Andromeda polifolia var. *latifolia*

Bog Rosemary

Ericaceae

Andromeda polifolia var. *latifolia* courtesy R. W. Smith, Lady Bird Johnson Wildflower Center

***Andromeda polifolia* var. *latifolia* 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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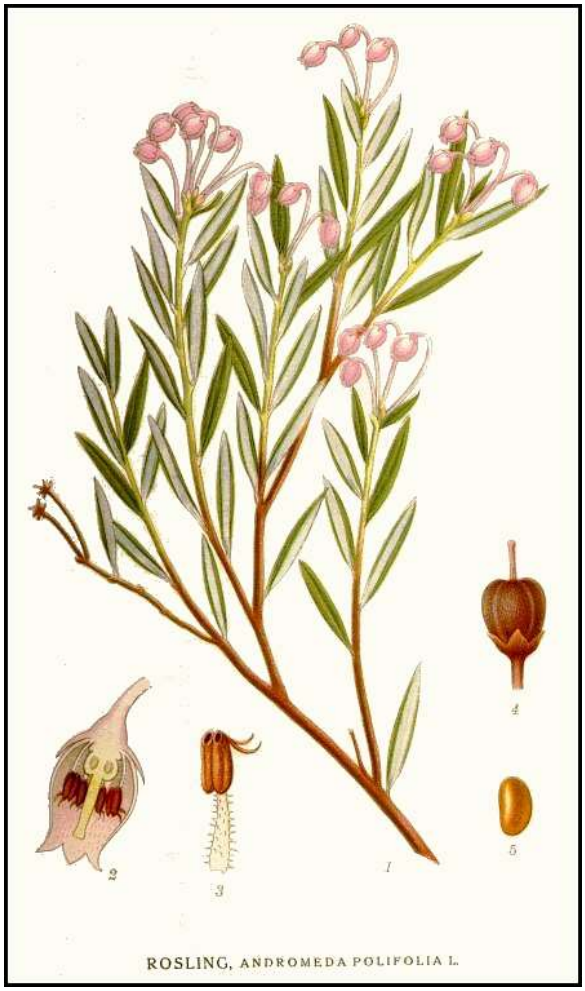
Life History

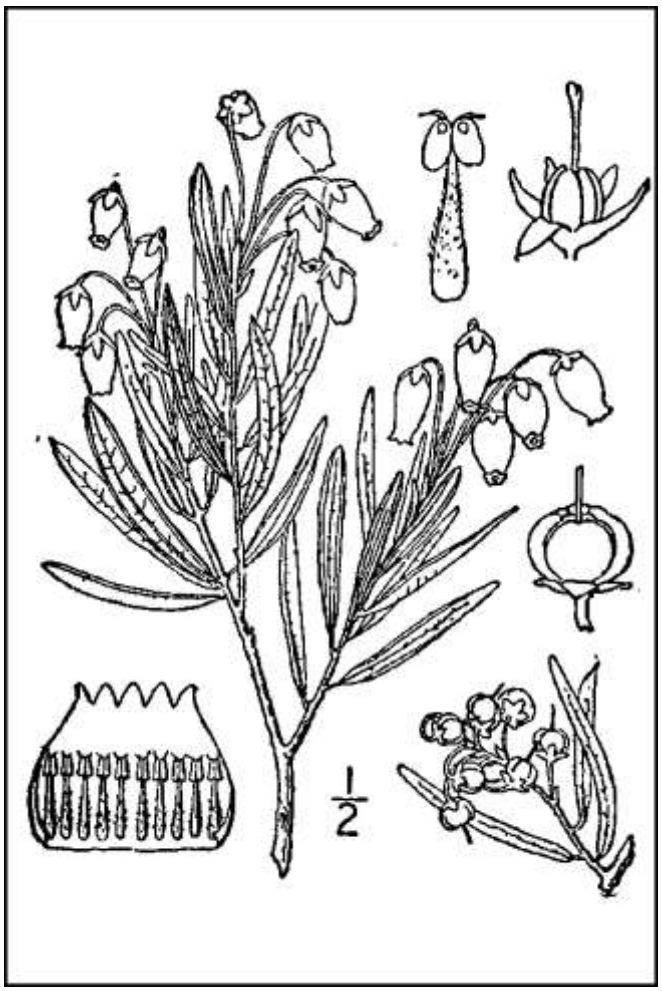
Andromeda polifolia var. *latifolia* is the only one of the three recognized varieties of Bog Rosemary to occur in the northeastern United States (Kartesz 2015). *A. polifolia* var. *polifolia* is widely distributed throughout the northern hemisphere, but in North America is found primarily in Canada with rare occurrences in two northwestern states. *A. polifolia* var. *jamesiana* is a hybrid of the other two varieties that is reported from three northern Canadian provinces (Fabijan 2020).

