Kalmia polifolia

Pale-laurel

Ericaceae

Kalmia polifolia by Peter M. Dziuk, 2004

***Kalmia polifolia* 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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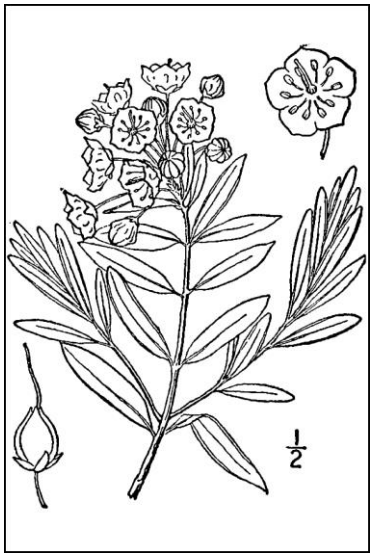
Life History

Kalmia polifolia (Pale-laurel) is a rhizomatous evergreen shrub in the Ericaceae that is sparingly branched and less than a meter in height. The twigs are slightly flattened and two-edged. The leathery leaves are opposite and have very short (< 3 mm) petioles. The oblong blades are 1.5–4.5 cm long and 0.3–1.5 cm wide; they are shiny and green above and white below with margins that usually roll under. Purple hairs are often present along the midribs, particularly in younger leaves. *K. polifolia* flowers may be solitary in the axils or arranged in small terminal clusters of 3–8. Each flower has five thin, papery sepals, five fused petals that form a saucer-like shape, and ten stamens. The flowers are usually rose-purple, but a form with white petals was described from a site in Newfoundland where it was found growing among more typical plants. The fruit is a five-parted red capsule 4–6 mm long and 4–7 mm wide that contains numerous small seeds. (See Britton and Brown 1913, Fernald 1950, Ebinger 1974, Southall and Hardin 1974, Ryan 1978, Gleason and Cronquist 1991, Liu et al. 2020). Pale-laurel is vegetatively similar to Bog Rosemary (*Andromeda polifolia*) and they often co-occur, but the latter species has alternate leaves that are not shiny on the upper surface (Ryan 1978, Leopold 2005).



Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Center: Peter M. Dziuk, 2010. Right: Peter M. Dziuk, 2005.

Kalmia polifolia develops new leaves in the spring and sheds older leaves in the fall but individual leaves can be retained for 1–3 years depending on environmental conditions. In most cases some green leaves can be found year round (Pease 1917, Riggs 1921, Jensen et al. 2019). Reader (1978) determined that after the first year the dry weight of older leaves decreased as the growing season progressed, suggesting that they were transferring stored nutrients to developing parts of the plant. The experimental removal of older leaves significantly reduced the growth of new shoots.

Flowers for the following year are initiated during the summer and winter over as buds (Reader 1982). Throughout its range, *Kalmia polifolia* blooms between May and July or early August (Southall and Hardin 1974, Hough 1983, Rhoads and Block 2007, Liu et al. 2020, Weakley et al. 2024). The species flowers earlier at the southern end of its range and progressively later as the

latitude increases (Reader 1983). Individuals that were transplanted to North Carolina bloomed between mid-March and mid-April (Southall and Hardin 1974). Fruit development follows a similar pattern: Plants in New Jersey can be found in fruit by late June (NJNHP 2024) but in Newfoundland and Labrador the fruits ripen in August (Ryan 1978).

Kalmia species generally don't hybridize, although hybrids between *K. polifolia* and *K. microphylla* have occasionally been reported (Southall and Hardin 1974). Jaynes (1969) indicated that experimental crosses between *Kalmia* species could only be made with difficulty and the resulting offspring were sterile. Most species in the genus, including the nearest relatives of *Kalmia polifolia*, are diploid but *K. polifolia* is tetraploid (Jaynes 1969, Kron and King 1996). Some of the Pale-laurel plants examined by Gillooly and Ranney (2015) were described as potentially pentaploid.

