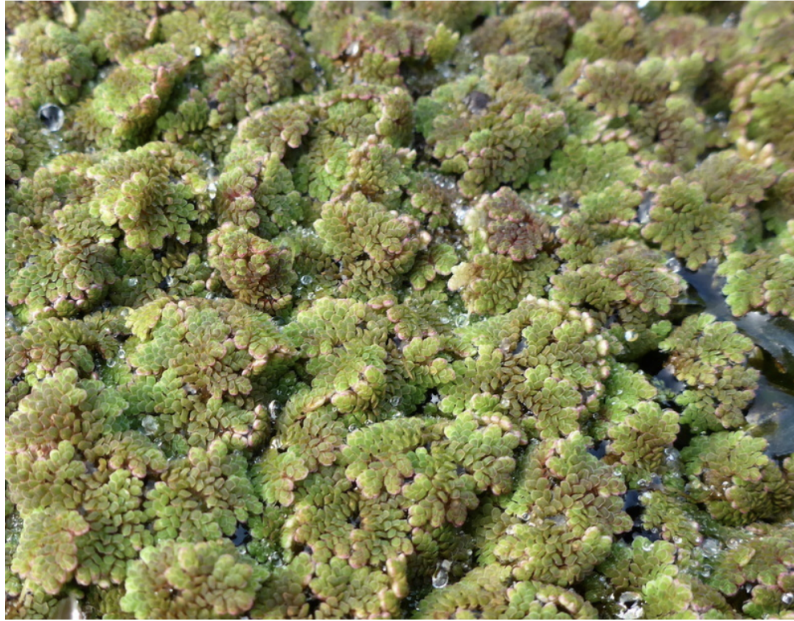


Azolla caroliniana Species Profile




(Mfeaver, 2018) <https://www.inaturalist.org/observations/19325877>

Scientific Name: *Azolla caroliniana*

Common name: Fairy Moss, Mosquito Fern

Synonyms and Other Names: Eastern/Carolina mosquito fern

Taxonomy: available through 

Taxonomic Hierarchy

Kingdom	Plantae
Subkingdom	Viridiplantae
Infrakingdom	Streptophyta
Superdivision	Embryophyta
Division	Tracheophyta
Subdivision	Polypodiophytina
Class	Polypodiopsida
Subclass	Polypodiidae
Order	Salviniales

Family	Salviniaceae
Genus	Azolla
Species	Azolla caroliniana Willd

Retrieved [December, 7, 2023], from the Integrated Taxonomic Information System (ITIS) on-line database, www.itis.gov, [CC0](https://doi.org/10.5066/F7KH0KBK)
<https://doi.org/10.5066/F7KH0KBK>

Noxious: This species is not listed by the U.S. Department of Agriculture as a noxious weed

Identification: Example Characteristics

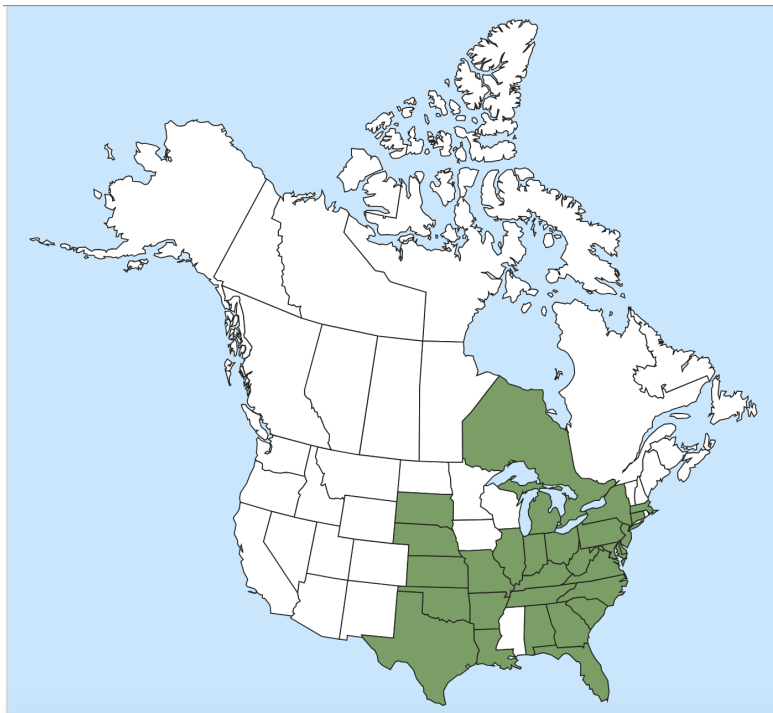
Stem/Rhizoids: Small dark green and/or crimson free-floating plant (Fowler and Rhoades, 2011). Prostrate, branching stems (NCSU, n.d.).

