# *Gaultheria hispidula*

**Creeping-snowberry**

**Ericaceae**

*Gaultheria hispidula* by J. S. Dodds, 2018

***Gaultheria hispidula* 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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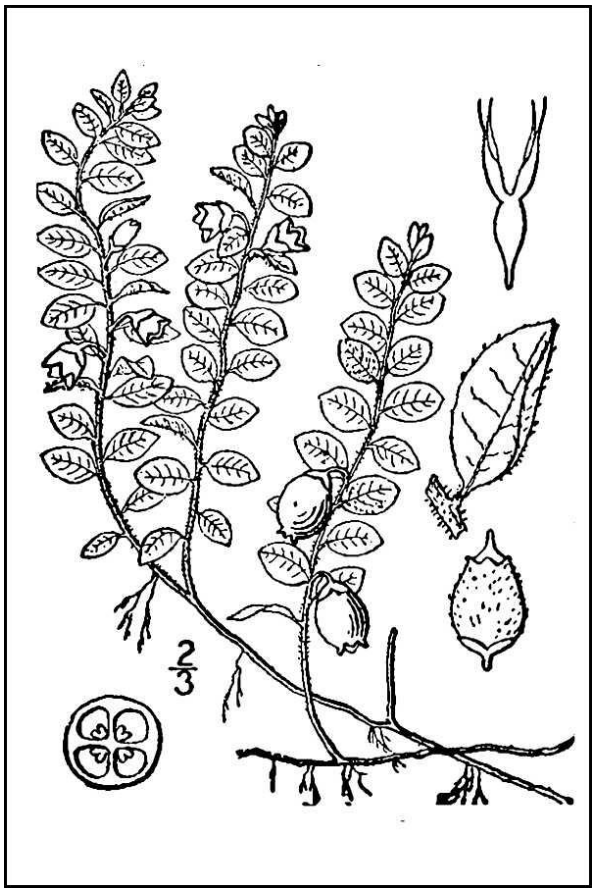
## Life History

*Gaultheria hispidula* (Creeping-snowberry) is a trailing evergreen subshrub in the heath family. The horizontal stems can form roots and branches at the nodes, often resulting in mat-like growth. The small (5–10 mm) leaves are alternate, entire, oval, and pointed at the tip. Stiff hairs are present on the stems and undersides of the leaves. The flowers are mostly solitary, developing on short, nodding stalks in the axils of the leaves. Each of the bell-shaped, greenish-white flowers has four sepals and four petals that are fused at the base; the petals end in slightly flared lobes. The eight short stamens do not extend beyond the corolla. The fruit is a capsule surrounded by the persistent, fleshy calyx which gives it the appearance of a white berry. Short, dark red bristles are also present on the surface of the fruits. (See Britton and Brown 1913, Fernald 1950, Gleason and Cronquist 1991, Middleton 1991a, Ryan 1995, Trock 2020).




Britton and Brown 1913, courtesy USDA NRCS 2022a.


Peter M. Dziuk, 2013.

Andy Fyon, 2015.

Hough (1982) reported that *Gaultheria hispidula* can flower between April and August, but May-June is the typical blooming period cited for the eastern United States and Canada and the fruits usually ripen during August and September (Ryan 1995, Rhoads and Block 2007, Weakley 2015). The fruits of *G. hispidula* are edible, although many-seeded and perhaps somewhat mealy, with a flavor reminiscent of sweet birch or wintergreen (Britton and Brown 1913, Ryan 1995). Fernald (1950) described the fruits as juicy, delicately acid and aromatic, Hays (2001)

indicated that they were somewhat spicy with a mild flavor of wintergreen, and Shackleford (undated) said that they had a spectacular wintergreen flavor comparable to that of a "wet Tic-Tac".

Several other small-leaved, creeping, evergreen subshrubs may occur in the same habitat with *Gaultheria hispidula* but the species is relatively easy to distinguish even when flowers or fruits are absent. Partridge-berry (*Mitchella repens*) has opposite leaves, and the cranberries (*Vaccinium macrocarpon* and *V. oxycoccos*) have narrower leaves without coarse hairs below. The leaves of *G. hispidula* are also aromatic (Symonds 1963, Hays 2001), so the wintergreen scent can be a useful tool for recognition of the species.

