

Utricularia olivacea

Dwarf White Bladderwort

Lentibulariaceae



Utricularia olivacea by anhinga0, 2021

***Utricularia olivacea* Rare Plant Profile**

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

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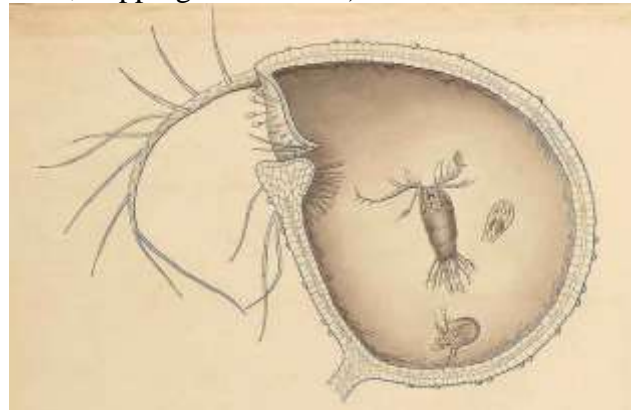
Life History

Utricularia olivacea (Dwarf White Bladderwort) may be the smallest by weight of any flowering plant in the world (Schnell 2002). The plant is an aquatic annual with no true roots, having instead threadlike stolons which are often intermingled with other aquatic vegetation (Glidden 2000, Schnell 2002). The species also lacks leaves, having only the small bladders characteristic of the genus along its branching stolons (Allen 1958, Taylor 1991). The white flowers of *U. olivacea* are also minute (1–2.5 mm), arising on pedicels up to 10 mm in height (Schnell 2002). Details of the tiny flowers are hard to appreciate, even with a hand lens, but sufficient magnification will reveal faint yellow veins and purple anthers (Glidden 2000). The flowers are usually solitary (Allen 1958), although as many as five per stem have been reported (Anderson 2000).

Utricularia olivacea may be extremely difficult to identify in its vegetative state, particularly when growing in a tangle with other *Utricularia* spp. (Schnell 2002). If the plant can be isolated from associated species, vegetative specimens may be distinguished from other North American bladderworts by the complete absence of leaves (Taylor 1991). When in bloom, the tiny white flowers readily separate the species from all other bladderworts in the region (Schnell 2002, Weakley 2015). Flowering on the coastal plain occurs between August and October, but may take place from November through March in Florida (Hough 1983, Schnell 2002). Even while in flower, however, the diminutive plants are easily overlooked (Les 2017). Frank Hirst discovered the New Jersey population after noticing "a group of tiny stalks with pinhead-like tips" (McAvoy 2011). Glidden (2000) remarked that at first glance the plants were "not too striking" and noted that they resembled "tiny bits of crumbled white styrofoam covering the algae."

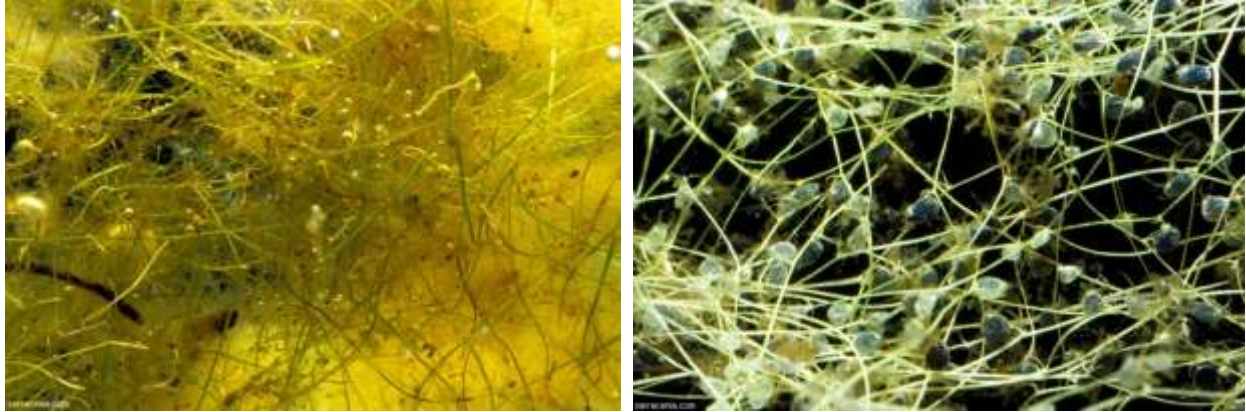
Bladderworts (*Utricularia* spp.) are carnivorous plants that consume a variety of tiny aquatic animals by means of little suction traps (bladders) which are attached to their branches or stolons by short stalks. Each bladder has a "door" with a watertight seal that controls the pressure inside the chamber, and the walls of an empty bladder are slightly inverted. Bristles around the opening direct potential prey items toward the entrance. When a small animal brushes against a set of trigger hairs near the door it flies open, drawing in water and the prey item then rapidly reclosing. Once inside, a captured animal succumbs to anoxia and is