Pollinator Dynamics

The blooming period of *Kalmia polifolia* lasts for about two weeks (Reader 1977). *Kalmia* flowers produce small amounts of nectar and they are fertilized by insects. The pollination mechanism is unusual. The anthers are tucked into small pockets on the corolla when the flowers first open and the flexible filaments are held under tension. As an insect lands on the flower and probes for nectar the spring-loaded anthers are released, showering the visitor with pollen. Medium to large-sized bees such as *Bombus* and *Andrena* species appear to be most capable of triggering anther release in *Kalmia* flowers (Lovell and Lovell 1934, Ebinger 1974, Southall and Hardin 1974, Reader 1977). Two species—*Andrena bradleyi* and *A. kalmiae*—are pollen specialists on *Kalmia* and other genera in the Ericaceae (Fowler and Droege 2020). Pollinators observed on *K. polifolia* have included multiple species of *Bombus* and *Andrena* as well as *Apis mellifera*, *Colletes inaequalis*, and a *Lasioglossum*. Unidentified syrphid flies were also seen visiting the flowers (Reader 1975, 1977).

Since *Kalmia* anthers remain in the corolla pockets unless they are dislodged by an insect, pollinator visits are critical for seed set (Reader 1975). The pollen release mechanism reduces the probability of self-fertilization. *K. polifolia* is self-compatible: Flowers that are experimentally fertilized with their own pollen can develop viable seeds, although the resulting offspring are typically less vigorous than those produced via outcrossing (Jaynes 1968, Ebinger 1974, Reader 1977).

Davidson (1921) noted that honey made from the pollen of *K. polifolia* plants was often said to be poisonous but conclusive evidence was lacking. Ebinger (1974) reported a similar lack of proof for reports of toxicity in honey derived from other *Kalmia* species, suggesting that the genus had been suspect because other parts of the plants were known to be poisonous. Toxic substances (grayanotoxins) have been documented in *K. angustifolia* and *K. latifolia* but it is not clear if they are also present in *K. polifolia*. Depending on the quantity consumed, grayanotoxins can affect the muscular, nervous, and cardiovascular systems of mammals. Lethal effects have been reported in grazers but are rare in humans, and the chemicals do not appear to harm the bees that collect the pollen (Gunduz et al. 2008, Jansen et al. 2012, Schrenk et al. 2023). The

taxonomic significance of *Kalmia* pollen morphology was evaluated by Sarwar and Takahashi (2012) but chemical properties were not examined during their study.

Seed Dispersal and Establishment

Kalmia polifolia produces an average of 176 seeds per fruit. The seeds are small and have terminal wings, facilitating dispersal by wind, but they are also capable of floating on water for several days (Campbell et al. 2003).

The seeds of *Kalmia polifolia* have variously been reported as having a dormancy requirement or being non-dormant (Amen 1966, Jaynes 1982). Deno (1993) noted that *Kalmia* fruits are often retained on the shrubs all winter. *Kalmia* seeds germinate better after cold stratification so their delayed release may be well-timed for spring germination (Campbell and Rochefort 2003). The seeds of *K. polifolia* require light for germination and germinate best at or near the surface (Bliss 1958, Jaynes 1971). Burial at depths of even a few millimeters will deter seedling emergence (Campbell and Rochefort 2003). *K. polifolia* sprouts more rapidly in warmer conditions, and 22°C was identified as the optimal germination temperature for the species (Jaynes 1982).

Kalmia polifolia has ericoid mycorrhizae, an unusual type found exclusively in the Ericaceae and Diapensiaceae. Wang and Qiu (2006) noted that the fungi which 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. Black (2016) identified *Meliniomyces variabilis* as a fungal partner of *Kalmia polifolia*. His study of the relative abundance and distribution of *M. variabilis* on *Kalmia polifolia* and *Picea mariana* indicated that the fungus preferentially colonized the ericaceous species.

Habitat

Kalmia polifolia is a denizen of northern bogs. The sites are generally saturated, acidic, and relatively open (Hough 1983, Lynn 1984, Allen and Johnson 2000, Leopold 2005, Weakley et al. 2024). While the shrub is typically found at elevations of 0–800 meters above sea level (Liu et al. 2020), it has been recorded at elevations of 1,100 meters or more at several sites in Maine (Urban et al. 2017).

