

# *Orthilia secunda* (L.) House

Sidebells

Ericaceae



Anton Hartinger, *Atlas der Alpenflora*, Public Domain

## *Orthilia secunda* Plant Profile

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New Jersey Forest Service  
Office of Natural Lands Management  
New Jersey Natural Heritage Program

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## Life History

*Orthilia secunda* (sidebells, one-sided shinleaf, one-sided wintergreen) is an evergreen perennial plant in the heath family, Ericaceae. *Orthilia secunda* (hereafter referred to as *Orthilia*), formerly a member of the genus *Pyrola*, is the sole species in the genus *Orthilia* (Gleason & Cronquist, 1991). Common names such as “one-sided shinleaf” and “sidebells” refer to the cluster of flowers that sprout from a single side of the scape (Native Plant Trust, 2020). *Orthilia* inhabits mossy wetlands, wetland margins, damp woods, and coniferous forests. *Orthilia* is widespread throughout Eurasia and North America, occurring as far south as Mexico and Guatemala in areas above 2000m in elevation (NatureServe, 2020). There is some research suggesting that *Orthilia* is a partial myco-heterotroph, able to obtain carbon from both photosynthesis and its own mycorrhizal associations (Whitfield, 2007). *Orthilia* is a low, rhizomatous, evergreen perennial with basal leaves and a long flowering scape. The glaucous leaves are roughly egg shaped, elliptic to broadly ovate, crenate to entire, 1.5-4cm long, and rounded at the base. Petioles are 4-20mm long, with noticeable internodes separating them on the stem. The scape is 10-20cm long with a crowded and secund racemic inflorescence bearing 3-29 flowers. Each pedicel is 3-7mm long. Sepals are semi-orbicular to ovate and 0.5-1mm long. Flowers are white to greenish with 5 petals, each 5mm long and obscurely denticulate. Anthers are 1.5-2mm long and rounded at the base with large and conspicuous pores on the distal ends. Style is 3-5mm and exsert at anthesis. The fruit is a globular, 5-chambered capsule roughly 6.5mm long, with the long style still conspicuous. The dry fruit persist on the stem until the next growing season (Minnesota Wildflowers, 2020; Gleason and Cronquist, 1991; Flora of North America Vol 8, 2020.) While the unique inflorescence makes it relatively easy to identify while in flowering/fruitlet life stages, *Orthilia* is diminutive and subtle with basal leaves and habitat similar to species of the genus *Pyrola*. For these reasons, the best time to accurately identify *Orthilia* is during its bloom time from June-August (Connecticut Botanical Society, 2015).

It should be noted, however, that *Orthilia* has rarely been seen blooming in New Jersey and can be easily overlooked in its vegetative form. Familiarity with the subtle differences between the leaves of *Pyrola* spp. and *Orthilia* will likely be required for any surveys (David Snyder, Personal Communication January 2021). Vegetative *Orthilia* can be differentiated from vegetative *Pyrola americana* and *P. elliptica* using subtle leaf characteristics. *Orthilia* leaves are generally smaller (1.5-4cm) compared to *P. americana* and *P. elliptica* (2.5-7cm), but overlap still exists. However, the leaves of *P. americana* and *P. elliptica* are nearly always decurrent along the petiole, while *Orthilia* leaves are not. Additionally, *Orthilia* leaves are usually separated by conspicuous internodes, a characteristic that both *P. americana* and *P. elliptica* lack (Gleason and Cronquist, 1991).