## Pollinator Dynamics

The flowers of Ericaceae in temperate regions are primarily cross-fertilized by bees (Luteyn and Pedraza-Peñalosa 2022). Reported pollinators of *G. hispidula* include solitary bees, bumblebees, bee-flies, and hover flies (Hays 2001). Flattened filaments and awned anthers are characteristic of *Gaultheria* species, and the anthers of *G. hispidula* end in two branching awns while the pollen is released through subterminal pores (Trock 2020). Lovell (1898) described how a comparable stamen structure influenced the movements of insect visitors to flowers of *G. procumbens*, and Zomlefer (1994) said that in similarly-shaped ericaceous flowers with appendaged anthers insects receive a pollen shower as they enter the flowers in search of nectar.

Although no pollination studies of *Gaultheria hispidula* were found, research on the pollinators of *G. procumbens* was carried out by Mirick and Quinn (1981). They found that *G. procumbens* flowers were cross-pollinated almost exclusively by bumblebees (*Bombus spp*.) but insects visited the blooms infrequently and fruit set was not reduced when insects were excluded so some self-fertilization was evidently taking place. The anthers of *Gaultheria* flowers mature before the stigmas, which encourages outcrossing (Luteyn et al. 1995), but Mirick and Quinn (1981) observed that the dangling position of the flowers places the stigmas below the anthers which may facilitate self-pollination. Self-compatibility has been reported in *Gaultheria hispidula* (Middleton 1991b, Luteyn et al. 1995).

Although pollinator visits are limited in many species of *Gaultheria*, fruit set is usually high (Middleton 1991b). Copious fruit set was noted in *G. hispidula* by Lawson (1871) who remarked that the species "produces its white wax like berries so abundantly that they are made into an elegant preserve."

## Seed Dispersal

The edible berry-like fruits of *Gaultheria hispidula* encourage animals to disperse its seeds (Lu et al. 2010). The fleshy capsules of Creeping-snowberry fit the pattern of fall low-quality fruits, which generally remain on the parent plants for a long time and continue to be dispersed well into the winter months (Stiles 1980). Stiles noted that fall low-quality fruits which are presented near the ground, such as those of *G. hispidula*, typically have small seeds and they are frequently

dispersed by mice although birds may also play a role in their dissemination. Krefting and Roe (1949) found that the berries of *G. hispidula* were eaten by Eastern Chipmunks (*Tamias striatus*) and Deer Mice (*Peromyscus maniculatus*) and the expelled seeds were viable. Willson (1993) cited the dispersal of *Gaultheria* seeds by Black Bears (*Ursus americanus*).

Scant information is available regarding the germination and establishment of *Gaultheria hispidula*. Luteyn et al. (1995) noted that seedlings of *Gaultheria* species were not frequently encountered. Deno (1998) found that seeds of *G. hispidula* germinated at comparable rates whether they were grown in dark or light conditions and either way germination was fairly low (20% and 23% respectively). When grown in controlled conditions, *G. hispidula* seeds can apparently germinate well following a period of cold stratification but the seedlings are susceptible to damping off and to spring frosts (Huffman et al. 2008, PFAF 2022). Mycorrhizae have been reported in Creeping-snowberry (Transeau 1906, Griffin and Kernaghan 2022), although it is unclear if fungal associations are required for establishment.

Vegetative proliferation seems to be the prevalent means of reproduction in Creeping-snowberry (Minnesota Wildflowers 2022). The horizontal stems can increase by 2–7 cm per year and they branch frequently. Slight differences in leaf color and size and the shape of the stems distinguish the current year's growth from that of previous years (Sobey and Barkhouse 1977).

## Habitat

*Gaultheria hispidula* can occur from 30–1400 meters above sea level but it is frequently found at high elevations (Hough 1983, Weakley 2015, Trock 2020). The most typical habitat is wet coniferous-dominated woodlands and bogs (Fairbrothers and Hough 1973, Hough 1983, Ryan 1995, Rhoads and Block 2007, Weakley 2015, PANHP 2019, Wildflowers of the Adirondacks 2022). New Jersey habitats have included a spruce bog, a pine swamp, and a cedar swamp (NJNHP 2022). However, *G. hispidula* can also grow in drier sites and the snowberry has been cited as an indicator species of suitable habitat for facultative upland plants such as *Picea rubens* (Dibble et al. 1999) and *Pinus banksiana* (Légaré et al. 2001). In fact, Griffin and Kernaghan (2022) selected *G. hispidula* as a research subject based on its broad use of habitats. They found that Creeping-snowberry formed mycorrhizal associations wherever it grew but utilized different fungal partners in upland and wetland sites and was colonized more than twice as often when growing in wetlands.