The communities occupied by *Kalmia polifolia* typically include *Sphagnum* mosses and a variety of ericaceous shrubs and subshrubs such as *Chamaedaphne calyculata, Rhododendron groenlandicum, Andromeda polifolia, Empetrum nigrum, Vaccinium oxycoccus*, and *V. myrtilloides*. Carnivorous plants like *Sarracenia purpurea* and *Drosera* species are typical in the habitats. Scattered trees (*Picea mariana*, *Larix laricina*) may also be present, as may assorted *Salix* spp. (Riggs 1925, Bliss 1963, Fahey 1976, Doyle et al. 1987, Motzkin and Patterson 1991, Allen and Johnson 2000, Breden et al. 2001, Cameron and Bondrup-Nielsen 2013).

Kalmia polifolia can become established early in the development of bog communities. Riggs (1925) described it as a pioneer species in bogs, and it often colonizes the edges of ponds or

lakes, forming dense root mats that extend out over the water (Ebinger 1974). *K. polifolia* has also been noted as a prominent component or sub-dominant shrub in some established peatland habitats (Karlin and Lynn 1988, Jensen et al. 2019). Anderson and Davis (1998) analyzed the vegetative composition of 30 peatland community types in Maine using data from 108 locations. *Kalmia polifolia* was found in nearly a third of the peatland types, and some of the key habitat characteristics are summarized in Table 1.

Table 1. *Kalmia polifolia* in Maine Peatlands.

Community Type	mean pH	% H_2O in peat	% overstory	peat layer depth	Pale Laurel % cover
(Kalmia angustifolia-Chamaedaphne calyculata - Gaylussacia dumosa var. *bigeloviana/Sphagnum capillifolium)*	3.87	84.3	1.5	3.8	4.3
(Picea mariana - Chamaedaphne calyculata - Kalmia angustifolia - Rhododendron groenlandicum/Picea mariana)	4.16	89.3	8.4	4.4	1.5
(Chamaedaphne calyculata- Rhododendron canadense- Myrica gale - Kalmia angustifolia)	4.59	90.3	3.4	1.2	1.4
(Sphagnum rubellum/Chamaedaphne calyculata - Enophorum virginicum)	4.02	93.0	0	5.8	1.0
(Trichophorum cespitosum - Gaylussacia dumosa var. *bigeloviana)*	4.51	94.4	0	2.0	0.9
(Picea mariana - Larix laricina/Carex stricta - Rhododendron canadense - Rhododendron groenlandicum)	4.63	91.1	33	2.7	0.8
(Gaylussacia dumosa var. *bigeloviana/Empetrum nigrum)*	4.18	91.8	2.2	4.0	0.6
(Sphagnum rubellum/Chamaedaphne calyculata - Eriophorum vaginatum var. *spissum)*	4.04	94.5	0	4.9	0.4
(Picea mariana/Picea mariana/Picea mariana - Rhododendron groenlandicum- Maianthemum trifolium)	4.27	94.0	27.1	2.3	0.4

Source: Anderson and Davis 1998

Wetland Indicator Status

Kalmia 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 2024b)

KAPO

Coefficient of Conservancy (Walz et al. 2020)

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 native range of *Kalmia polifolia* includes parts of the northern United States and Canada. It has naturalized in Great Britain, where it was first introduced in 1767 (Ebinger 1974, POWO 2024). The map in Figure 1 depicts the extent of the species in North America.

