

Rhynchospora mesoatlantica

Mid-Atlantic Beaksedge

Cyperaceae



Rhynchospora mesoatlantica by William McAvoy, 2006

Rhynchospora mesoatlantica 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

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Life History

Rhynchospora mesoatlantica (Mid-Atlantic Beaksedge) is a perennial sedge that grows in dense tufts. The species was recently described by Eberly and Naczi (2023). *R. mesoatlantica* is very similar in appearance to *Rhynchospora filifolia* and *R. harperi*, and prior to its description it was usually mistaken for one of those two species. Kral (1996) and LeBlond (1997) observed that some specimens of *Rhynchospora* from Delaware and Maryland were vegetatively similar to *R. filifolia* but had achenes that were more like those of *R. harperi*. Eberly began to investigate the sedges in question while she was a graduate student and her work ultimately led to the discovery of a new species (Swanson 2024).

Rhynchospora mesoatlantica has threadlike leaves that are 7–25 cm in length and become somewhat wavy toward the top. The culms are erect and 3–9 cm tall, surpassing the leaves. The spikelets are arranged in 1–3 tight clusters (fascicles) of 5–75 spikelets. The fascicles are top-shaped or hemispheric and 1–2 cm wide. The spikelets are 3.6–4.7 mm long. The brown scales have a darker central nerve: Those near the base are 1.5–2 mm long and those near the center of the spikelet are 3.0–3.4 mm long. The flattened achenes have a basal stipe, a distinct tubercle, a whitish central disk on each side, and six bristles with forward-pointing barbs (Eberly and Naczi 2023).



Left: Hirst 1991, courtesy Claude E. Phillips Herbarium. Right: William McAvoy, undated.

As with most *Rhynchospora* species, well-developed achenes are needed for identification. *R. mesoatlantica* produces flowers and fruits during the summer and early fall (DEDNREC 2024, Weakley et al. 2024). In New Jersey specimens of *R. mesoatlantica* with mature achenes have been collected during the last week in August and the first week in September, and plants with mature fruit have been observed in mid-September (NJNHP 2024). Stone (1911) observed that the sedge's achenes had matured and some scales were already gone by August 30.

R. mesoatlantica belongs in *Rhynchospora* section *Fuscae* (Eberly and Naczi 2023). Only two other sedges in that section occur in New Jersey: *R. filifolia* and *R. fusca* (Kartesz 2015). *Rhynchospora mesoatlantica* and *R. fusca* are not likely to be confused but careful measurements are needed to distinguish *R. mesoatlantica* from *R. filifolia*. *R. mesoatlantica* and *R. filifolia* have similar habitat preferences—Frank Hirst collected both sedges from coastal plain ponds on the Delmarva Peninsula (McAvoy 2000, Mid-Atlantic Herbaria 2024) and Eberly and Naczi (2023) found them growing together at a site in Delaware. In *R. mesoatlantica* the mid-spike scales are 3.0–3.4 mm long, total achene length (body + tubercle) is 2.1–2.3 mm, achene width is 0.9 mm, and the stipe is 0.3–0.4 mm long. In *R. filifolia* the mid-spike scales are 2.1–3.0 mm long, total achene length (body + tubercle) is 1.5–1.9 mm, achene width is 0.6–0.8 mm, and the stipe is 0.2–0.3 mm long. See Eberly and Naczi (2023) for additional information.

Pollinator Dynamics

Most species in the Cyperaceae are wind-pollinated although insect pollination has also been documented in several sedge genera, including *Rhynchospora*. Nearly all of the insect-pollinated sedges are also pollinated by wind (Goetghebeur 1998). Wind is the prevailing pollination mechanism for the majority of *Rhynchospora* species outside of section *Dichromena*: The flowers of plants in that group have pale, leafy involucre bracts, white glumes, and sticky pollen and use insects as their primary means of cross-fertilization (Lucero et al. 2014). Some New Jersey *Rhynchospora* species, including *R. alba* and *R. pallida*, utilize a combination of insect and wind pollination. The floral morphology of *Rhynchospora mesoatlantica* is indicative of wind pollination because the spikelets lack features that would be attractive to insects (Buddenhagen et al. 2017, da Costa et al. 2021).