Andromeda polifolia var. *latifolia* is a low shrub with an elongate creeping base and ascending stems. The narrow, alternate leaves are leathery and evergreen with densely white-hairy undersides and edges that roll inward. The flowers have thickish curving pedicels, and usually occur in small groups of 4–8. *A. polifolia* flowers have five distinct sepals but the petals are joined into an urn-shaped corolla that is white or pink. The fruits are round reddish or brown capsules with five evident sections. (See Fernald 1903, Britton and Brown 1913, Fernald 1950, Gleason and Cronquist 1991, Fabijan 2020). Bog Rosemary blooms between May and July and produces fruit from June through September (Weakley 2015). *Andromeda polifolia* var. *latifolia* frequently grows in the same location as *Kalmia polifolia* (Pale Laurel), and the two species may superficially resemble one another in the absence of flowers or fruit but can be readily distinguished by closer examination of the leaves. *Andromeda* leaves are alternate and end in a sharp point, while those of *Kalmia polifolia* are opposite and lack the sharp point at the tip (Munroe et al. 2014).

Andromeda polifolia var. *latifolia* reproduces vegetatively by producing new stems from its horizontal rootstock (Ryan 1995, Fabijan 2020) which may be situated as far as 37 centimeters below the surface (Taylor 2007). Bog Rosemary forms ericoid mycorrhizal associations, an unusual type found exclusively in the Ericaceae and Diapensiaceae (Wang and Qiu 2006). Wang and Qiu noted that the fungi that form ericoid mycorrhizae are able to engage in more typical associations with plants from other families, suggesting that the host plants influence the manner in which mycorrhizae develop. *Andromeda polifolia* plants usually have six times more biomass belowground than above, and some *A. polifolia* plants were reported to maintain as much as 98% of their biomass below the surface (Jacquemart 1998).

Andromeda polifolia var. *latifolia* plants (2001) and fruit(2010) by Peter M. Dziuk.





Andromeda polifolia. No variety was specified for either illustration. Left: C. A. M. Lindman, undated. Right: Britton and Brown 1913, courtesy USDA NRCS 2022a.

Pollinator Dynamics

Andromeda polifolia var. *latifolia* is primarily pollinated by insects, although both Reader (1975, 1977) and Small (1976) observed that *Andromeda* plants had low numbers of floral visitors compared to most other ericaceous species sharing the habitat (e.g. *Chamaedaphne, Gaylussacia, Kalmia, Ledum, Vaccinium*). Reader (1975) noted that Bog Rosemary and *Kalmia polifolia* flowered simultaneously and suggested that they might compete for pollinators. The pollinators of *Andromeda polifolia* var. *latifolia* include an assortment of insects: A review by Hilty (2020) included seven kinds of bumblebee (*Bombus spp*.) as well as various types of honeybee (*Apis sp*.), mining bee (*Andrena sp*.), hoverfly (*Eristalis sp.*), and bee fly (*Bombylius sp*.). Small (1976) remarked that Syrphidae (hoverflies) were richly represented in the bog and likely quite significant in effecting pollination, and Reader (1977) captured equal numbers of flies and bees on *Andromeda* flowers. Ssymank et al. (2008) suggested that the role of Syrphid flies in pollination has been greatly underestimated, and pointed out that hoverflies are additionally beneficial because their larvae eat plant pests such as aphids and scale insects.