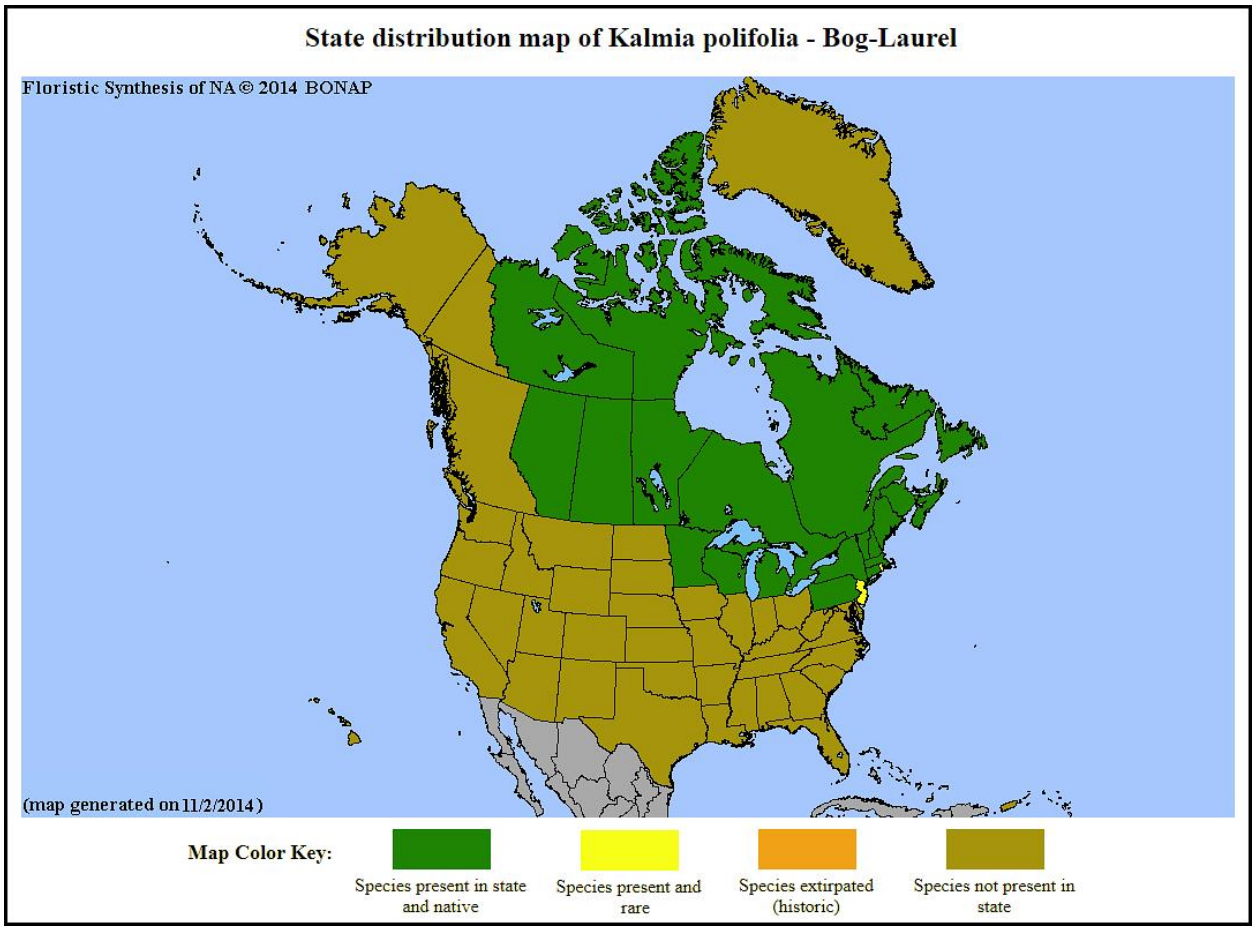


Figure 1. Distribution of K. polifolia in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2024b) shows records of *Kalmia polifolia* in four New Jersey counties: Morris, Passaic, Sussex, and Warren (Figure 2 below). Two herbarium specimens reportedly originated in Camden and Ocean counties (Mid-Atlantic Herbaria 2024), although they may have been mislabeled or obtained from cultivated plants. The data include historic observations and do not reflect the current distribution of the species.