*Gaultheria hispidula* habitats typically have acidic or neutral soils, and the plants often grow on moss or rotting logs or stumps (Leopold 2005, Trock 2020, Wildflowers of the Adirondacks 2022). A plant community analysis by Bergeron and Bouchard (1983) associated *G. hispidula* with "poorly decomposed humus." Kumar et al. (2017) studied the vegetation on logs in various states of decay and noted that *G. hispidula* was a characteristic species on *Picea* logs in the most advanced state of decomposition.

In some parts of its range, *Gaultheria hispidula* has been considered to be one of several diagnostic species that distinguish a Black Spruce Saturated Woodland Alliance from a similar community (Breden et al. 2001). *G. hispidula* has also been associated with a number of

ecological communities in the Adirondacks, including Alpine Sliding Fen, Balsam Flats, Black Spruce-Tamarack Bog, Ice Cave Talus Community, Northern White Cedar Swamp, Spruce Flats, and Spruce-Fir Swamp (Wildflowers of the Adirondacks 2022). Anderson and Davis (1998) analyzed the vegetative composition of 30 peatland community types in Maine using data from 108 locations. *Gaultheria hispidula* was found in five of the peatland types, and some key habitat characteristics are summarized in Table 1.

**Table 1. *Gaultheria hispidula* in Maine Peatlands.**

| Community Type | mean pH | % $H_2O$ in peat | % overstory | peat layer depth | Creeping Snowberry % cover |
|---|---|---|---|---|---|
| *(Picea mariana - Acer rubrum/Nemopanthus mucronatus- Viburnum nudum* var. *cassinoides/Carex trisperma)* | 4.60 | 90.8 | 71.3 | 2.7 | 3.4 |
| *(Picea mariana/Picea mariana/Picea mariana-Rhododendron groenlandicum- Vaccinium myrtllloides)* | 4.21 | 85.5 | 40.6 | 4.6 | 1.6 |
| *(Thuja occidentalis-Abies balsamea-Acer rubrum/Alnus incana* ssp. *rugosa)* | 7.02 | 90.3 | 54.2 | 2.0 | 0.9 |
| *(Thuja occidentalis/Osmunda cinnamomea)* | 7.54 | 88.4 | 74.3 | 1.5 | 0.8 |
| *(Alnus incana* ssp. *rugosa/Acer rubrum)* | 6.21 | 91.4 | 89.9 | 1.5 | 0.2 |
| Source: Anderson and Davis 1998 | | | | | |

## Wetland Indicator Status

*Gaultheria hispidula* is a facultative wetland species, meaning that it usually occurs in wetlands but may occur in nonwetlands (U. S. Army Corps of Engineers 2020).

## USDA Plants Code (USDA, NRCS 2022b)

GAHI2

## 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 extent of *Gaultheria hispidula* is limited to Canada and the northern United States (POWO 2022). The map in Figure 1 depicts the extent of Creeping-snowberry in North America.