dissolved by digestive enzymes while excess water is pumped out and the trap is reset (Schnell 2002, Poppinga et al. 2015).



A *Utricularia* bladder (Schilthuis undated).

There are hundreds of species of *Utricularia* worldwide which have been further subdivided into 3 subgenera and 35 sections based on morphological characteristics. *Utricularia olivacea* belongs to subgenus *Utricularia*, section *Utricularia* (Rice 2021). A detailed description of trap function in section *Utricularia* is provided by Poppinga et al. (2015).



Tangle of threadlike stolons and bladders on *Utricularia olivacea*, photos by Barry Rice, 2009.

Pollinator Dynamics

No studies of the reproductive biology of *Utricularia olivacea* were found. The genus *Utricularia* is often presumed to be cross-fertilized by insects based on flower structure, and Zomlefer (1994) suggested that the wide lower lip of bladderwort flowers serves as a landing platform for pollinators. However, the pollination mechanisms of *Utricularia* in general have not been well documented (Schnell 2002), and the few species that have been investigated were found to be self-compatible and often self-pollinating (Les 2017). Schnell (2002) observed that *Utricularia olivacea* was visited by small midges and gnatlike flying insects, but was not certain that fertilization resulted from those interactions.

Seed Dispersal

Species in the Lentibulariaceae have capsular fruits (Fernald 1950). The capsules of *Utricularia olivacea* are elongate, indehiscent, and one-seeded (Taylor 1991). A single seed is about 0.5 mm long (Les 2017). Although dispersal in the species has not been studied, it seems likely that the small capsules are locally dispersed by gravity or water. Beal and Quay (1968) put forth a convincing argument for long distance dispersal by birds, suggesting that seeds and plant fragments adhere to the feet, legs and feathers of waterfowl, herons, and shorebirds and are thus transported to new locations. Bird-mediated distribution would certainly explain how New Jersey's isolated population of the tiny plant became established so far beyond the normal range of the species.

The length of time for which *Utricularia olivacea* seeds can remain viable is unknown. Some extended viability may be inferred from monitoring records: The species has been noted as absent or nonflowering during years when circumstances are unsuitable but rapidly returns under favorable conditions (Cavileer and Gallegos 1982, NJNHP 2022). Since *U. olivacea* is an annual plant with no means of persisting through the winter, it may be assumed that the regeneration is attributable to dormant seeds.

Habitat

Throughout its range, *Utricularia olivacea* has been reported in a number of habitats including borrow pits, depressions, ditches, lakes, ponds, streams and swamps (Les 2017). The New Jersey population occurs in a coastal plain intermittent pond with seasonally fluctuating water levels (Cavileer and Gallegos 1982, NJNHP 2022). Coastal plain intermittent ponds are shallow, isolated depressions in well-drained soils that replenish their water supply mainly through precipitation or subsurface flow (Kirkman et al. 1999).

Favorable water levels for the species are judged by the conditions in which the plants have been found in bloom. *Utricularia olivacea* is most often recorded in shallow water or on wet, muddy substrate. Anderson (2000) reported that the plants were usually in shallow water although they could occasionally occur on the surface of deep (6 meter) ponds, and that the species was most likely to flower when stranded on muddy soil. Beal and Quay (1968) described the habitat of a North Carolina population as a shallow, spring-fed, permanent pond. One Florida colony was found in an old road rut with water levels varying from a few centimeters to a meter, and the observer noted that all of the *U. olivacea* plants were growing along the edge where there was just enough water to hold them a few centimeters above the substrate (Glidden 2000). Following a New Jersey study of rare plants in coastal plain ponds, Cavileer and Gallegos (1982) concluded that the Dwarf White Bladderwort benefitted from low (< 6 cm) water levels as it was not seen during years when heavy precipitation had increased the pond depth. Although nonflowering occurrences in deeper water cannot be ruled out due to the difficulty of finding and identifying the species in its vegetative state, emergence without reproduction would not be a beneficial strategy for an annual plant. *U. olivacea* has also failed to appear during drought years when the substrate became completely dry (NJNIHP 2022).