Some self-fertilization may occur in *A. polifolia* var. *latifolia*. Reader (1977) found that hand-pollination of Bog Rosemary flowers resulted in 100% seed production regardless of the pollen source (self or other). Self-compatibility is reportedly prevalent in the Ericaceae, but self-fertilization does not automatically occur (Kevan et al. 1993). Les (2017) indicated that self-pollination frequently takes place in *Andromeda polifolia* but results in lower seed set than cross-fertilization. Despite the species' physiological self-compatibility, experiments by Reader (1975, 1977) demonstrated that seed production in *Andromeda* was greatly reduced when insects were prevented from visiting the flowers and Reader suggested that flower morphology may limit the potential for self-fertilization. Reader (1975) reported 26% and 40% seed set in two open-pollinated Bog Rosemary colonies, and Les (2017) said that the average seed set in natural populations approaches 30%.

Seed Dispersal

Andromeda polifolia var. *latifolia* produces about 20 seeds per capsule (Campbell et al. 2003). The seeds are oval (1.1 x 0.8 mm) and light brown (Lu et al. 2010) and have a smooth, shiny appearance (Fabijan 2020). Dispersal by wind has been presumed for *A. polifolia* var. *polifolia* (Jacquemart 1998), but Campbell et al. (2003) calculated a limited wind dispersal potential for *A. polifolia* var. *latifolia* based on features such as release height, fall time, and wing loading. The study results suggested that Bog Rosemary had a higher dispersal potential via water because the seeds were able to float for up to 72 hours utilizing trapped air bubbles, although the feasibility of water dispersal depends on site conditions. It is likely that *A. polifolia* var. *latifolia* can utilize either wind or water for short distance dispersal, but no reports of long distance dispersal mechanisms were found.

The seeds of *A. polifolia* var. *latifolia* germinate best at or near the surface. Experiments conducted by Campbell and Rochefort (2003) found that over 90% of seeds planted on a peat surface germinated, but emergence declined steeply with burial depth and germination was negligible at depths of 5 millimeters or more. No documentation of seed banking in *A. polifolia* var. *latifolia* was found, although Campbell and Rochefort (2003) suggested that the plant's seed characteristics favored the likelihood of persistence. Seeds of *Andromeda polifolia* var. *polifolia* retrieved from depths of 40–50 centimeters were successfully germinated by Jauhiainen (1998), although Jacquemart (1998) noted that the species was under-represented in the seed banks of soils where the plant was common.

Habitat

The warmth and stillness in the hollows about the Andromeda ponds are charming. You dispense with gloves. Henry David Thoreau ~ January 25, 1855.

Andromeda polifolia var. *latifolia* grew on a floating mat of *Sphagnum* moss in Thoreau's Bog (Hemond 1980) and the species occurs in comparable habitat at some New Jersey locations (NJNHP 2022). Habitat for other New Jersey populations has been described as spruce bogs and calcareous fens (Fairbrothers and Hough 1973, Johnson and Walz 2013). Throughout the

species' range, the wetlands supporting *A. polifolia* var. *latifolia* occur at elevations from 100–700 meters and are locally identified as bogs, fens, wet heaths, peaty wetlands, floating islands, and boggy shores (Church 1980, Ryan 1995, Rhoads and Block 2007, Weakley 2015, Fabijan 2020).

Preferred habitats are usually open or semi-open, and a shade tolerance index developed by Humbert et al. (2007) classified *A. polifolia* var. *latifolia* as highly intolerant of shade. Leopold (2005) noted that Bog Rosemary can be cultivated if the grower can meet the species' exacting requirements for soils that are acidic, organic, and moist. A detailed analysis of water budget and nutrient flow for the community at Thoreau's Bog was provided by Hemond (1980).

Anderson and Davis (1998) analyzed the vegetative composition of 30 peatland community types in Maine using data from 108 locations. *Andromeda polifolia* var. *latifolia* was found in one third of the peatland types, and some key habitat characteristics are summarized in Table 1.

Table 1. *Andromeda polifolia* var. *latifolia* in Maine Peatlands.