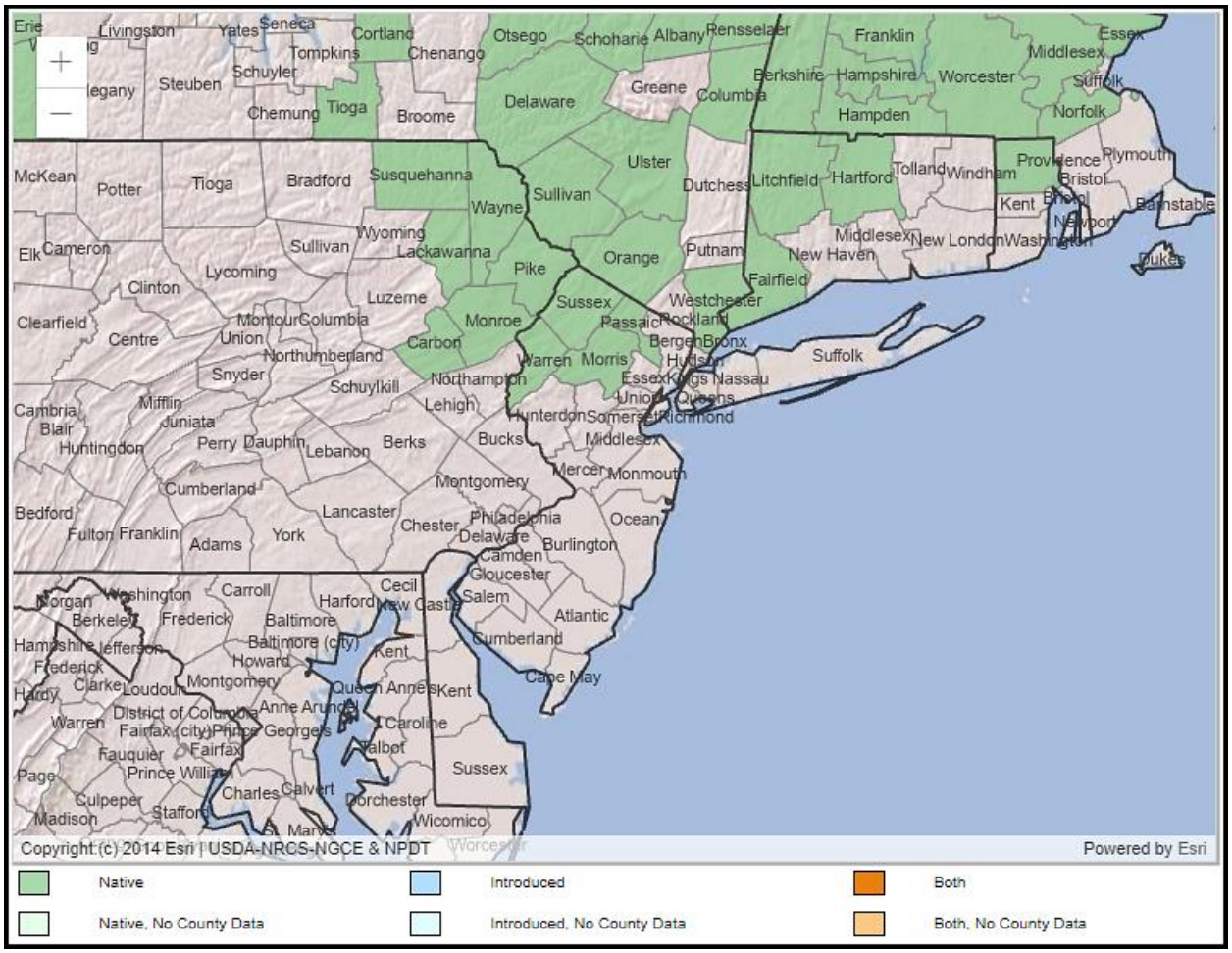


Figure 2. County records of K. polifolia in New Jersey and vicinity (USDA NRCS 2024b).

Conservation Status

Kalmia polifolia is considered globally secure. 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 (NatureServe 2024). The map below (Figure 3) illustrates the conservation status of *K. polifolia* throughout its range. The shrub is critically imperiled in two eastern states but it is secure, apparently secure, or unranked everywhere else in its native range.