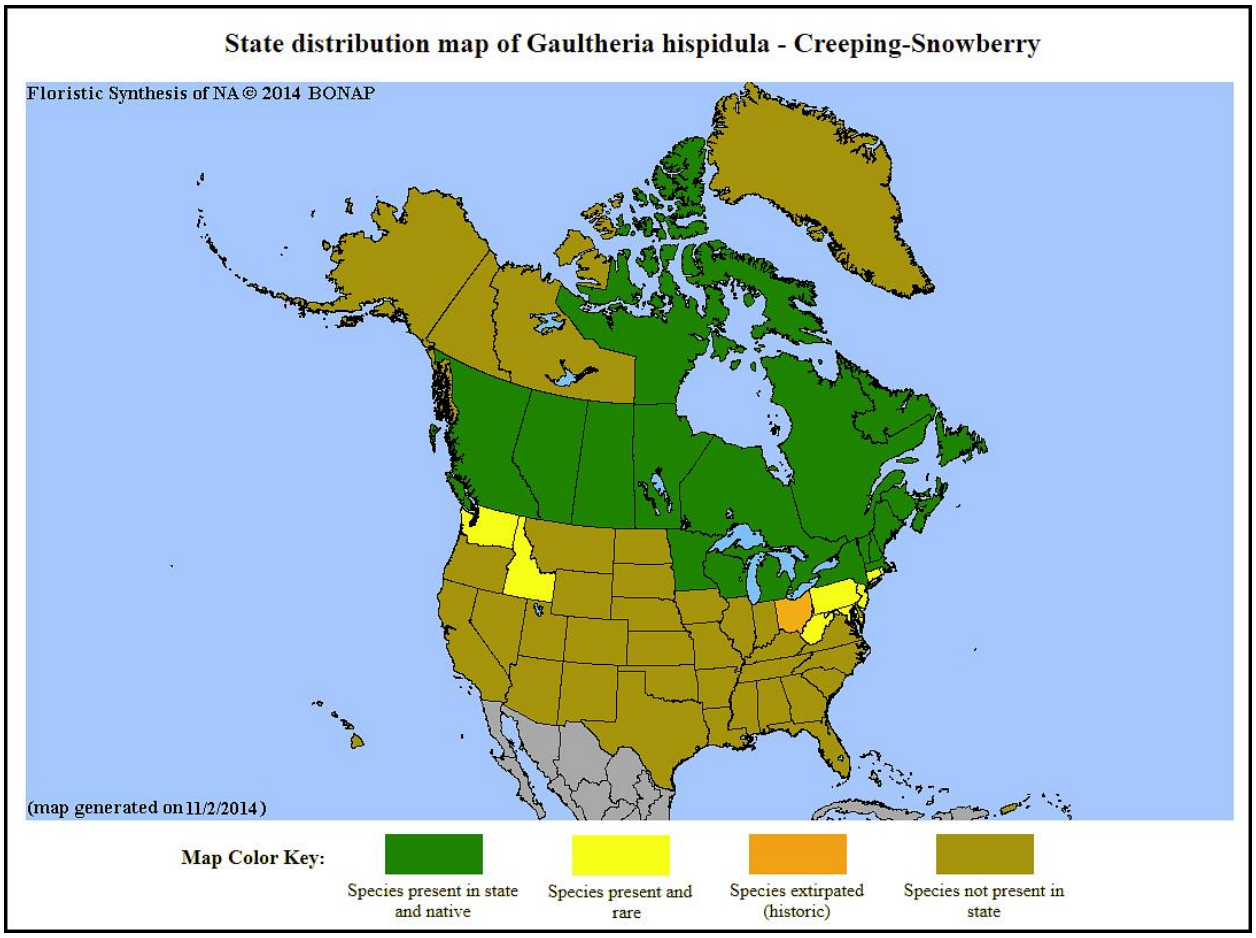



*Figure 1. Distribution of G. hispidula in North America, adapted from BONAP (Kartesz 2015).*

The USDA PLANTS Database (2022b) shows records of *Gaultheria hispidula* in four New Jersey counties: Bergen, Hudson, Passaic, and Sussex (Figure 2). The data include historic observations and do not reflect the current distribution of the species.