Community Type	mean pH	% H_2O in peat	% overstory	peat layer depth	Bog Rosemary % cover
(Sphagnum rubellum/Chamaedaphne calyculata - Eriophorum vaginatum var. *spissum)*	4.04	94.5	0	4.9	6.3
(Carex oligosperma- Chamaedaphne calyculata)	4.83	86.6	0	3.4	4.3
(Sphagnum cuspidatum-Cladopodiella fluitans/ Rhynchospora alba)	4.04	95.6	0	6.2	3.9
(Sphagnum rubellum/Chamaedaphne calyculata - Enophorum virginicum)	4.02	93.0	0	5.8	3.6
(Carex oligosperma-Chamaedaphne calyculata/Sphagnum recurvum- Sphagnum magellanicum)	4.88	94.2	1.3	2.5	3.6
(Carex limosa-Rhynchospora alba-Scheuchzeria palustris ssp. *americana/Sphagnum papillosum-Sphagnum magellanicum)*	4.43	95.6	0	2.4	3.3
(Rhynchospora alba- Carex limosa/Cladopodiella fluitans- Drosera intermedia)	4.90	96.6	0	3.1	1.1
(Sphagnum cuspidatum)	3.94	94.6	0	5.7	1.1
(Trichophorum cespitosum- Carex lasiocarpa-Rhynchospora alba - Trichophorum alpinum - Muhlenbergia glomerata)	7.89	88.0	7.2	4.8	0.8
(Picea mariana - Larix laricina/Carex stricta - Rhododendron canadense - Rhododendron groenlandicum)	4.63	91.1	33	2.7	0.2

Source: Anderson and Davis 1998

Vegetation alliances where *Andromeda polifolia* var. *latifolia* is cited as a typical component of the low shrub layer include *Picea mariana* Saturated Woodland Alliance, *Betula pumila* - (*Salix* spp.) Saturated Shrubland Alliance, and *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (Breden et al. 2001). In Michigan, Bog Rosemary grows on low peat mounds in

coastal fens of the *Dasiphora fruticosa* ssp. *floribunda* - *Myrica gale* Rich Shore Fen Shrubland Alliance (Cohen et al. 2010). A Quebec survey by Pellerin et al. (2009) recorded *A. polifolia* var. *latifolia* in two plant communities, a *Chamaedaphne calyculata* - *Sphagnum angustifolium* bog (24.1% *Andromeda* cover) and an *Alnus incana* ssp. *rugosa* - *Chamaedaphne calyculata* - *Sphagnum fallax* swamp (1.6% *Andromeda* cover). In the higher elevations of West Virginia, Bog Rosemary is the dominant species in *Andromeda polifolia* var. *glaucophylla*/*Polytrichum strictum* - *Cladina spp*. - *Sphagnum spp*. peatlands, a plant association that is critically imperiled both in that state and globally (Byers et al. 2007).

Wetland Indicator Status

Andromeda polifolia 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 2022b)

ANPOG. The USDA Plants Database utilizes the synonym *Andromeda polifolia* var. *glaucophylla*, and does not currently list a separate code for the name *Andromeda polifolia* var. *latifolia*.

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 global range of *Andromeda polifolia* var. *latifolia* includes eastern North America and Greenland (POWO 2022). The map in Figure 1 shows the extent of the variety in the United States and Canada.

The USDA PLANTS Database (2022b) shows records of Bog Rosemary in five New Jersey counties: Bergen, Morris, Passaic, Sussex, and Warren (Figure 2). The data include historic observations and do not reflect the current distribution of the species. A specimen held by the Academy of Natural Sciences at Drexel University was reportedly collected in Ocean County (Mid-Atlantic Herbaria, 2022).