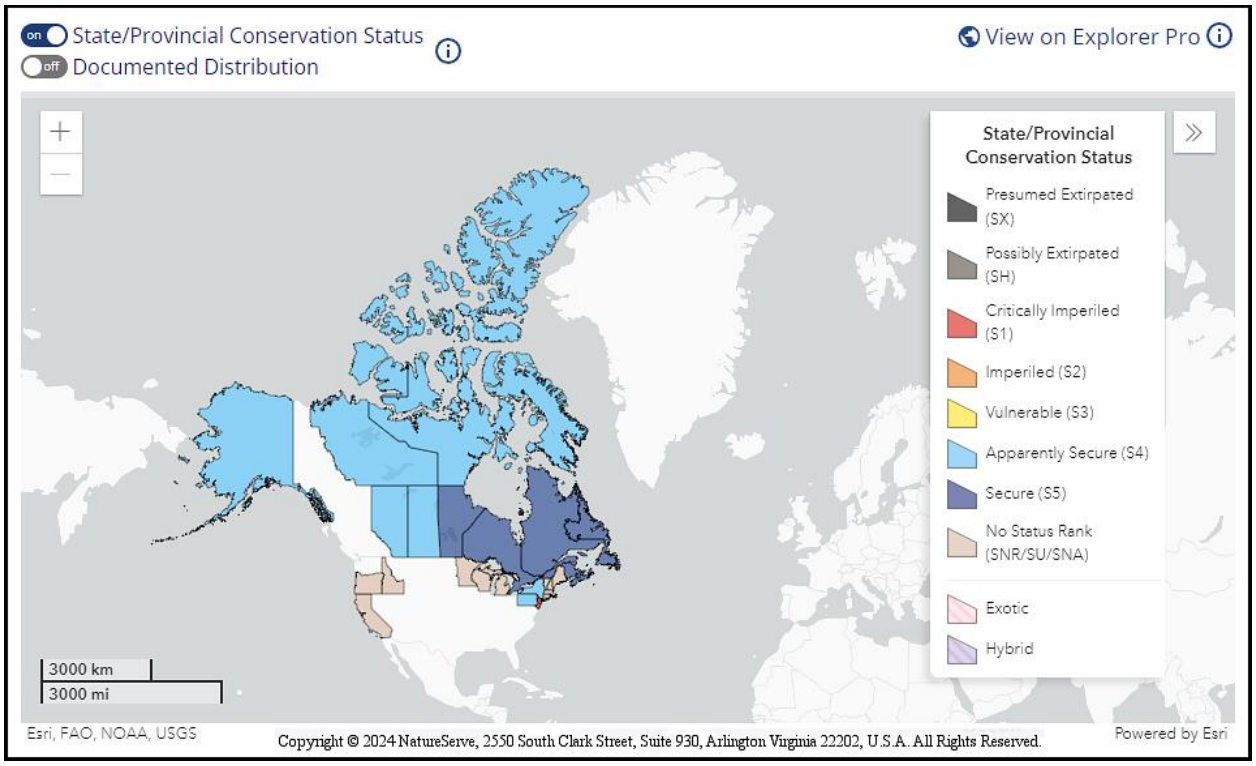


Figure 3. Conservation status of K. polifolia in North America (NatureServe 2024).

New Jersey is one of the two states where *Kalmia polifolia* is critically imperiled (NJNHP 2024). An S1 rank usually 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. *K. polifolia* 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 the laurel 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).

In New Jersey, *Kalmia polifolia* was first documented in Morris County near the end of the 1800s then a second site was discovered in Sussex County (Britton 1889, Taylor 1915). By the mid 1900s it was known from about a half-dozen locations in northern New Jersey (Fables 1956) but some of the habitats were threatened and it was categorized as endangered by Fairbrothers and Hough (1973). *K. polifolia* has not been seen at any locations outside of Sussex County since the 1940s (Hough 1983, Breden et al. 2006). Six populations in that county are tracked as extant but four of those were very small when they were last observed during the 1980s or 1990s (NJNHP 2024).

