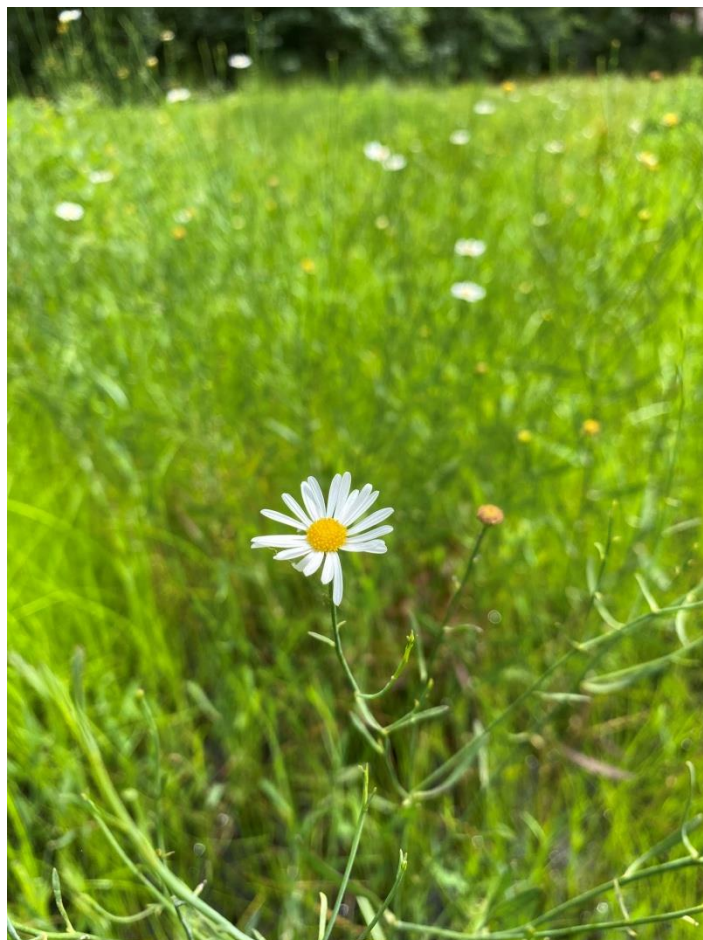


Boltonia asteroides var. *glastifolia*

Southern Boltonia

Asteraceae



Boltonia asteroides var. *glastifolia* by Bonnie Semmling, 2020

***Boltonia asteroides* var. *glastifolia* 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

Boltonia asteroides var. *glastifolia* (Southern Boltonia) is a perennial herb in the Asteraceae. It is the only one of the four recognized varieties of *Boltonia asteroides* that is native to New Jersey, although *B. asteroides* var. *recognita* has been introduced in the state (Townsend 2013, Kartesz 2015, NatureServe 2024). Some sources do not make a distinction between the varieties of *B. asteroides* (see Synonyms and Taxonomy section).



Left: *Boltonia asteroides* (no variety) by Britton and Brown 1913, courtesy USDA NRCS 2024a.
Right: *B. asteroides* var. *glastifolia*, J. S. Dodds 2020.

Boltonia plants have smooth, erect, branched stems. Their basal leaves disappear by flowering time, and the stem leaves are alternate and stalkless. The stems of *Boltonia asteroides* var. *glastifolia* can be up to 1.2 meters tall, and the leaves are narrow and somewhat leathery. The variety reproduces clonally via long (up to 35 cm) stolons. As with many other members of the aster family, *Boltonia* flowers are composite heads of both ray and disc florets. The bracts at the base of the flower heads (phyllaries) are linear to lanceolate in *B. asteroides* var. *glastifolia*, whereas they are oblanceolate in *B. asteroides* var. *recognita*. The disc florets of *B. asteroides* var. *glastifolia* are yellow and the 20–60 ray florets are white or pale purple and 8–13 mm long. The achenes are 1–3 mm in length and usually winged, and they have two distinct awns that are 0.4–1.2 mm long. (See Fernald 1940 & 1950, Townsend 2013, Karaman-Castro and Urbatsch 2020, Weakley et al. 2022). In New Jersey, *Boltonia asteroides* var. *glastifolia* usually blooms from mid-August through September. Fruits may be present throughout the fall (Stone 1911, NJNHP 2024).