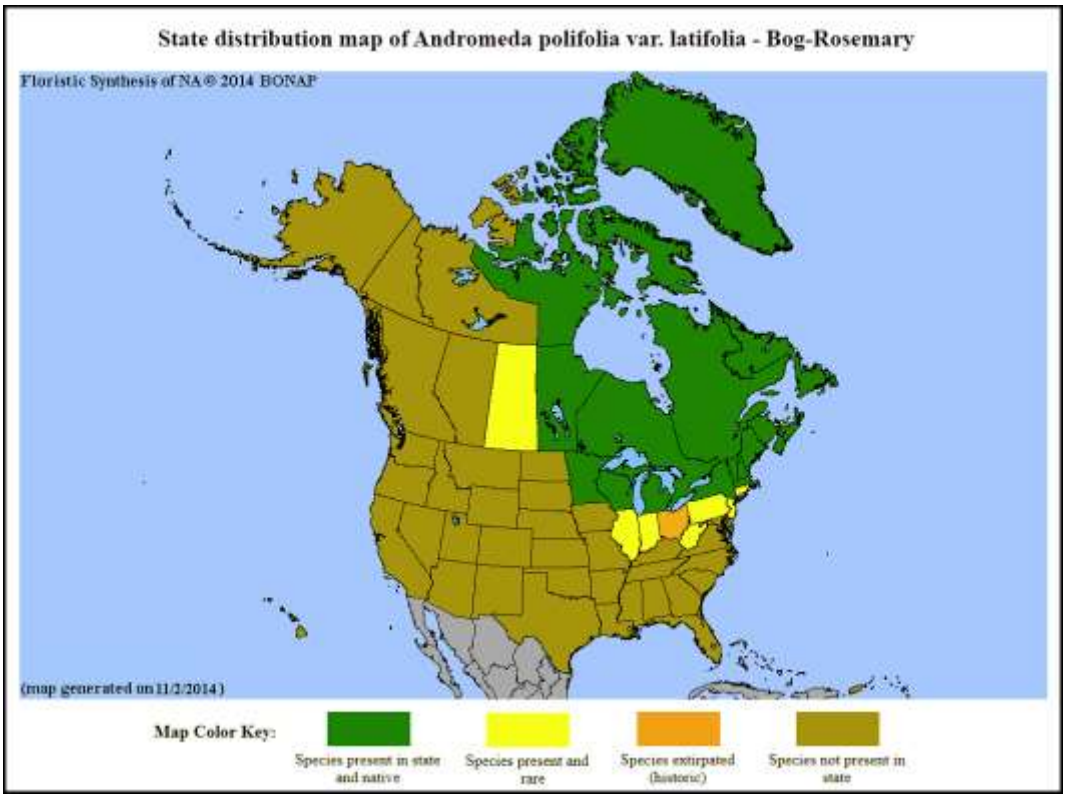


Figure 1. A. polifolia var. latifolia in North America, adapted from BONAP (Kartesz 2015).