Threats

Riggs (1925) observed that *Kalmia polifolia* was highly susceptible to changes in habitat conditions resulting from activities like draining, burning, or removal of the humus layer. A common agent of change in bog communities is the North American Beaver (*Castor canadensis*). One New Jersey population of *K. polifolia* was lost after the site was flooded by beavers (NJNHP 2024). Even more modest increases in water level could be detrimental to Pale-laurel. A comparative study of the effects of two water levels (5 cm vs. 25 cm from the surface) on the growth of bog plants demonstrated that *K. polifolia* fared significantly better under the lower water table conditions (Dieleman et al. 2014). On the other hand, beaver activity can sometimes create additional habitat for the shrub. At one site where the animals converted a forested wetland to an open fen *K. polifolia* increased in abundance (Mitchell and Niering 1993).

In places where its habitat remains intact, *Kalmia polifolia* faces few other threats. If the foliage of *K. polifolia* contains grayanotoxins comparable to those found in other North American *Kalmia* species that is likely to discourage herbivory, although Pellerin et al. (2006) observed that even some species that are known to be poisonous (eg. *K. angustifolia*) were occasionally browsed by deer. Lynn and Karlin (1985) found that the invasive Common Reed (*Phragmites australis* ssp. *australis*) was encroaching on the bog mat at the site of one *K. polifolia* occurrence in New York. *P. australis* has become established in a number of northern New Jersey fens, and—as discussed in the following section—the threat from the introduced grass is expected to increase.

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Kalmia polifolia* populations to climate change. The species was assigned 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) and the state climactic computations by Ring et al. (2013). Based on available data *K. polifolia* was assessed as Moderately Vulnerable, meaning that it is likely to show some decrease in abundance or range extent in New Jersey by 2050.

Changing climactic conditions are causing temperatures to rise faster in New Jersey than in other parts of the northeast and the state is now experiencing a longer growing season, while shifting precipitation patterns are increasing the frequency and intensity of both droughts and floods (Hill et al. 2020). Since *Kalmia polifolia* is primarily a northern plant that reaches the southeastern-most end of its range in New Jersey it may have trouble adapting to higher temperatures in the state. The species might be able to make certain kinds of adjustments in response to changing conditions: Its flower development and blooming periods are regulated by environmental cues, and transplantation experiments have shown that it can alter the timing of those events in response to external circumstances (Reader 1979, 1982, 1983). Then again, *K. polifolia* is dependent on stable habitat conditions and a number of studies have indicated that peatlands will be particularly vulnerable to climate change (Weltzin et al. 2003, Lesica and McCune 2004,

Dieleman et al. 2014). Climate change is also likely to exacerbate existing concerns regarding the proliferation of *Phragmites australis* ssp. *australis*. The invasive grass is expected to spread further and become even more competitive as a result of higher temperatures, greater concentrations of CO_2, and drought-induced opportunities for the colonization of new sites (Mozdzer and Megonigal 2012, Tougas-Tellier et al. 2015, Eller et al. 2017).

Management Summary and Recommendations

No threats to populations of *Kalmia polifolia* in New Jersey have been identified but the majority of the occurrences have not been monitored for several decades. Updated assessments of population status and habitat condition are needed at five sites. *K. polifolia* populations in the state are particularly vulnerable because they are situated right on the edge of the species' range, so every effort should be made to assure that their habitats remain intact.

Synonyms

The accepted botanical name of the species is *Kalmia polifolia* Wangenh. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024, USDA NRCS 2024b).

Botanical Synonyms	Common Names
Chamaedaphne glauca (Aiton) Kuntze	Pale-laurel
Kalmia glauca Aiton	Bog Laurel
Kalmia glauca var. *rosmarinifolia* Pursh	Swamp Laurel
Kalmia oleifolia Dum. Cours.	
Kalmia polifolia Wangenh. ssp. *polifolia*	
Kalmia polifolia var. *rosmarinifolia* (Pursh) Rehder	
Kalmia rosmarinifolia Dum. Cours.	

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