Seed Dispersal and Establishment

Rhynchospora seeds can be locally dispersed by gravity, wind, or water (Leck and Schütz 1994). *R. mesoatlantica* seeds may occasionally be transported to new locations by animals, particularly birds. *Rhynchospora* achenes are sometimes consumed by waterfowl and have been found in the gizzards of various ducks (McAtee 1918, Mabbott 1920, Fassett 1957, Stieglitz 1972). The dispersal of viable propagules following consumption by avian species has been documented in an assortment of sedges (Leck and Schütz 1994).

Rhynchospora mesoatlantica is found in habitats that can experience erratic hydrological cycles (see next section). Many other plants that inhabit sites with similar characteristics are capable of persisting in the seed bank for years until conditions become favorable for germination, which might be either substrate exposure or flooding depending on the species (van der Valk 1981, Cavileer and Gallegos 1982, Zaremba and Lamont 1993, Neill et al. 2009). Seed banking has been documented in the closely related *Rhynchospora filifolia* (Mulhouse 1996, Kirkman and Sharitz 1994). Because *R. mesoatlantica* was only recently identified as a distinct species, the particulars of its germination and establishment requirements have not yet been determined.

Habitat

Rhynchospora mesoatlantica grows in shallow, nutrient-poor, seasonally wet ponds on the coastal plain (Eberly and Naczi 2023). Coastal plain intermittent ponds are isolated depressions in well-drained soils that replenish their water supply mainly through precipitation or subsurface flow. Typically the water levels are highest during winter and spring and drop during the summer months, often ranging from depths of a meter or more to exposed substrate. However, water levels can also vary substantially between years depending on precipitation patterns and groundwater reserves. Both periods of flooding and episodic fires are thought to play a role in maintaining open communities at the sites by hampering the establishment of woody species (Sutter and Kral 1994, Kirkman et al. 1999, McAvoy and Bowman 2002).

Vegetation in seasonal ponds is often arranged in roughly concentric zones based on the hydrologic characteristics of the substrate, but the floristic composition of the wetlands can be highly variable. Walz et al. (2006) identified 20 different kinds of plant communities that were associated with coastal plain intermittent pondshores in New Jersey and noted that a single pond may support multiple community types. Eberly and Naczi (2023) observed that *Rhynchospora mesoatlantica* usually only occupied a portion of the ponds where it occurred and it was generally found in sunny, moist sites along the upper part of the depressions.

Stone (1911) described the location where New Jersey's first *R. mesoatlantica* population was documented as "swamps along the railroad" but the site is now known to be a seasonal pond. The second occurrence was also situated in an intermittently flooded pond. At the latter location, the vegetation was dominated by tall grasses like *Saccharum giganteum* and *Coleataenia longifolia* that often concealed the beaksedge. Other plants reported in the immediate vicinity of *R. mesoatlantica* included *Cladium mariscoides*, *Eleocharis tenuis*, *Dichanthelium* sp., *Proserpinaca* sp., and *Sphagnum* sp. (NJNHP 2024).

Wetland Indicator Status

Rhynchospora mesoatlantica had not yet been described at the time that the last National Wetland Plant List was released (U. S. Army Corps of Engineers, 2020).

USDA Plants Code

The USDA has not yet assigned a code to *Rhynchospora mesoatlantica*. Based on their usual conventions, which use the first two letters of the genus and species names plus the next available tie-breaking number, the code for *R. mesoatlantica* is likely to be RHME4 (USDA NRCS 2024).

Coefficient of Conservancy (Walz et al. 2024)

CoC = 6. 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 global range of *Rhynchospora mesoatlantica* is limited to a very small area in the mid-Atlantic United States (POWO 2024). The map in Figure 1 depicts the known extent of the species. In the three states where it occurs the distribution of the *R. mesoatlantica* is restricted to the coastal plain (Weakley et al. 2024).