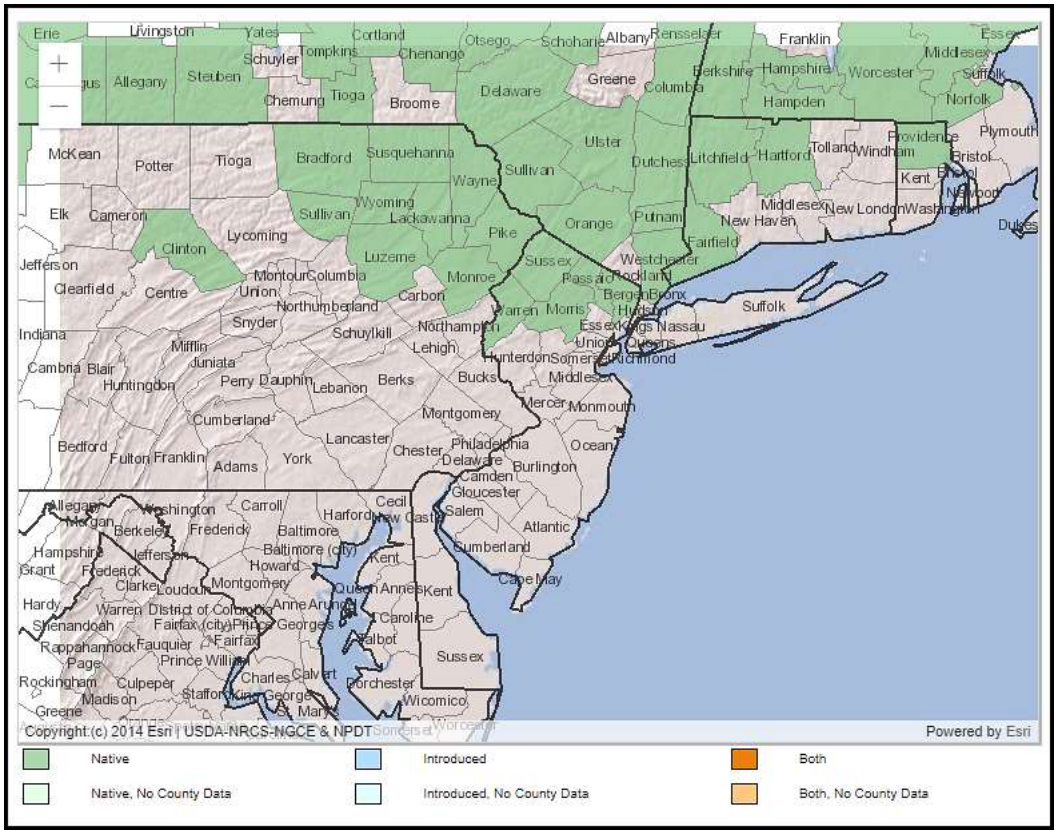


Figure 2. Records of A. polifolia var. latifolia in New Jersey and vicinity (USDA NRCS 2022b).

Conservation Status

Andromeda polifolia var. *latifolia* is considered globally secure. The G5T5 rank means both the species and the variety are at 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 (NatureServe 2022). The map in Figure 3 illustrates the conservation status of *A. polifolia* var. *latifolia* in the United States and Canada. The variety is critically imperiled (very high risk of extinction) in three states, imperiled (high risk of extinction) in two states and two provinces, vulnerable (moderate risk of extinction) in one state, and presumed extirpated in Ohio. Throughout much of its North American range *A. polifolia* var. *latifolia* is secure, apparently secure, or unranked.

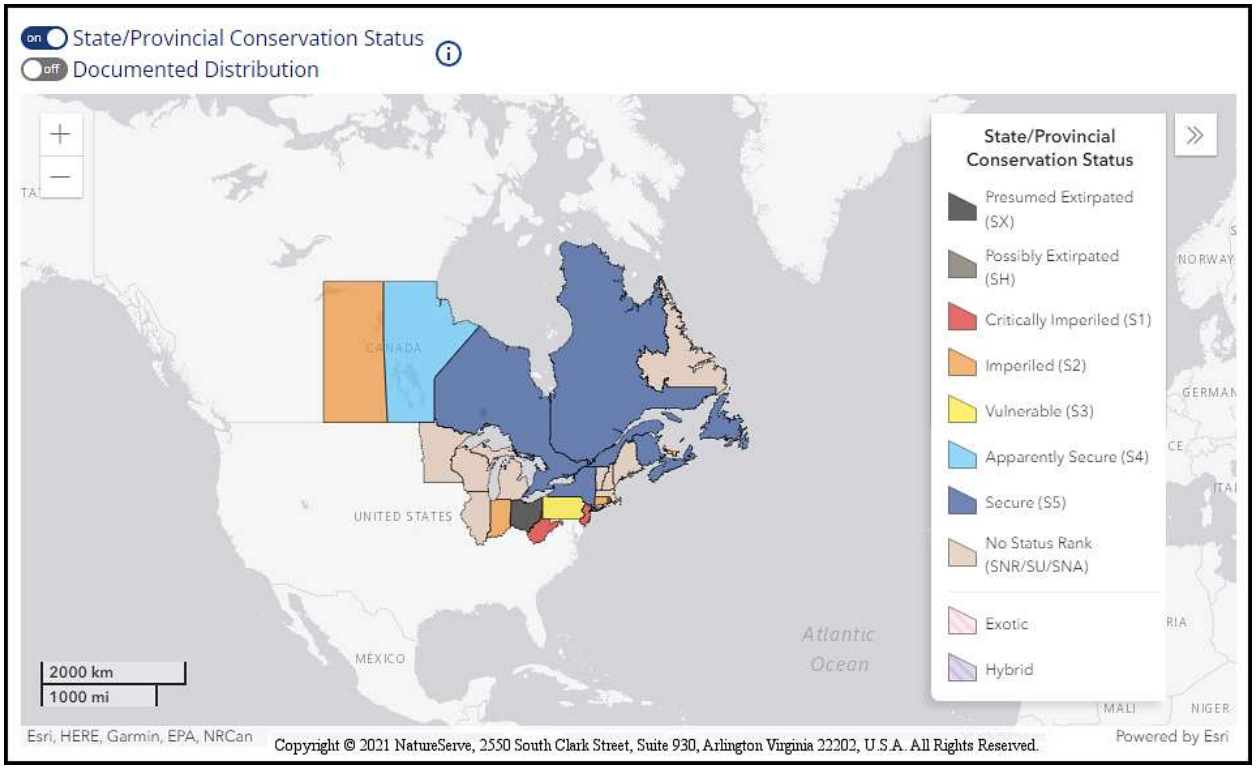


Figure 3. Conservation status of A. polifolia var. latifolia in North America (NatureServe 2022).