Wetland Indicator Status

Utricularia olivacea is an obligate wetland species, meaning that it almost always occurs in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2022)

UTOL

Coefficient of Conservatism (Walz et al., 2018)

CoC = 10. Criteria for a value of 9 to 10: Native with a narrow range of ecological tolerances, high fidelity to particular habitat conditions, and sensitive to anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

The worldwide range of *Utricularia olivacea* extends from the southeastern United States to central South America (POWO 2022). The map in Figure 1 depicts the extent of the Dwarf White Bladderwort in North America.

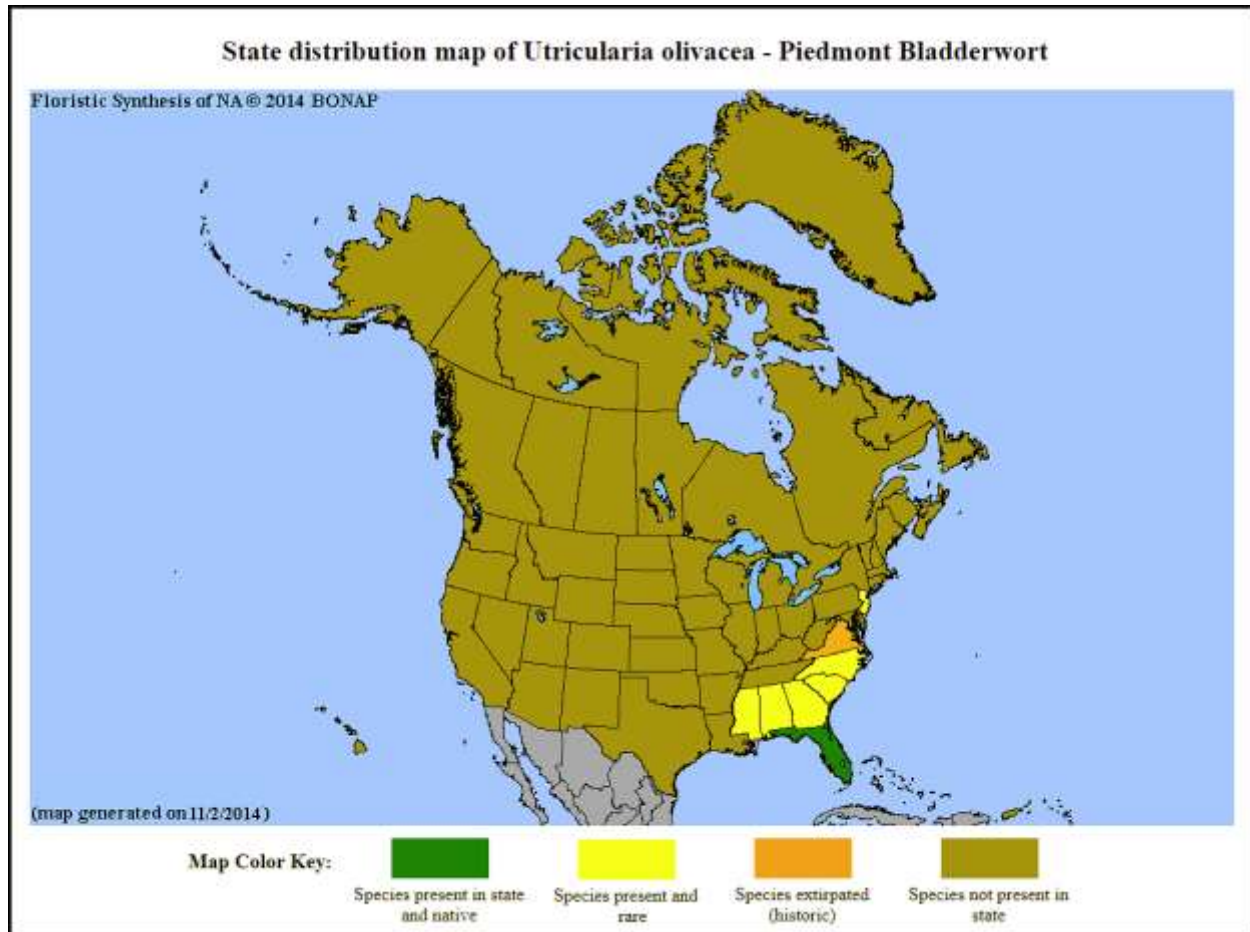


Figure 1. Distribution of *U. olivacea* in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2022) shows a record of *Utricularia olivacea* in Atlantic County, New Jersey (Figure 2 below). The New Jersey occurrence currently represents the northernmost global record of the species, and *U. olivacea* has not been documented in any adjacent states.