B. asteroides var. *glastifolia*, Bonnie Semmling, 2020.

Pollinator Dynamics

Within the large composite family, *Boltonia asteroides* has been placed in Section Astereae (Karaman-Castro and Urbatsch 2020). Both the disc and ray flowers of species in that section are generally fertile but only the disc flowers have anthers and the two types of florets have different styles (Jones 1976). The styles of disc flowers have pollen-collecting hairs and curve inward (outer surfaces turned upward) while those of ray flowers lack appendages and curve outward (outer surfaces turned downward). Jones observed this in *Boltonia* and many other species in the Astereae but not in other sections of the family. Some members of the Astereae are self-incompatible (Jones 1976) but the majority of species in the section that were tested by Ferrer and Good-Avila (2007) were not. Self-fertilization has been documented in *Boltonia decurrens* (DeWoody et al. 2004).

Cross-fertilization of *Boltonia* flowers is carried out by insects and *B. asteroides* is not lacking for pollinators. Robertson (1929) observed a wide variety of visitors to the blooms of *B. asteroides* including numerous bees, wasps, flies, butterflies, and beetles. Webb (2008) indicated that bees and wasps were the primary pollinators. The species names of two bees (*Melissodes boltoniae* and *Perdita boltoniae*) suggest that they favor *Boltonia* flowers but they are also known to visit many other species in the Aster family (Fowler and Droege 2020, Hilty 2020). Additional species of *Melissodes*, *Megachile*, and *Anthophorula* also pollinate *B. asteroides* (Owens et al. 2018) and some syrphid flies (*Eristalis dimidiata*, *Spilomyia*

longicornis) were collected on the flowers during a recent pollination study by Chisausky et al. (2020).

Seed Dispersal and Establishment

Boltonia differs from many close relatives in the Asteraceae in having awns rather than hairs on the achenes, so instead of being transported by wind the propagules of *B. asteroides* are primarily dispersed by gravity or by water (Hudson 1972, Hilty 2020). The awns might also facilitate dispersal by adhering to the fur or feathers of passing animals (Howe and Smallwood 1982).

The seeds of a related perennial species, *Boltonia decurrens*, are capable of sprouting immediately but peak germination usually occurs during the first spring following dispersal (Baskin and Baskin 1988). When *B. decurrens* seedlings become established in the fall they winter over as rosettes. Both fall and spring-germinated seedlings may flower the first year or persist as rosettes until conditions are suitable for reproduction (Smith and Keevin 1998). A Kentucky study which included an unspecified variety of *Boltonia asteroides* indicated that germination rates could be inhibited by high temperatures and low soil moisture (Hall et al. 2009). The seeds of *Boltonia asteroides* var. *glastifolia* are able to persist in the ground until circumstances are favorable for germination—seedlings emerged from soils collected in Carolina Bays (Poiani and Dixon 1995) and some New Jersey populations have been known to temporarily disappear and then regenerate from the seed bank in response to environmental cues (NJNHP 2024).

Habitat

Fernald (1940) indicated that *Boltonia asteroides* var. *glastifolia* was associated with fresh tidal marshes and shores from southern New Jersey to Louisiana. The majority of eastern populations are located in intermittent ponds on the coastal plain, also known as Carolina Bays (Clancy 1993, McAvoy and Bowman 2002, LeGrand 2005, Johnson and Walz 2013, NJNHP 2024). Such habitats are shallow, seasonally wet depressions. They are typically flooded in the spring and dry in the fall, although the hydrology can vary from one year to the next depending on local groundwater conditions (McAvoy and Wilson 2014).

Bayard Long, who first documented *Boltonia asteroides* var. *glastifolia* in New Jersey, observed that the communities where the species occurred supported an interesting assortment of rare flora to the state (Long 1911, 1928) and similar observations have been made in Delaware (Clancy 1993, McAvoy and Wilson 2014). That vegetative association, known as Cape May—Delmarva Depression Meadow, is extremely rare in New Jersey (Breden et al. 2001). Clancy (1993) noted that comparable communities could sometimes develop at excavated sites. In the southeast, associations of rare species that include *B. asteroides* var. *glastifolia* may be also found in Pond Cypress Savannas or Natural Lake Shoreline Swamps (Sutter and Kral 1994, Howell et al. 2016). Carr (1939) described the habitat of a Virginia occurrence as a low meadow resembling a shallow basin.

