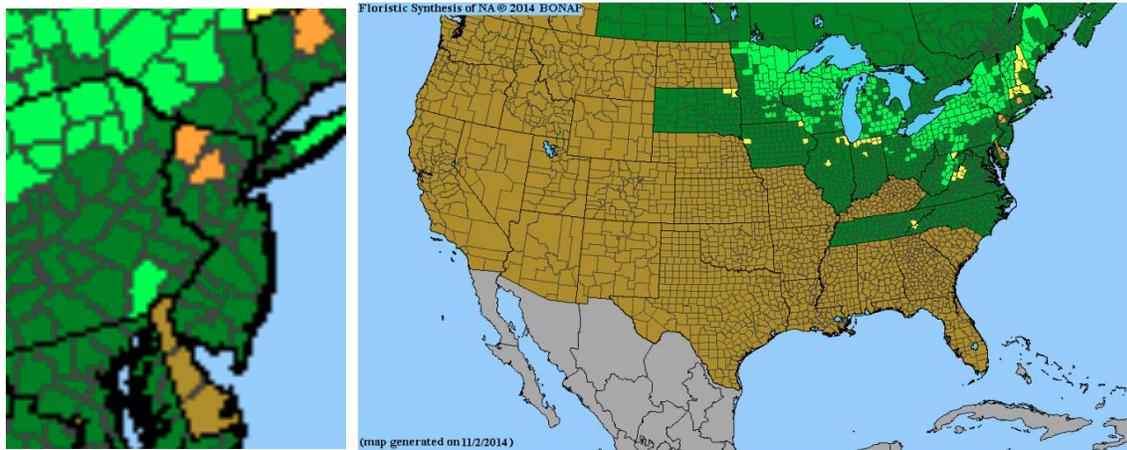
arbuscular mycorrhizal fungi. It is suggested that studies showing no interactions could be contributed to the environmental settings (De Frenne 2017).

Wetland Indicator Status

FACU (Facultative Upland): Usually occur in non-wetlands, but may occur in wetlands. (USDA 2019)