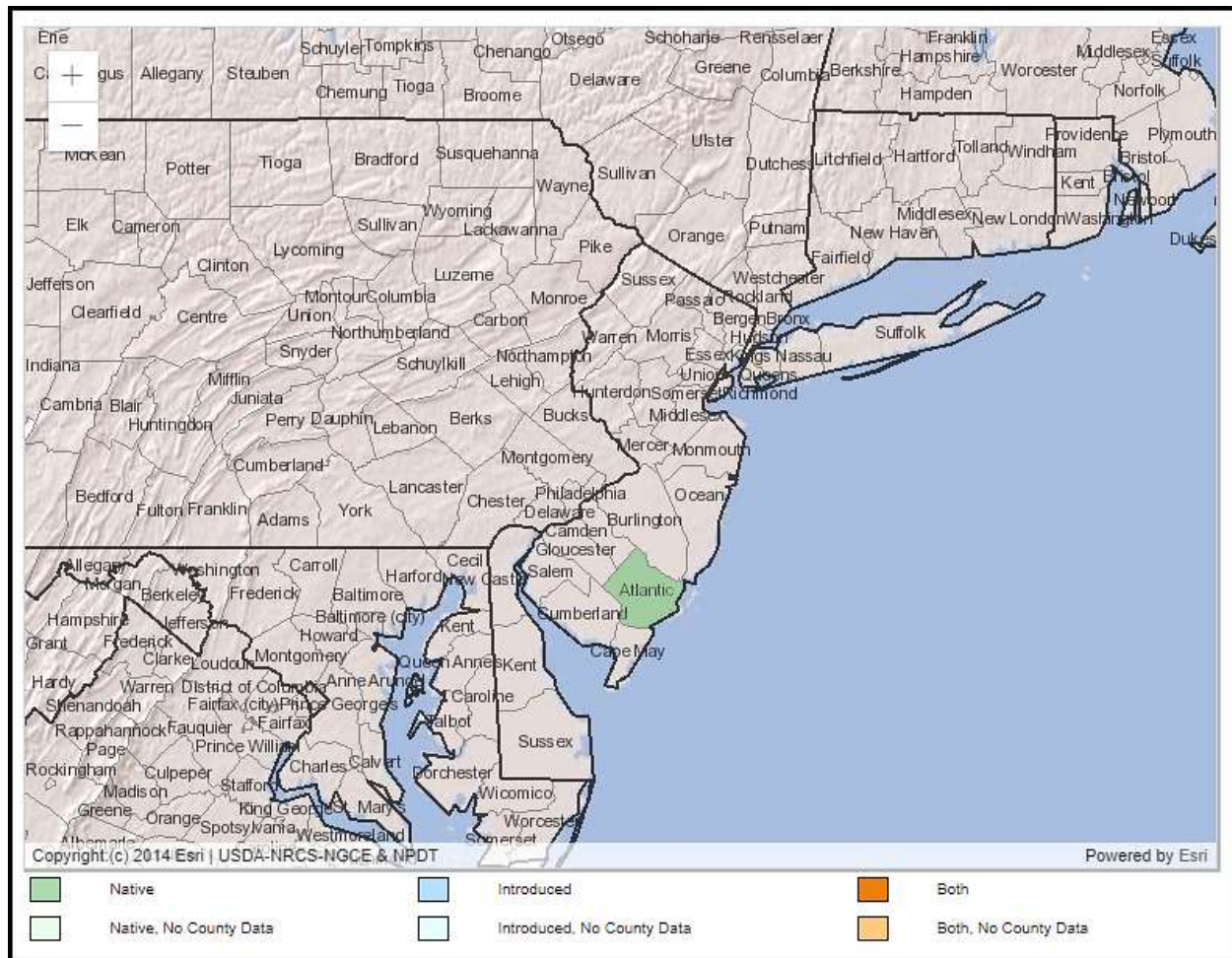


Figure 2. County records of *U. olivacea* in New Jersey and vicinity (USDA NRCS 2022).

Conservation Status

Utricularia olivacea is apparently secure at a global scale. The G4 rank means the species is at fairly low risk of extinction or collapse due to an extensive range and/or many populations or occurrences, although there is some cause for concern as a result of local recent declines, threats, or other factors (NatureServe 2022). In North America, *U. olivacea* has been identified as a plant species of highest conservation priority for the North Atlantic region, which includes four Canadian provinces and twelve U. S. states. The species has a regional rank of R1 (critically imperiled), signifying a very high risk of extinction (Frances 2017).

The map below (Figure 3) illustrates the conservation status of Dwarf White Bladderwort throughout the United States. It is shown as critically imperiled (very high risk of extinction) in four states, imperiled (high risk of extinction) in two states, and possibly extirpated in North Carolina; however, the plant seems to be persisting in North Carolina where it is currently listed as imperiled (Wichmann 2021). The species is unranked in Florida.