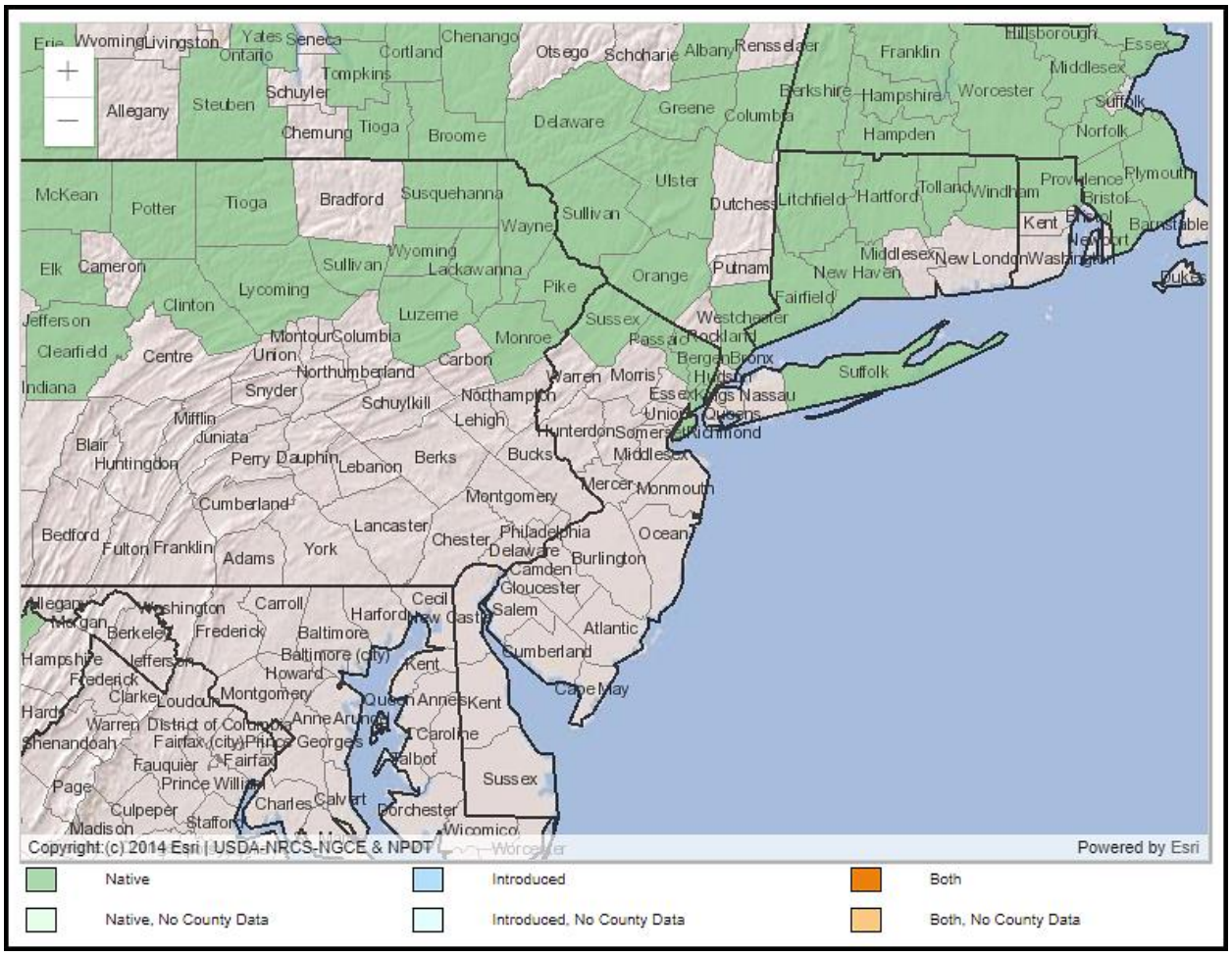



*Figure 2. County records of G. hispidula in New Jersey and vicinity (USDA NRCS 2022b).*

## Conservation Status

*Gaultheria hispidula* 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 2022). The map below (Figure 3) illustrates the conservation status of *G. hispidula* throughout its range. Creeping-snowberry is critically imperiled (very high risk of extinction) in three states, imperiled (high risk of extinction) in two states and one province, vulnerable (moderate risk of extinction) in two states, and presumed extirpated in Ohio. In other places where *G. hispidula* occurs it is secure, apparently secure, or unranked.