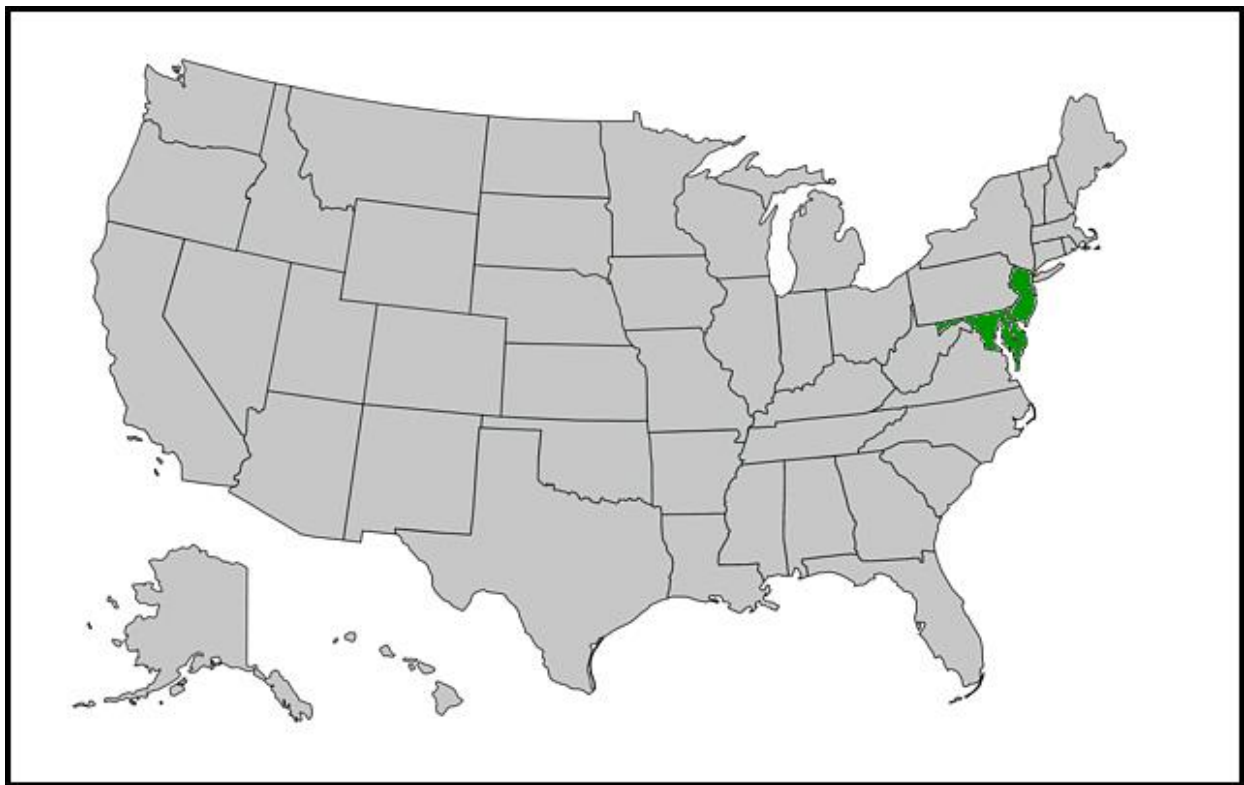


Figure 1. Distribution of *R. mesoatlantica* in the United States (source data from Eberly and Naczi 2023).

In New Jersey, *Rhynchospora mesoatlantica* is only known from Cape May County (Figure 2 below). It has also been documented in one county in Delaware and in three Maryland counties (Eberly and Naczi 2023).