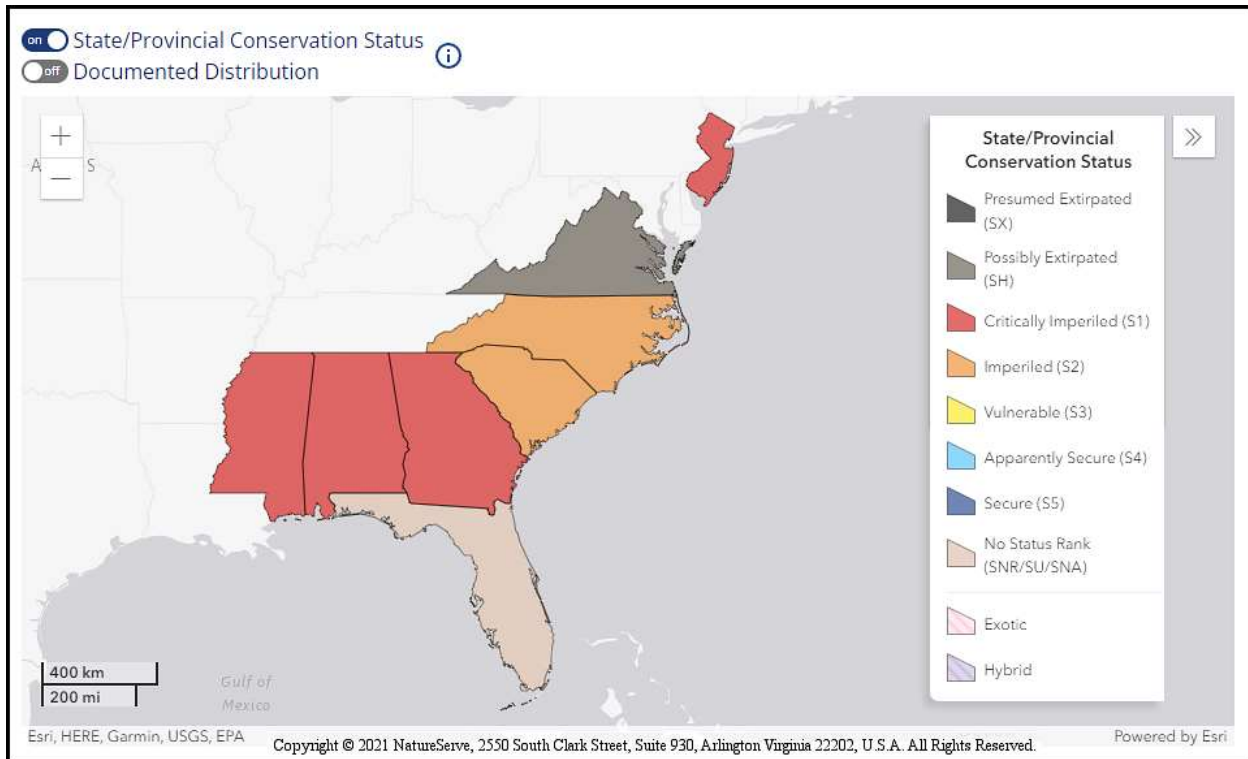


Figure 3. Conservation status of *U. olivacea* in North America (NatureServe 2022).

Utricularia olivacea is ranked S1.1 in New Jersey (NJNHP 2022), meaning that it is critically imperiled due to extreme rarity. An S1.1 rank means that the species has only ever been documented at a single location in the state. Dwarf White Bladderwort is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of extinction in the state. Although the presence of endangered flora may restrict development in certain communities such as wetlands or coastal habitats, being listed does not currently provide broad statewide protection for plants. Additional regional status codes assigned to the bladderwort signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and in the New Jersey Pinelands (LP) (NJNHP 2010).

The sole New Jersey population of *U. olivacea* was first discovered in New Jersey by the Hirst brothers in 1957 (McAvoy 2011). The plants were described in detail by Ruth McVaugh Allen (1958) and subsequently identified by Edgar T. Wherry. The bladderwort was included on a list of Endangered Pinelands species by Calazza and Fairbrothers (1980), who noted it as a disjunct occurrence north of *Utricularia olivacea*'s usual range. Based on the most recent available data, the estimated viability of the population is presently ranked as 'Good' (NJNHP 2022).

Threats

Although coastal plain intermittent ponds are a unique habitat type utilized by an assortment of rare flora and fauna species, they enjoy only limited regulatory protections in comparison with many other wetland types (Kirkman et al. 1999). Primary threats to the fragile ecosystems include changes to their natural hydrologic regimes or water quality, and some have been

severely impacted or eliminated by resource extraction or agriculture (Johnson and Walz 2013). The New Jersey occurrence of *Utricularia olivacea* could be threatened by long-term flooding or drying of its habitat.

Like many carnivorous plants, *Utricularia olivacea* is adapted to thrive in low pH environments with limited nutrient availability. *U. olivacea* has demonstrated some tolerance for the enrichment of aquatic environments, sometimes even forming dense mats in response (Les 2017). Over the long term, however, eutrophication of wetlands in the Pine Barrens typically leads to the replacement of characteristic native flora with common non-pinelands species (Morgan and Philipp 1986).