Leaves: 1-4 cm fronds (Pandey 2021). Fronds are arranged in two rows with two leaves with two lobes each (NCSU, n.d.).

Look-a-likes: Often confused with *Azolla cristata*, and its name has been improperly applied to the species *Azolla Mexicana*.

Size: 1-4 cm (Pandey 2021)

Native Range: Ontario Canada, Midwestern, Southern and Eastern United States, Mexico, and central and South America (FWS, 2021)

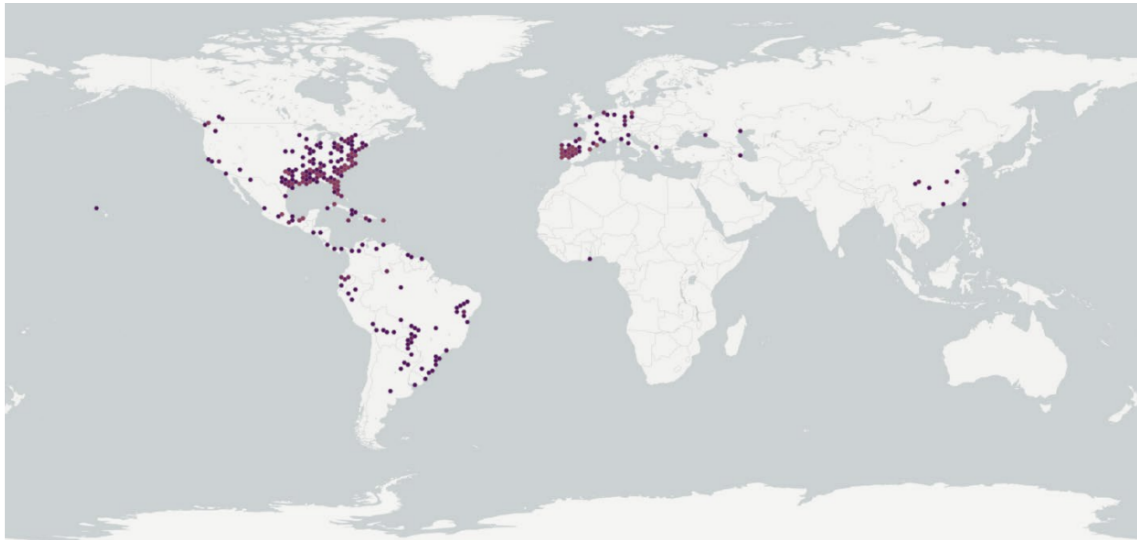


Azolla caroliniana distribution in the United States (Willdenow and Lumpkin, 2020).

Nonindigenous Occurrences:

Azolla caroliniana has been introduced to more Eastern states including New Jersey (Cohn and Renlund, 1953), Connecticut, Massachusetts, New Hampshire, Maine (Native Plant Trust, 2023).

Introductions outside of the United States have been surveyed in France, Spain, Italy, China (Shi and Hall, 1988), Ukraine (Protopopova et al., 2006), and South Africa (Imada and Kennedy, 2020).



Azolla caroliniana global distribution (GBIF Secretariat, 2021).

Ecology:

Azolla caroliniana is a highly productive aquatic fern and can double its biomass in 3-9 days depending on the conditions of its habitat (Pandey, 2012). Phosphorus is a limiting factor on its growth, and large amounts of phosphorus in a system typically result in large azolla blooms. It grows in stagnant, slow moving water (Willdenow and Lumpkin, 2020) and fixes large amounts of Nitrogen by using symbiotic cyanobacteria (Madeira et al., 2019). Its hardiness zones are 7a-11b (NCSU, n.d).

Means of Introduction:

It has been introduced outside of its native habitat for agricultural purposes. *Azolla caroliniana* is preferred for agriculture because it is drought, heat, and cold tolerant, and because it fixes large amounts of Nitrogen (Madeira et al., 2019). Other means of introduction include the dumping of aquarium contents into natural ecosystems (Darbyshire, 2002), where azolla from an aquarium gets released into the wild.

Status:

Azolla caroliniana is spreading throughout the eastern and southern United States outside of its native range. All states and areas within the United States without prolonged freezing in the winter are susceptible to invasion.