Andromeda polifolia var. *latifolia* is critically imperiled (S1) in New Jersey (NJNHP 2022). 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. Bog Rosemary 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 Bog Rosemary 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).

The earliest documented records of *Andromeda polifolia* var. *latifolia* in New Jersey were from Morris County. Britton (1881) first reported a single site and then a second in the same county (Britton 1889), and soon after that the species was also known to occur in Sussex County (Taylor 1915). During the mid-1900s extant occurrences were still known in both counties (Fables 1956), but shortly thereafter the species was reported as 'formerly in Morris County' by Fairbrothers and Hough (1973) although it had also been collected in Passaic County by that time. As of 1998 there were five extant populations in northern New Jersey (Breden et al. 2006) and that continues to be the case (NJNHP 2022).

Threats

Andromeda polifolia var. *latifolia* is most likely to thrive in open sites with moist, acidic, organic soils. Bog Rosemary can tolerate, and even potentially benefit from, certain types of short term disturbance—probably due to its large investment in belowground biomass and deeply placed roots and rhizomes. However, long-term changes to habitat characteristics are likely to threaten the species. Shifts in hydrology or water quality can result in changes to community composition that may favor graminoid species over shrubs or promote the growth of trees and taller woody species that decrease light availability. Harris et al. (2020) compared the vegetation of a pristine bog to that of a drained bog and found that *A. polifolia* var. *latifolia* was less abundant at the site where the water table had been lower for a 7 year period.

Overgrazing is frequently reported as a concern for species in New Jersey's calcareous fens (Johnson and Walz 2013), but Pellerin et al. (2006) evaluated the impact of deer on peatland vegetation and found that browsing does not appear to threaten *A. polifolia* var. *latifolia*. In fact, Bog Rosemary plants were both more abundant and taller at the sites where deer were present, although the differences were not statistically significant. Higher ammonium (NH_4^+) levels were detected at sites populated by deer, which may have contributed to increased shrub growth (Pellerin et al. 2006). Enhanced aboveground growth of *A. polifolia* var. *latifolia* following the addition of ammonium nitrate (NH_4NO_3) was previously reported by Thormann and Bayley (1997).

Fire may be beneficial or detrimental to *Andromeda polifolia* var. *latifolia* depending on site conditions and burn intensity. Flinn and Wein (1988) found that Bog Rosemary growth was stimulated by spring and autumn burns, but summer fire did not produce the same result. Fire intensity in bogs is determined by the dryness of the peat layer, and bogs often burn in irregular patterns (Taylor 2007). In some circumstances *Andromeda* roots and rhizomes positioned well below the surface are protected and can rapidly resprout, but the plant's underground organs can be destroyed by a fire that penetrates deeply into the peat. Summer fires may burn hotter and deeper because the substrate is likely to be drier, and Taylor (2007) noted that recurring fires may also be a threat to *A. polifolia*.

Ring et al. (2013) evaluated the risks posed by climate change to plants identified as Species of Greatest Conservation Need in New Jersey's 2017 Wildlife Action Plan. *Andromeda polifolia* var. *latifolia* was ranked as moderately vulnerable, signifying that its abundance or range in northern New Jersey is likely to decrease by 2050. Some studies of temperature effects have