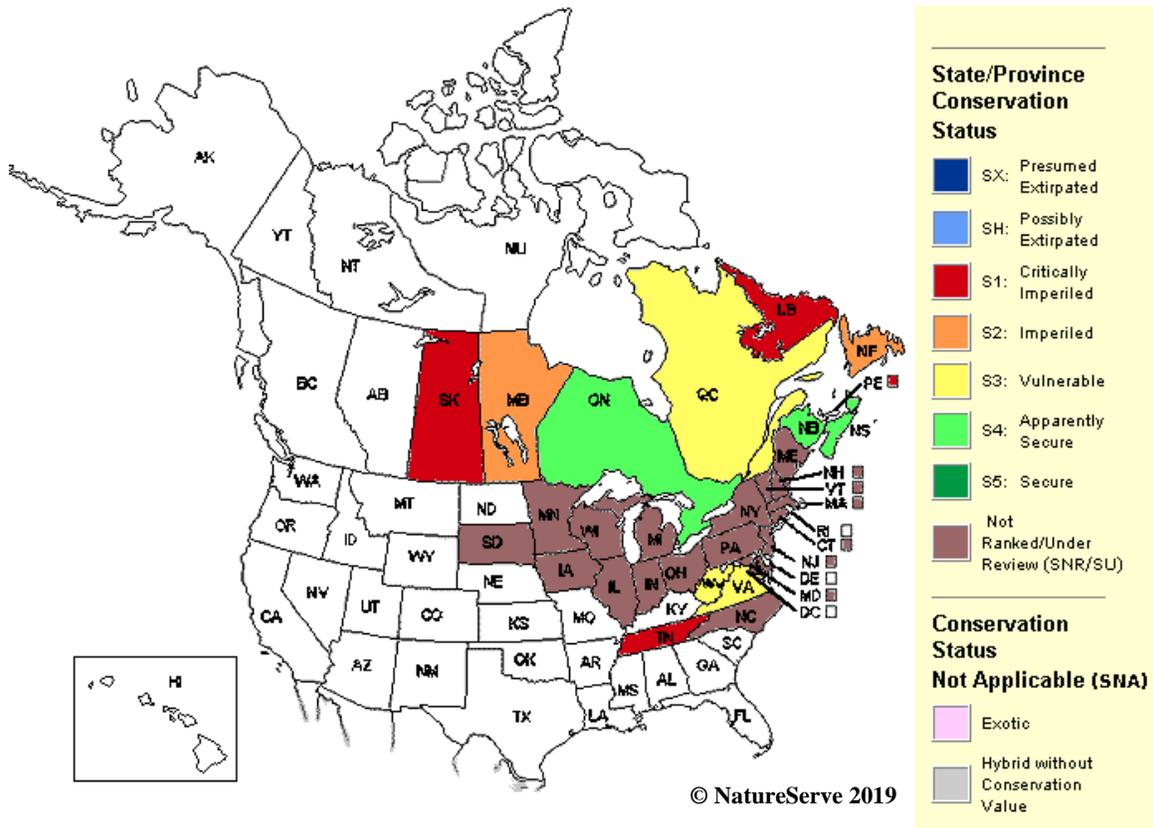
Distribution and Range

While it is sometimes suggested that *Milium effusum* has distribution in North America and Europe, the variety native to North American is known as *Milium effusum var. cisatlanticum*. The range of the species with their respective rankings in the United States is as follows, Connecticut (SNR), Illinois (SNR), Indiana (SNR), Iowa (SNR), Maine (SNR), Maryland (SNR), Massachusetts (SNR), Michigan (SNR), Minnesota (SNR), New Hampshire (SNR), New Jersey (SNR), New York (SNR), North Carolina (SNR), Ohio (SNR), Pennsylvania (SNR), South Dakota (SNR), Tennessee (S1), Vermont (SNR), Virginia (S3), West Virginia (S3), Wisconsin (SNR).



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County Color Key: ■ Native, not rare ■ Native, rare ■ Native, adventive ■ Extirpated ■ Extinct ■ Exotic
■ Noxious weed ■ Eradicated ■ Waif ■ Questionable presence



Conservation Status

State Status for New Jersey:

Milium effusum (S1) (NatureServe 2019)

(Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.)

Milium effusum var. cisatlanticum (SNR) (NatureServe 2019)

(State not ranked.)

Global Status:

Milium effusum (G5)

(Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.)

Milium effusum var. cisatlanticum G5T5 (USDA 2019)

(Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.)

Threats

This species may be negatively impacted by increased gaps in the canopy causing it to be outcompeted by native or invasive species. In the “*Biological Flora of the British Isles: Miliun effusum*” publication it was said that high subsoil water conditions would promote growth of the *Miliun effusum*. The species can only tolerate rare flooding events, but the species is absent from wetlands or woods that are flooded frequently. The species is sensitive to grazing and mowing, and is often found in post-agricultural forests (De Frenne 2017).

Management Responses & Recommendations

While *Miliun effusum* would greatly benefit from a more open canopy and lower amounts of leaf litter (Sydes 1981), the downside would be that the species is then exposed to herbivory and could potentially be outcompeted by native or invasive species. While there seems to be no correlation between dry masses of tree litter and bare soil on the biomass of *M. effusum* the depth tolerance of leaf litter should not exceed 10 cm. The species is often found occurring on mull soils, which are continuously being disturbed, and have been colonized by an active invertebrate fauna. In the United States, this species is seen as an indicator of moderate invasion by European earthworms (De Frenne 2017; Bennett 2013).

During an artificial canopy gap experiment (Holmes and Webster 2011), clumps of *Tsuga canadensis* in combination with deer enclosures were used to study responses of light on *Miliun effusum*. After five years of treatments, the species abundance did not have a significant response.

Species-specific buffer zone:

In 2017, Jack and Janet Holt recommended at least a 50 foot buffer zone for a population of *M. effusum*. They suggested that this would, at least temporarily, inhibit the overgrowth of invasive species.