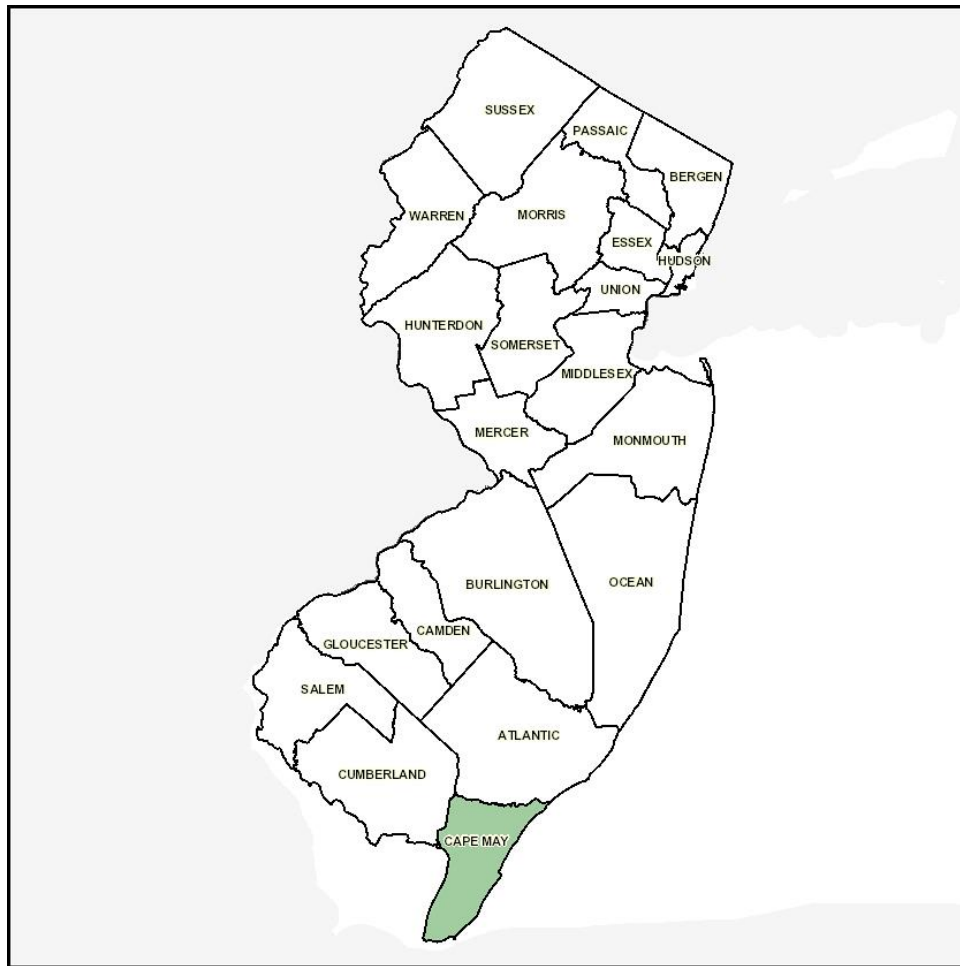


Figure 2. County records of *R. mesoatlantica* in New Jersey (source data from NJNHP 2022).

Conservation Status

Rhynchospora mesoatlantica is critically imperiled globally. The G1 rank means the species is at very high risk of extinction or collapse due to a very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors (NatureServe 2024). The map below (Figure 3) illustrates the conservation status of *R. mesoatlantica*. The sedge is critically imperiled (very high risk of extinction) in all three states where it occurs. Mid-Atlantic Beaksedge has been documented at a total of twelve locations throughout its range but only six of those occurrences have been seen during the present century despite repeated searches of the other historic sites (Eberly 2023, Eberly and Naczi 2023). Swanson (2023) described *R. mesoatlantica* as "imperiled from the moment of its discovery" because Eberly and Naczi had estimated that only about 700 plants were present throughout its entire range.