suggested that warmer conditions can benefit the species in certain ways. Colder weather may result in reduced reproduction for Bog Rosemary: Experiments showed that when temperatures fell below freezing, flower mortality was minimal (<5%) at temperatures above -4ºC but increased to 19% at -6ºC, 50% at -8ºC and 87% at -10ºC (Reader 1979). Weltzin et al. (2003) simulated the effects of climate change by lowering the water table and using infrared heat lamps to increase temperatures, reporting increased growth of *A. polifolia* var. *latifolia* plants as a result. A similar positive response to warming was described by Buttler et al. (2015) who suggested that long roots may allow Bog Rosemary to retrieve moisture and nutrients from deeper in the soil than other species, thus giving it a competitive advantage. While short-term warming promotes aboveground development in the species, lengthy periods of increased temperatures may extend the effects of warming deeper into the soil or alter natural hydrologic regimes and the advantage could disappear. Although Hedwall et al. (2017) found that increasing tree cover induced by altered climactic conditions slowed the impact of climate change on other species in Swedish peatlands, *Andromeda polifolia* var. *latifolia* is unlikely to benefit from enhanced tree growth because of its poor shade tolerance. At the community level, New Jersey's fen habitats are highly vulnerable to climate change and altered hydrology resulting from shifting weather patterns is expected to make sites less suitable for specialist species and more susceptible to generalist or invasive species (Johnson and Walz 2013). On the whole, *A. polifolia* var. *latifolia* is a northern plant that is most vulnerable at the southern edge of its range, and a warming climate will probably have a net negative impact on populations that are already imperiled.

Management Summary and Recommendations

The northern peatland habitats that support *Andromeda polifolia* var. *latifolia* are infrequent in New Jersey and conservation of those sites is the primary management consideration for the species. In addition to protecting the wetlands themselves, adequate buffers are needed to maintain the natural hydrology of the sites (PNHP 2019). Active management may be required in order to maintain open habitat and prevent the establishment of invasive plant species, and manual vegetation removal or a limited use of herbicides that can be applied directly to individual plants is recommended (Johnson and Walz 2013). Controlled burning is another tool that can beneficially maintain habitat for Bog Rosemary (Taylor 2007), but site-specific planning is essential in order to consider variables such as fuel load, soil moisture, weather conditions, and the impact on other rare flora and fauna in the community.

One of New Jersey's former *Andromeda polifolia* var. *latifolia* populations was extirpated by habitat destruction resulting from a peat mining operation (NJNHP 2022). A method for restoring mined peatlands by generating a *Sphagnum* mat was developed by Rochefort et al. (2003), and the revegetation processes at both abandoned and restored peatlands were subsequently studied by Pouliot et al. (2012). While restoration activities sped up the re-establishment of ericaceous shrubs, the process unfolded at a slow pace and the cover did not evolve in a linear fashion to resemble that of natural bogs at either restored or spontaneously re-vegetated sites. Another experiment in peatland restoration successfully used transplanted *A. polifolia* var. *latifolia* to stabilize the banks of newly created pools in order to reduce frost heave intensity (Laberge et al. 2013). Bog Rosemary plants can be propagated from seed or from

cuttings (PFAF 2022), so reintroduction of the species into restored habitats may be a viable option for maintaining populations in regions where *A. polifolia* var. *latifolia* is critically imperiled. Additional research in that area would be worthwhile. Because landscape fragmentation has resulted in poor connectivity between wetlands, a better understanding of the potential for long-distance dispersal in Bog Rosemary would also be valuable.

Synonyms

The accepted botanical name of the species is *Andromeda polifolia* var. *latifolia* Aiton. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, Kartesz 2015, POWO 2022, Britton and Brown 1913).

Botanical Synonyms	**Common Names**
Andromeda polifolia var. *glaucophylla* (Link) DC.	Bog Rosemary
Andromeda polifolia ssp. *glaucophylla* (Link) Hultén	Marsh Holy Rose
Andromeda polifolia var. *angustifolia* Aiton	Moorwort
Andromeda polifolia var. *rosmarinifolia* Torr.	
Andromeda glaucophylla Link	
Andromeda glaucophylla var. *iodandra* Fernald	
Andromeda glaucophylla var. *latifolia* (Aiton) Rehder	
Andromeda canescens Small	
Andromeda glaucifolia Wender.	
Andromeda kalmiifolia Hoffmanns.	
Andromeda oleifolia Hoffmanns.	
Andromeda rosmarinifolia Pursh	
Polifolia montana var. *latifolia* (Aiton) Nakai	

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