In states along the gulf coast, *Boltonia asteroides* var. *glastifolia* may be found in either fresh or brackish marshes and it is a characteristic species of wet coastal prairies (Harper 1913, Eleuterius 1972, Smith 1996). Mississippi occurrences have also been documented along a disturbed riverside and in a fallow field (Carter et al. 1990). One Louisiana prairie studied by Grace et al. (2000) featured a high density of mima mounds, which are raised areas of disputed geologic origin that are about 0.5–1 meter high and 5–10 meters wide. *B. asteroides* was significantly more frequent in between the mounds than upon them.

Wetland Indicator Status

Boltonia asteroides is a facultative wetland species in New Jersey, meaning that it usually occurs in wetlands but may occur in nonwetlands. It is considered an obligate wetland species in some other parts of the country (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2024b)

The USDA code for *Boltonia asteroides* var. *glastifolia* is BOASG, although the USDA currently treats it as a synonym of *Boltonia asteroides* var. *asteroides* (BOASA).

Coefficient of Conservancy (Walz et al. 2020)

CoC = 9. 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 native global range of *Boltonia asteroides* var. *glastifolia* is restricted to the United States (Kartesz 2015, Weakley et al. 2022). The map in Figure 1 depicts the extent of *B. asteroides* var. *glastifolia* in North America. *Boltonia asteroides* has also been reported as an introduced species on the island of Java in Indonesia (POWO 2024) but it is not clear which variety has established there due to nomenclatural inconsistencies.

The map in Figure 2 shows the known distribution of *B. asteroides* var. *glastifolia* in the New Jersey. The records include both historic and current observations.

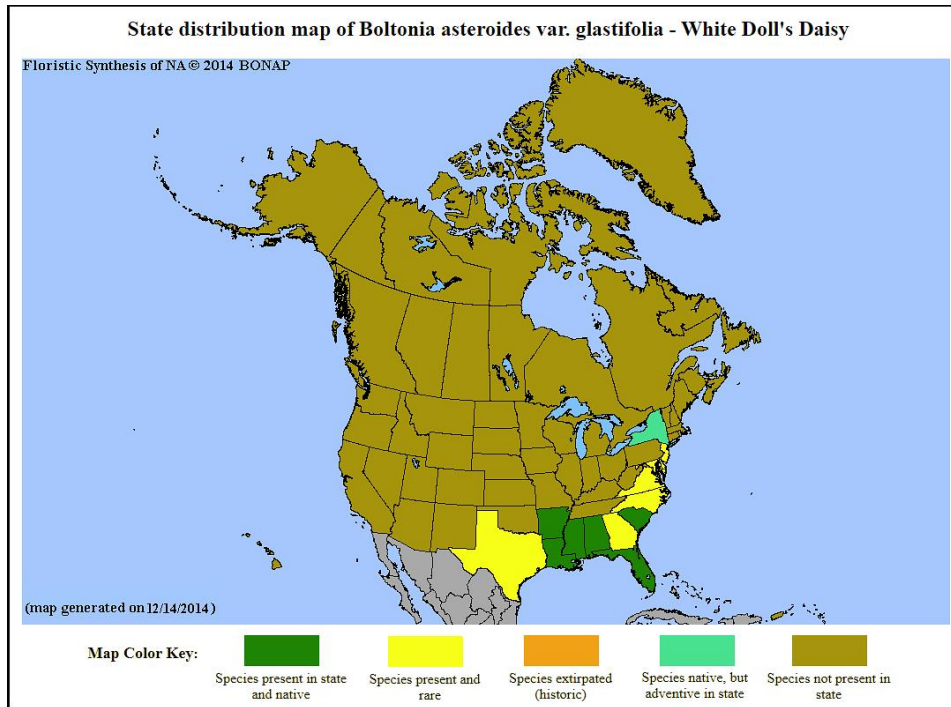


Figure 1. Distribution of *B. asteroides* var. *glastifolia* in North America, adapted from BONAP (Kartesz 2015).