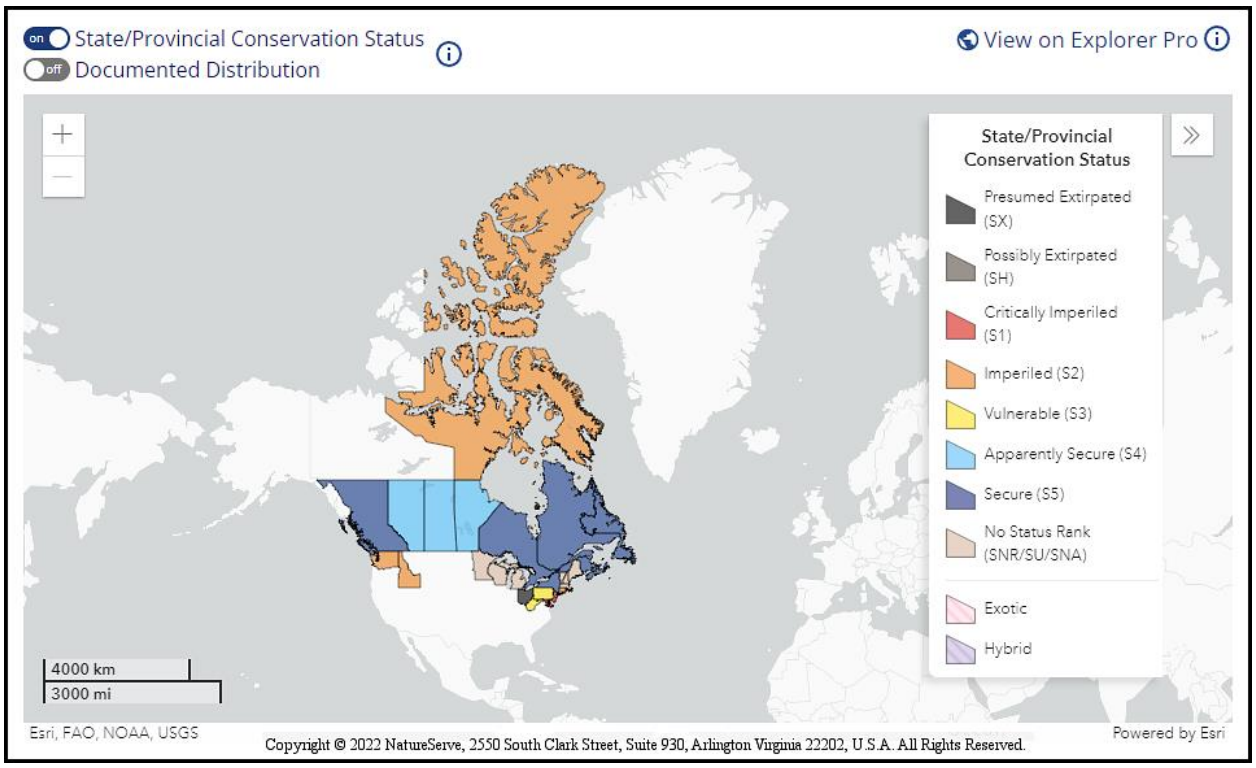



*Figure 3. Conservation status of G. hispidula in North America (NatureServe 2022).*

New Jersey is one of the states where *Gaultheria hispidula* is critically imperiled (NJNHP 2022). The S1 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. *G. hispidula* 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 Creeping-snowberry 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).

New Jersey's original record of *Gaultheria hispidula* was based on a specimen collected in a Hudson County cedar swamp during the 1800s. The location was subsequently reported as "probably already extinct" by Britton (1889), then as "long ago destroyed" by Taylor (1915). A few populations were later found in Passaic and Sussex Counties (Fables 1956, Fairbrothers and Hough 1973). The Sussex occurrences are presently ranked as historical and only the small Passaic County colony is considered extant (NJNHP 2022).

## Threats

Fairbrothers and Hough (1973) observed that *Gaultheria hispidula* was becoming increasingly rare as a result of habitat loss to lumbering and similar activities, and the site of at least one former New Jersey occurrence was destroyed by development (NJNHP 2022). Elsewhere in its

range *G. hispidula* habitat has also been altered for agriculture or railway construction, and current threats include additional development, impacts from recreational activities, and the proliferation of invasive flora (Hays 2001).

Fire often has a negative effect on *Gaultheria hispidula*, and the threat appears to increase with the intensity of the blaze. *G. hispidula* can persist at some locations following a light burn but typically vanishes after a severe fire, in some cases re-establishing later from seed (Ahlgren 1960). Krefting and Ahlgren (1974) reported that Creeping-snowberry plants were often completely missing from burned land until 5–10 years post-fire. Significant decreases in the cover of *G. hispidula* following fires were also reported by Foster (1985) and Harper et al. (2004). The shallow root systems of the plant seem to make it particularly vulnerable to burning (Foster 1985).

The responses of *Gaultheria hispidula* to other types of habitat disruption that result in canopy removal may vary according to disturbance type or scope. Dibble et al. (1999) identified *G. hispidula* as an indicator of habitat stability. Canopy age does not appear to be significant, as Moola and Vasseur (2004) found that *G. hispidula* had no particular affinity for either young clearcuts (3-6 years old) or late successional stands (100-165 years old). Some studies of logging impacts reported that Creeping-snowberry disappeared following clear-cuts (Roberts and Zhu 2002, DeGraaf and Roberts 2009). In a comparison of harvest methodologies, *G. hispidula* showed a slightly better subsequent recovery in clear-cuts than in strip-cuts but the effect was short-lived (Elson and Simon 2007). When residual forest patches were maintained in logged sites the percent cover of *G. hispidula* was significantly higher in tree-retention groups than in clear-cut areas (Lachance et al. 2013) and the authors noted that the greater availability of highly-decomposed snags in the retention area may have aided the species. Moola and Vasseur (2008) pointed out the importance of dead wood on the forest floor in understory recovery from canopy loss. Relatively minor disturbances such as those caused by windthrow can be beneficial for *G. hispidula*: The small gaps create favorable conditions for vegetative reproduction and the increase in coarse woody debris on the forest floor provides microsites that will eventually become suitable for seedlings (Girard et al. 2014).