In a review of climate change risk factors for New Jersey species in coastal plain intermittent ponds, *Utricularia olivacea* was scored as Presumed Stable, meaning that available evidence did not forecast a substantial change in the species' abundance by 2050 (Ring et al. 2013). However, the models most often utilized to evaluate species vulnerability are not particularly well-suited to carnivorous plants according to Fitzpatrick and Ellison (2018). Looking specifically at carnivorous plants, Fitzpatrick and Ellison computed a measure they termed 'bioclimactic velocity' to evaluate potential changes in availability of climatically suitable habitat. *Utricularia olivacea* fared poorly with their model, having the lowest measure ($-4.62 \text{ km year}^{-1}$)—and therefore the greatest vulnerability—of all 180 species to which the projection was applied. Negative velocity measures indicated that most of the locations where the plants had been observed were projected to decrease in suitability, forcing the species to migrate or face possible local extinctions.

Management Summary and Recommendations

At one time, it was thought that *Utricularia olivacea* was a fairly recent arrival to North America that would continue expanding its range northward (Beal and Quay 1968). Unfortunately that does not seem to be the case, as the Dwarf White Bladderwort is now imperiled in all but one of the states where it has been recorded. Protection of extant occurrences is key to the future of the species in the United States. In addition to assuring that sites where the species occurs are not eliminated or destroyed, conservation measures also need to assure that its habitats remain stable in terms of water regime and quality. Management strategies might include land acquisition, establishment of buffers, and cooperative efforts with owners of neighboring parcels in order to prevent impacts from hydrologic changes, erosion, siltation, and the introduction of pollutants that could alter pH or otherwise reduce water quality. Depending on the site characteristics, measures may be needed to deter human activities that could directly damage the plants or habitat such as off-road vehicle use or trampling.