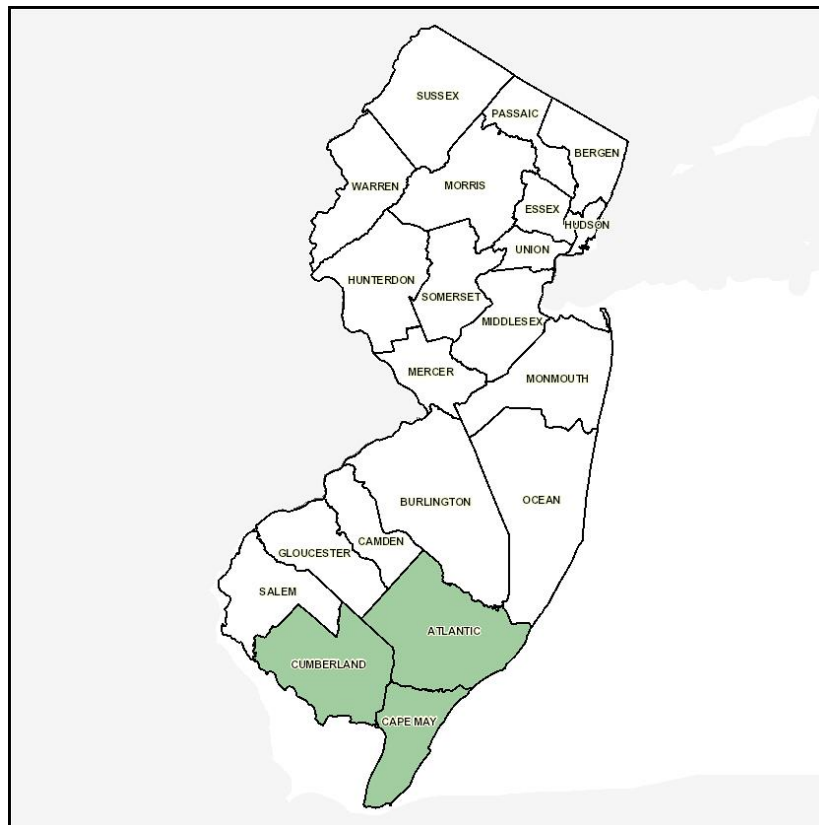


Figure 2. County records of *B. asteroides* var. *glastifolia* in New Jersey (source data from NJNHP 2024).

Conservation Status

Boltonia asteroides is considered globally secure at the species level. 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. However, there are four named varieties of *B. asteroides*. *B. asteroides* var. *glastifolia* is tracked by NatureServe but the variety has not yet been ranked because it is pending final recognition (NatureServe 2024). The map below (Figure 3) illustrates the conservation status of *Boltonia asteroides* var. *glastifolia* throughout a portion of its range. The incomplete map may be due to uncertainty regarding the status of the variety (see Synonyms and Taxonomy section). *Boltonia asteroides* var. *glastifolia* is listed as imperiled (high risk of extinction) in four states and critically imperiled (very high risk of extinction) in two states. *B. asteroides* var. *glastifolia* has also 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 R2 (imperiled), signifying a high risk of extinction (Frances 2017).