Impact of Introduction:

Azolla caroliniana outcompetes other plants for resources, which impacts community structure (Prokopuk, 2016). They reduce oxygen levels in an invaded system as well as preventing light penetrating the water's surface and getting to other aquatic plants. Invasion interferes with human activities like fishing and disrupts ecology by forming huge mats of vegetation (Darbyshire, 2002).

Remarks:

Azolla caroliniana is a valid species considered by World Flora online, and is a separate species from *Azolla cristata*, although many scientific articles treat *A. caroliniana* and *A. cristata* as the same species (USFWS, 2021).

References:

- Cohn, J., & Renlund, R. N. (1953). Notes on *Azolla caroliniana*. *American Fern Journal*, 43(1), 7. <https://doi.org/10.2307/1545147>
- Darbyshire SJ. 2002. Ephemeral occurrence of the mosquito fern, *Azolla caroliniana*, at Ottawa, Ontario. *Canadian Field-Naturalist* 116(3):441–445.
- Fowler, B. T. A. ;Rhoads A. (2011). *Aquatic plants of Pennsylvania: A complete reference guide*. University of Pennsylvania Press.
- GBIF Secretariat. 2021. GBIF backbone taxonomy: *Azolla caroliniana* Willd. Copenhagen: Global Biodiversity Information Facility. Available: <https://www.gbif.org/species/2650105> (March 2021).
- Haines, A. (2011). *New England Wild Flower Society's flora novae angliae: A Manual for the identification of native and naturalized higher vascular plants of New England*. Yale University Press.
- Imada CT, Kennedy BH. 2020. New Hawaiian plant records from Herbarium Pacificum for 2019. *Bishop Museum Occasional Papers* 129:67–92.
- Madeira PT, Dray FA, Tipping PW. 2019. Molecular identification of *Azolla* in the Yangtze River watershed, China. *Aquatic Botany* 159.
- Mfeaver. (2018, December 31). *Eastern Mosquito Fern (azolla caroliniana)*. iNaturalist. <https://www.inaturalist.org/observations/19325877>
- Native Plant Trust. (2023). *Azolla caroliniana - Carolina mosquito fern*. Native Plant Trust: Go Botany. <https://gobotany.nativeplanttrust.org/species/azolla/caroliniana/>

NatureServe. (2023). *Azolla caroliniana* Eastern Mosquito Fern.
https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.141544/Azolla_caroliniana

NCSU. (n.d.). *Azolla caroliniana*. *Azolla caroliniana* (Eastern Mosquito Fern, Fairy Moss, Mosquito Fern, Water Velvet) | North Carolina Extension Gardener Plant Toolbox.
<https://plants.ces.ncsu.edu/plants/azolla-caroliniana/>

Pandey, V. C. (2012). Phytoremediation of heavy metals from fly ash pond by *Azolla caroliniana*. *Ecotoxicology and Environmental Safety*, 82, 8–12.
<https://doi.org/10.1016/j.ecoenv.2012.05.002>

Prokopuk MS. 2016. New record of *Azolla caroliniana* in water bodies of Kiev. *Hydrobiological Journal* 52(2):56–58.

Protopopova VV, Shevera MV, Mosyakin SL. 2006. Deliberate and unintentional introduction of invasive weeds: A case study of the alien flora of Ukraine. *Euphytica* 148:17–33.

Shi DJ, Hall DO. 1988. The *Azolla*-*Anabaena* association: Historical perspective, symbiosis and energy metabolism. *Botanical Review* 54(4):353–386.

Taxon: Azolla Caroliniana Willd. *Azolla caroliniana* Willd. GRIN-Global. (2023).
<https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomydetail?id=102986>

U.S. Fish & Wildlife Service,. (2021). *Carolina Mosquitofern (Azolla caroliniana) Ecological Risk Screening Summary*. Carolina Mosquitofern (*Azolla caroliniana*) ERSS.
<https://www.fws.gov/sites/default/files/documents/Ecological-Risk-Screening-Summary-Carolina-Mosquitofern.pdf>

USDA. (n.d.). *Azolla caroliniana* Willd. *Carolina mosquitofern*. USDA plants database.
<https://plants.sc.egov.usda.gov/home/plantProfile?symbol=AZCA>

Willdenow, & Lumpkin, T. A. (2020). *Azolla caroliniana*. *Azolla caroliniana* - FNA.
http://floranorthamerica.org/Azolla_caroliniana