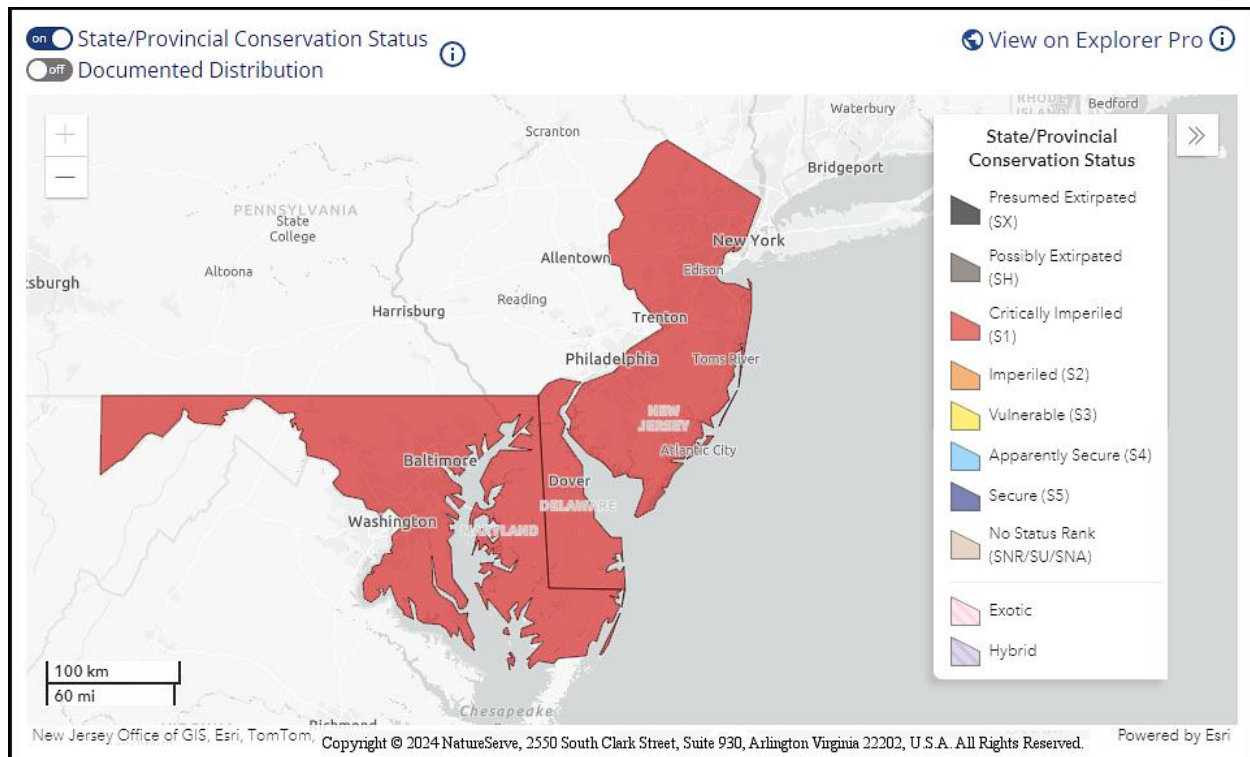


Figure 3. Conservation status of *R. mesoatlantica* in North America (NatureServe 2024).

Rhynchospora mesoatlantica is critically imperiled (S1) in New Jersey (NJNHP 2024). The 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. Mid-Atlantic Beaksedge 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).

Rhynchospora mesoatlantica was first documented in August 1899 with a specimen that Albert Commons collected in Delaware (Tatnall 1946) but a second collection was made in New Jersey only a year later (in August 1900) by Stewardson Brown (Stone 1911). The most recent collection of the sedge was also made in New Jersey, at a site discovered by Robert Moyer in 2015. Like all of the specimens cited in the recent description of *R. mesoatlantica* by Eberly and Naczi (2023), the collected sedges were initially identified as a different species. In New Jersey they were thought to be *R. filifolia*, which is also critically imperiled in the state. During 1960 Robert Hirst relocated the population that had been documented by Brown, but subsequent searches of the site have failed to turn up the rare sedge. The population discovered by Moyer is the only extant occurrence in New Jersey (NJNHP 2024) and it currently appears to be the largest known population anywhere (Eberly and Naczi 2023).

Threats

Factors that may contribute to the rarity of a plant species include its geographic range, habitat specificity, and local population size (Rabinowitz 1981). *Rhynchospora mesoatlantica* faces

constraints in all three categories. The sedge's geographic range is limited to six counties on or near the Delmarva Peninsula and its habitat is restricted to seasonal ponds, which are rare both within that region and elsewhere along the Atlantic coast (McAvoy and Bowman 2002, Walz et al. 2006). The extant occurrences of *R. mesoatlantica* are generally small and half of the colonies contain fewer than 100 plants (Eberly and Naczi 2023). By and large, plant populations that are small and isolated are more vulnerable to extinction as a result of random catastrophic events (Nunney and Campbell 1993, Traill et al. 2007).

The habitats utilized by *Rhynchospora mesoatlantica*—intermittent coastal plain ponds—are threatened in their own right. Many of the seasonal ponds on the coastal plain have been destroyed by anthropogenic activities: They were historically replaced with residential properties and recreational sites; eliminated by timbering and mining operations; and drained or flooded for various types of agriculture. Some estimates of coastal plain depression ponds losses exceed 90%. Even today the small, isolated ponds do not have the legal safeguards available to larger wetlands so threats from land conversion persist. Ponds that are situated on protected property can be altered or degraded by offsite activities that change local hydrologic patterns or introduce pollutants in runoff from adjacent properties. The suppression of natural fire regimes that normally keep succession in check can also eliminate the fragile communities (Kirkman et al. 1999, McAvoy and Bowman 2002, Tiner 2003, De Steven et al. 2006, Johnson and Walz 2013). Eberly and Naczi (2023) observed that the natural hydrologic conditions at most of the ponds supporting populations of *R. mesoatlantica* had previously been altered by ditching and draining, and the sites were slowly being colonized by woody vegetation.