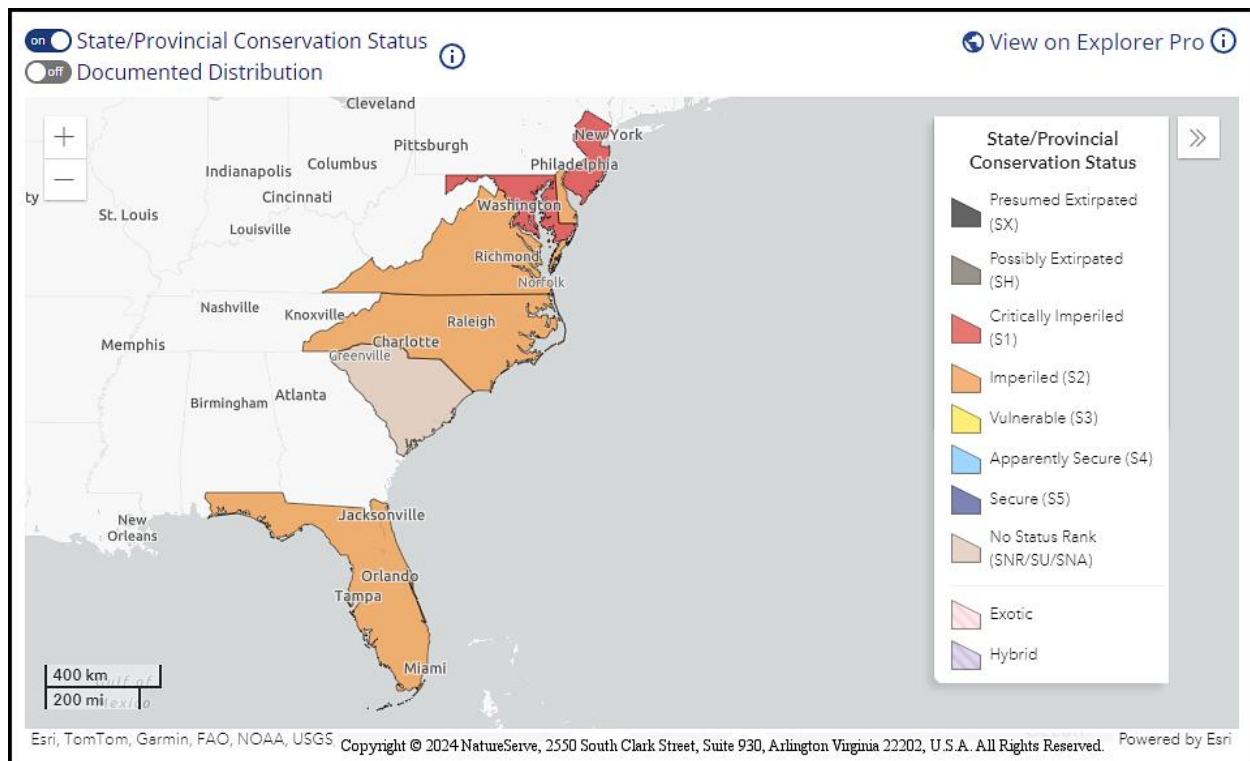


Figure 3. Conservation status of *B. asteroides* var. *glastifolia* in North America (NatureServe 2024).

Boltonia asteroides var. *glastifolia* 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. *B. asteroides* var. *glastifolia* 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 the plants. Additional regional status codes assigned to *B. asteroides* var. *glastifolia* signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

Boltonia asteroides var. *glastifolia* has been present in New Jersey for more than a century (Stone 1911), although earlier floras did not recognize the variety and also included the species now known as *B. montana* in *B. asteroides* (eg. Taylor 1915, Hough 1983). During the early 1900s specimens of *B. asteroides* var. *glastifolia* were collected in Atlantic, Cape May, and Cumberland counties but by the end of that century the species was primarily known from Cape May County (Breden et al. 2006, NJNHP 2024), with one additional site in Cumberland County noted by Moore et al. (2016). Two vigorous populations are currently extant and another small occurrence may still be persisting (NJNHP 2024).

Threats

Eastern populations of *Boltonia asteroides* var. *glastifolia* are exceptionally vulnerable to habitat loss. The majority of occurrences are situated in intermittent coastal plain ponds, which are rare throughout their range (Johnson and Walz 2013) and have been identified as one of the most threatened ecosystems on the Delmarva peninsula (McAvoy and Bowman 2002). Sutter and Kral (1994) noted that the Pond Cypress savannas which are utilized by the species in the southeast are one of the most threatened non-alluvial wetland communities in that region. *B. asteroides* var. *glastifolia* and the other rare plants that occupy the unique habitats are dependent on regular fluctuations in the water level and/or other periodic disturbances (eg. burning) to maintain an open canopy and discourage the establishment of more competitive species. Consequently, changes to the natural hydrological or fire regimes that alter the vegetative composition of the sites can eliminate the habitat specialists (Sutter and Kral 1994, LeGrand 2005, Johnson and Walz 2013). One New Jersey population of *B. asteroides* var. *glastifolia* was noted to be faring poorly following the proliferation of woody plants in an overly dry pond (NJNHP 2024).

Boltonia asteroides var. *glastifolia* does not seem to be particularly susceptible to herbivory or disease. *B. asteroides* is one of the larval food plants of a leaf-mining beetle (*Microrhopala xerene*) that occurs throughout many eastern states, but the insect uses multiple hosts in the Asteraceae and is unlikely to have a significant impact on plant populations (Hilty 2020, BugGuide 2024). Arthur (1903) reported that attempts to infect *B. asteroides* with various rust fungi were unsuccessful.