No other species-specific buffer distance data was identified in this literature review.

Additional information

There is a cultivar of *Miliun effusum* grown for its yellowish leaves and is known as ‘Aureum.’ (Crins 2019)

In Illinois, *M. effusum* is endangered and is only found in three counties. Within these areas it is mostly found in higher quality natural areas of deciduous woodlands (Hilty 2002-2007).

A study in Sweden, “*Performance of some field-layer vegetation species introduced into an acid beech forest with mor soil*” concluded that *M. effusum* survived the duration of the study period, but the soil acidity (mechanisms) prevented *M. effusum* as well as the other study species from growing on the acidic soil. The other study species are as follows: *Stellaria nemorum*, *Laminum galeobdolon*, and *Melica uniflora*. (Staff 1992)

When *M. effusum* was studied to see how the effect of fragmentation differs between forest specialists and generalists in Sweden, *M. effusum* was not influenced by the stand type. The results from this study suggest that the “degree of soil alteration and connectivity with older forests are critical factors for determining the process of understory recovery.” However, *M. effusum* was found in a relatively young oak stand, possibly due to its high capacity for long-distance dispersal (Brunet 2011).

According to the “Biological Flora of the British Isles,” *Milium effusum* is classified as an indicator species of ancient woodlands that favors thinning. Clear cutting and thinning can allow the plant to have extensive flowering and seed production under certain situations. It is also stated “...when beech seeds are present it lowers herbivory of *Milium*.” Not only is *M. effusum* an indicator of ancient woodlands, it has been seen as an indicator species of a moderate invasion by the European Earthworms of the *Lumbricidae* family (Bennett 2013, De Frenne 2017).

Information received during personal communications:

Jack & Janet Holt

After a survey in 2017 they found a very small population of what they felt was probably *M. effusum*. The population was found growing right along a trail at the base of a tree. From what Jack and Janet have observed from the species, it prefers moist and relatively rich open woods especially along the edge of or in partial clearings or on road banks.

“Although a woodland grass, it does not seem to tolerate deep shade nor does it seem to like competition, I’ve never seen it in dense herbaceous or shrubby vegetation. Logging would obviously increase light availability, but it would also promote the growth of other vegetation including invasive species like *Berberis*, *Microstegium*, and *Persicaria longisetata*. Not having seen it in woodlands in or near logging (the closest to that situation was a wooded hillside below an extant gas line ROW in western PA), I don’t know how it will respond to logging. At no site was it part of a distinctive suite of unusual or rare plants, the closest to that on a rich slope north of Williamsport PA which had a diverse spring flowering flora including something like 7-8 species of violets. A 50’ buffer around the population might be good enough to keep down the invasive species likely to come in after logging, at least for a while.”

Robert Naczi (NYBG)

Information pending.

Recorded Occurrences for New Jersey:

Historic occurrences from Chrysler Herbarium provided one specimen from each New Jersey, Vermont, Minnesota and an unknown location. The collection from Minnesota mentioned being collected in the woods, North of Lake Superior near a pumping station.

Natural Heritage Biotics Database Occurrences:

- Found first in 1966 in two locations along a river that borders Morris and Sussex County. This occurrence was last seen in 1982 and is possibly extirpated now since it wasn't found during a survey in 2008. The location is just over a half a mile away from a power line right-of-way, and a large interchange.
- Found first in 2014 in Sussex County, this occurrence has been spotted again in 2016. The location is upslope from a wetland and occurring in a fairly dense canopy/sub canopy. This species is at risk of being outcompeted by invasive *Berberis* if given more open canopy.

Suggestions towards further research

Look at other research to see proposed buffers for similar species. Using the TRY database to find species of similar traits, then use these species to see if similar research has been done.

Botanical Synonyms:

Milium effusum subsp. *cisatlanticum*

Grass Family: Poaceae

Other Common Names:

American milletgrass
Wood millet
Millet grass
Tall Millet grass

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