No threats to New Jersey's remaining occurrence of *Gaultheria hispidula* have been reported, and other potential hazards identified for the species appear to be negligible. American Cow-wheat (*Melampyrum lineare*) is a hemiparasitic plant that occasionally grows in wet bog habitats and it has been observed parasitizing *G. hispida* (Benninghouse 1976). Creeping-snowberry is sometimes cited as a host plant for the Bog Fritillary, *Boloria eunomia* (e.g. Wildflowers of the Adirondacks 2022), but the primary larval foodplants of the butterfly are species of *Polygonum*, *Viola* and *Salix* (Schweitzer 2001). Eiseman (2021) clarified that the fritillary had been observed ovipositing on *G. hispidula* but the plant was not considered to be a true larval host.

As the global climate warms, temperatures are rising faster in New Jersey than elsewhere in the northeast and the weather patterns are also changing. A net increase in annual precipitation is likely due to greater storm intensity but more frequent droughts are also expected in the state (Hill et al. 2020). *Gaultheria hispida* is able to grow in both wetlands and drier sites but responds poorly to canopy removal so the impact on the species may depend on how local conditions affect its ecological community. New Jersey's extant population of *G. hispida* is

situated under a canopy of Atlantic White Cedar (*Chamaecyparis thyoides*) (NJNHP 2022). In the central part of its range, which includes northern New Jersey, *C. thyoides* is particularly vulnerable to the combination of drought and heat stress that is increasing in the region although the impacts could be partially mitigated by additional precipitation (Pederson et al. 2020). If a change in community structure did result from a severe storm or extensive drought it would be difficult for the small, isolated occurrence of *Gaultheria hispidula* to rebound.

## Management Summary and Recommendations

The conservation status map in Figure 3 shows that *Gaultheria hispidula* is most likely to be vulnerable at the edges of its range. In places where the species is rare, land conservation and habitat protection appear to be its primary management needs. New Jersey's population is situated in a protected watershed and the habitat has been characterized as pristine (NJNHP 2022). However, the occurrence was small when it was last observed several decades ago and a site visit is needed to monitor the present status of the plant and evaluate current habitat conditions. Searches for *G. hispidula* at two historic locations where suitable habitat is still present are also recommended.

Hays (2001) recommended studies of some *Gaultheria hispidula* habitat components such as soil composition, light and moisture regimes, or community structure. Research regarding germination and early development in the species would be particularly beneficial as such knowledge could shed light on the reasons for the low rates of successful establishment from seed that have been reported for *G. hispidula*. Additional information about both the species' biology and its microsite preferences would help land managers understand what enables *G. hispidula* to rebound following disturbances or to colonize new locations.

## Synonyms

The accepted botanical name of the species is *Gaultheria hispidula* (L.) Muhl. ex Bigelow. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, POWO 2022, USDA NRCS 2022b). For nearly a century *G. hispidua* was placed in a separate genus (*Chiogenes*), but Airy-Shaw (1940) returned it to *Gaultheria* and the majority of botanists have accepted the reinstatement (Middleton 1991a).

| **Botanical Synonyms** | **Common Names** |
|---|---|
| *Arbutus filiformis* Lam. | Creeping-snowberry |
| *Arbutus thymifolia* Aiton | Creeping Teaberry |
| *Chiogenes hispidula* (L.) Torr. & A. Gray | Creeping Spicy-wintergreen |
| *Chiogenes serpyllifolia* (Pursh) Salisb. | Cancer Wintergreen |
| *Gaultheria serpyllifolia* Pursh | Ivory-plums |
| *Glyciphylla hispidula* (L.) Raf. | Moxie-plum |
| *Lasierpa hispidula* (L.) Torr. | Capillaire |
| *Oxycoccus hispidulus* (L.) Pers. | Maidenhair-berry |

*Phalerocarpus hispidulus* (L.) Heynh.
*Phalerocarpus serpyllifolia* (Pursh) G. Don
*Schollera hispidula* (L.) Steud.
*Vaccinium hispidulum* L.

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