Climate Change Vulnerability

In New Jersey *Boltonia asteroides* var. *glastifolia* is considered highly vulnerable to climate change, meaning that it is likely to significantly decrease in abundance and/or range extent by 2050 (Ring et al. 2013). New Jersey is already experiencing rising temperatures, increasingly intense storms, and more extreme weather patterns that are resulting in prolonged periods of

flooding or drought (Hill et al. 2020). As previously noted, the coastal plain pond communities utilized by the species are particularly susceptible to long-term changes in hydrology. While *B. asteroides* var. *glastifolia* can tolerate periodic inundation or desiccation it is not clear whether the plants can withstand such conditions for extended periods of time. Studies of other varieties have reported drought tolerance (McDonald 1935, Prevete et al. 2000) and an implied loss due to permanent flooding (Miller 1990). As the climate continues to warm, some of New Jersey's coastal wetlands will also be exposed to higher levels of salinity due to rising seas and more frequent inland flooding from storms (Hill et al. 2020). Although *B. asteroides* var. *glastifolia* has been known to occur in some brackish habitats, the extent of its salinity tolerance is presently unknown.

Management Summary and Recommendations

Conservation of *Boltonia asteroides* var. *glastifolia* in New Jersey and other eastern states is dependent upon the preservation of its fragile wetland habitats. Maintenance of the natural water regime is essential so land acquisition initiatives should include large enough buffers to keep water quantity and quality within normal limits. It is also necessary to keep the canopy open, which may be accomplished by selective cutting or burning (LeGrand 2005, Johnson and Walz 2013). The timing and frequency of disturbance events is an important consideration and the needs of all species in the community must be weighed. For example, a New Jersey habitat was once mowed by the landowner during early September before the *Boltonia* had a chance to set seed (NJNHP 2024). The North Carolina cypress savannas where the species occurs have a natural fire interval of 20+ years (Sutter and Kral 1994).

Boltonia asteroides var. *glastifolia* was found to be abundant at two New Jersey sites in 2023 but another occurrence that previously appeared to be declining as a result of woody succession has not been observed since 1988. An updated monitoring visit to the latter location is recommended, along with the development of a site-specific management plan if the species is still present. An effort should also be made to ascertain the current status of the Cumberland County occurrence. Where habitat remains suitable *B. asteroides* var. *glastifolia* is likely to persist: Despite periodic fluctuations in population size one of New Jersey's most vigorous occurrences has maintained a presence at the same site since 1907 (NJNHP 2024).

Additional research on *Boltonia asteroides* var. *glastifolia* could provide information that would be helpful in threat assessment and conservation planning. While populations are known to fluctuate in response to environmental conditions, more detail is needed regarding the specific circumstances that permit vegetative persistence or favor emergence from the seed bank. A better understanding of long-distance dispersal mechanisms, seed longevity, and salinity tolerance would also be useful.

Synonyms and Taxonomy

The accepted botanical name of the species is *Boltonia asteroides* var. *glastifolia* (Hill) Fernald. Orthographic variants, synonyms, and common names are listed below (Fernald 1940, Townsend

2013). Plants in the genus *Boltonia* are also sometimes referred to as Pseudo-asters or False Asters (eg. Hudson 1972, Hilty 2020).

Both *B. asteroides* var. *glastifolia* and *B. montana*, the two *Boltonia* species native to New Jersey, have historically been treated as synonymous with *B. asteroides* var. *asteroides*. Fernald (1940) distinguished *Boltonia asteroides* var. *glastifolia*, equating the variety with the *Matricaria glastifolia* originally described by Hill (1769), but his observations were largely ignored. *Boltonia montana* was not identified as a distinct species until the present century (Townsend and Karaman-Castro 2006), and the re-examination of the genus led to the resurrection of Fernald's varietal name by Townsend (2013). Some sources currently recognize *Boltonia asteroides* var. *glastifolia* (eg. Kartesz 2015, Weakley et al. 2022) but others continue to view it as a synonym of *B. asteroides* var. *asteroides* (eg. Karaman-Castro and Urbatsch 2020, ITIS 2024, POWO 2024, USDA NRCS 2024b).

Botanical Synonyms

Boltonia glastifolia (Hill) L'Her.
Matricaria glastifolia Hill

Common Names

Southern Boltonia
Eastern Doll's Daisy
White Doll's Daisy

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Illustration of *Matricaria glastifolia* from the original description by Hill (1769).