Rhynchospora mesoatlantica is probably susceptible to some of the fungal pathogens that are known to affect other local members of the genus. The rust fungus *Uromyces rhynchosporae* was first described in New Jersey, where it was found on *R. glomerata* (Ellis 1893). Some types of *Uromyces* can complete their entire life cycle on a single plant species but others use alternate hosts—one of which is often a graminoid species (Jackson 1931). *U. rhynchosporae* can be hosted by a variety of *Rhynchospora* spp. The fungus causes the formation of small rust-colored pustules that become surrounded by yellow rings as cells in the adjacent tissue die. Severe *Uromyces* infections can lead to a reduction of photosynthetic capacity and a consequent decrease in overall plant performance (Gautam et al. 2022). The smut fungus *Ustanciosporium* (*Cintractia*) *montagnei* is a species complex with variations and intermediate forms. It has been documented on *R. fusca*, which appears to be closely related to *R. mesoatlantica*. *U. montagnei* and similar smuts can also affect some of the other beaksedges that occur in New Jersey. *Ustanciosporium* species infect the ovaries of the sedge plants, eventually filling the spikelets with a powdery blackish-brown spore mass (Clinton 1902, Ling 1950, Vánky 2010). Smut fungi that attack the floral parts of graminoid species generally destroy the seeds entirely (Fischer 1953).

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Rhynchospora mesoatlantica* populations to climate change. An attempt was made to assign the species 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 climactic conditions in accordance with the guidelines described by Young et al. (2016). Since Mid-Atlantic Beaksedge was only described recently there was not a sufficient amount of data available regarding the life history and ecological requirements of the species to make a meaningful assessment of its vulnerability.

Changing precipitation patterns and rising temperatures are leading to more frequent and prolonged droughts in New Jersey, as well as unpredictable flooding events (Hill et al. 2020). The natural hydrologic cycles of intermittent coastal plain ponds are likely to be affected by the shifting conditions. However, plant communities in the ponds could remain relatively stable because many of the species that utilize the habitats are tolerant of periodic inundation or desiccation (Johnson and Walz 2013). Climate change vulnerability assessments for 17 rare New Jersey plants that occur in coastal plain intermittent ponds were conducted by Ring et al. (2013) and the highly varied results indicated that the responses of individual species were more closely aligned with their life history characteristics than with the habitat type. Nevertheless, some of the effects of climate change are likely to exacerbate existing stresses on the fragile communities. De Steven et al. (2006) found that lengthy droughts in depression wetlands favored the establishment and persistence of woody species. In sites where the water table has already been lowered by anthropogenic activities, prolonged droughts could hasten the replacement of characteristic seasonal pond flora with native woody plants or facilitate the establishment of invasive species.

Management Summary and Recommendations

Little is known about *Rhynchospora mesoatlantica*. Research will be required in order to develop a solid foundation for management of the globally imperiled beaksedge. For example, Eberly and Naczi (2023) noted the need to gain an understanding of the strategies utilized by *R. mesoatlantica* to persist when conditions are unfavorable. Unfortunately, opportunities for extensive study of the species may be limited by its scarcity.

Initial conservation efforts should be focused on habitat management and protection. Active intervention is needed to assure that suitable sites will remain available for *Rhynchospora mesoatlantica* (Eberly and Naczi 2023). An investment in the preservation of seasonal coastal plain ponds will simultaneously benefit Mid-Atlantic Beaksedge and numerous other rare plant and animal species that utilize the habitats in New Jersey and on the Delmarva Peninsula (McAvoy and Bowman 2002, Walz et al. 2006). De Steven et al. (2006) demonstrated that some South Carolina coastal plain ponds where the hydrology had been altered could successfully be restored, although their efforts also highlighted some pitfalls that may be encountered during the process. The creation of comparable habitat in new locations might also be an option. Zampella and Laidig (2003) found that manmade ponds could become functionally equivalent to natural coastal plain ponds under the right circumstances. The manmade ponds in their study had been excavated for commercial purposes and later abandoned, so if ponds were deliberately designed to replicate the features of naturally occurring *R. mesoatlantica* habitats and monitored closely during the colonization phase there could be a reasonable probability of success.

Synonyms

The accepted botanical name of the species is *Rhynchospora mesoatlantica* A. Eberly & Naczi. Orthographic variants, synonyms, and common names are listed below (POWO 2024, Weakley et al. 2024).

Botanical Synonyms

Common Names

Mid-Atlantic Beaksedge

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