Although no specific problems have been identified at the New Jersey site, the occurrence should be monitored on a regular basis to detect emerging threats and assure ongoing stability of the population and its habitat. Additional information about *Utricularia olivacea* is needed, and Les (2017) has recommended a comprehensive life history study of the species. Research on aspects of the bladderwort's reproductive biology such as pollination mechanisms, dispersal, and seed

longevity would provide a better basis for development of short and long term management goals.

Synonyms

The accepted botanical name of the species is *Utricularia olivacea* C. Wright ex Grisebach. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, USDA 2022, Beal and Quay 1968, Weakley 2015, Anderson 2000, POWO 2022).

Botanical Synonyms

Biovularia olivacea (C. Wright) Kamienski
Utricularia minima Warming
Biovularia minima (Warm.) Kamienski
Biovularia brasiliensis Kuhl.

Common Names

Dwarf White Bladderwort
Piedmont Bladderwort
Minute Bladderwort
Pygmy Bladderwort

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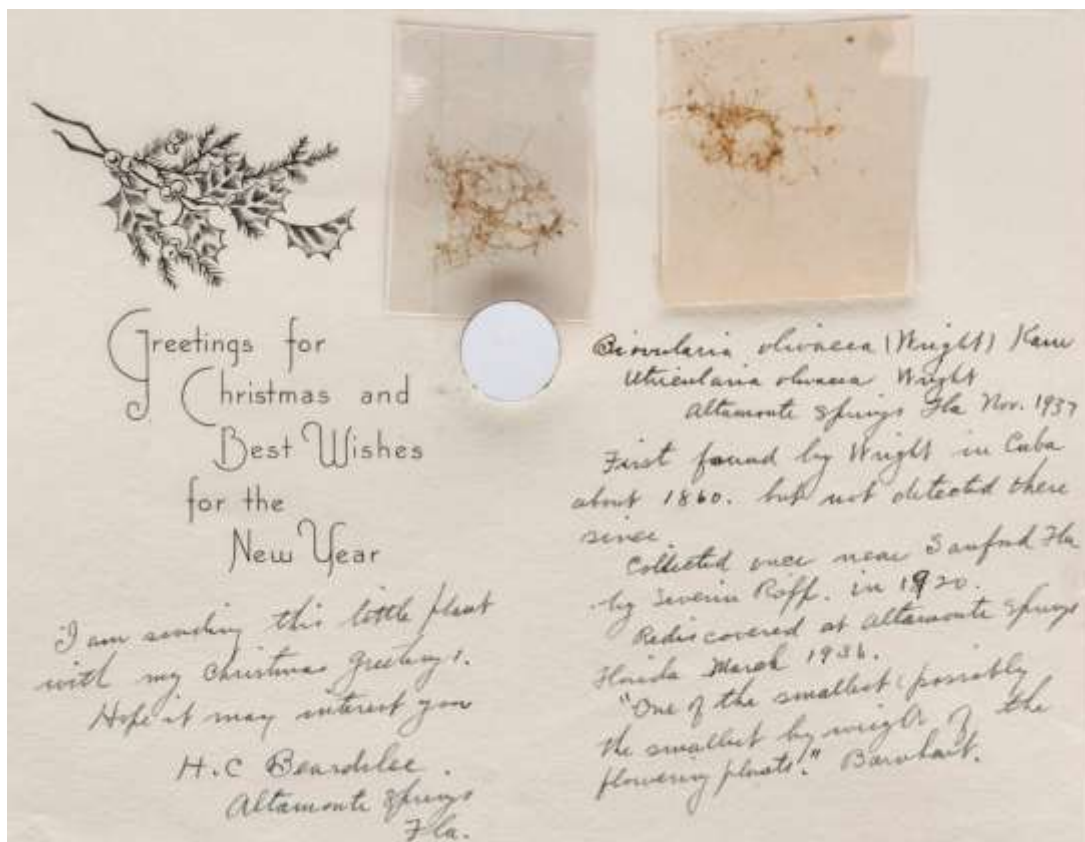
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1937 specimens, courtesy of the University of Florida Herbarium.