### Mixotrophy/Myco-heterotrophy in *Orthilia secunda*

Myco-heterotrophy is the symbiotic relationship between a plant and fungi in which the plant parasitizes a fungal host to obtain all or most of its nutrients (Leake, 1994). A fully myco-heterotrophic plant lacks photosynthesis and instead acquires all nutrients from a fungal host. *Orthilia* is often labeled as a mixotroph or partial myco-heterotroph (able to utilize several energy sources, i.e. photosynthesis as well as ectomycorrhizal fungi) rather than an obligate

myco-heterotroph as it is unclear the extent to which *Orthilia* and other members of the Pyroloideae rely on mycorrhizae for nutrient acquisition throughout their entire life cycles (Johansson et al. 2015; Malysheva et al. 2018). However, it is known that early development in *Orthilia* is almost completely reliant on a fungal host. *Orthilia* and related *Pyrola* spp. produce extremely small seeds known as dust seeds that lack any significant nutrient reserves and, like orchids, rely on a fungal host in the early stages of their development (Johansson et al. 2015). Seedlings can remain subterranean for years, completely relying on a fungal host for nutrient acquisition during this time (Johansson & Eriksson, 2013). Studies examining nutrient acquisition and origin and *Orthilia* suggest that during adult life stages, *Orthilia* acquires a large amount of enriched nitrogen from its fungal hosts when compared to strictly autotrophic interior forest species (Johansson et al. 2015). A separate study examining *Orthilia* indicates that as much as 65% of the fixed carbon found in *Orthilia* may be of fungal origin (Tedersoo et al. 2006). Furthermore, fungal carbon acquisition was only higher in *Orthilia* living in low light conditions, suggesting that the extent myco-heterotrophy in *Orthilia* is at least partially dependent on environmental factors (Johansson et al. 2015; Zimmer et al. 2007).

### **Pollinator Dynamics**

While specific pollinator information is not well known, *Orthilia* is known to be pollinated primarily by bumblebees (*Bombus* spp., Apidae). Unlike other plants in the subfamily Pyroloideae, *Orthilia* is visited by both nectar collectors and pollen buzzers as opposed to one or the other (Knudson and Olesen, 1993).

### **Seed Dispersal**

*Orthilia* produces a large number of very small seeds, known as dust seeds, and is assumed to depend on wind for seed dispersal (NatureServe, 2020). There is also some evidence that seeds dispersed closer to adult plants are more likely to successfully germinate, probably due to a shared mycorrhizal host (Johansson & Eriksson, 2013).

### **Habitat**

The habitat of *Orthilia* is variable throughout its extensive North American range. In the far northern and western extent of its range, *Orthilia* will grow in relatively open alpine and tundra habitat. In the northeast United States, however, *Orthilia* generally grows in rich, damp woods, wetlands margins, mossy wetlands, and mixed deciduous and coniferous forest (Gleason and Cronquist, 1991; Native Plant Trust, 2020; Flora of North America Vol. 8, 2020). In NJ, there are 32 historic, but now lost, occurrences of *Orthilia*, mostly known from herbarium records dated between 1860 and 1920. These 32 occurrences were spread across the Ridge and Valley, Highlands, Piedmont, and even Coastal Plane physiographic provinces. Historical occurrences from the Ridge and Valley, Highlands, and Piedmont physiographic provinces are usually

associated with trap rock and limestone substrates, but were found along wetlands under hemlock (*Tsuga canadensis*) stands as well. Coastal Plain occurrences were known from wooded ravines overtop a marl substrate (David Snyder, Personal Communication January 2021). There are 3 extant occurrences of *Orthilia* in New Jersey, all of which are found in the Ridge and Valley physiographic province. More specifically, *Orthilia* in NJ is found in rich, dry to moist woodlands on or near limestone ridges and sinkholes. All 3 extant occurrences of *Orthilia* indicate an affinity for limestone woodlands. While there is little soil data regarding NJ occurrences, this affinity for limestone bedrock may indicate a preference for higher soil pH associated with limestone woodlands. Associated rare species include *Panax quinquefolia* and *Chamaelirium luteum* (New Jersey Natural Heritage Program, 2020).

### **Wetland Indicator Status**

FACW

*Orthilia* is classified as a facultative wetland species, indicating that it usually occurs in wetlands, but can be found in non-wetland habitat as well (USDA, 2020).

### **USDA Plants Code**

ORSE

“Each symbol is composed of the first two letters of the genus+first two letters of the species+first letter of the terminal infraspecific name+tiebreaking number (if needed)” (USDA, 2020).

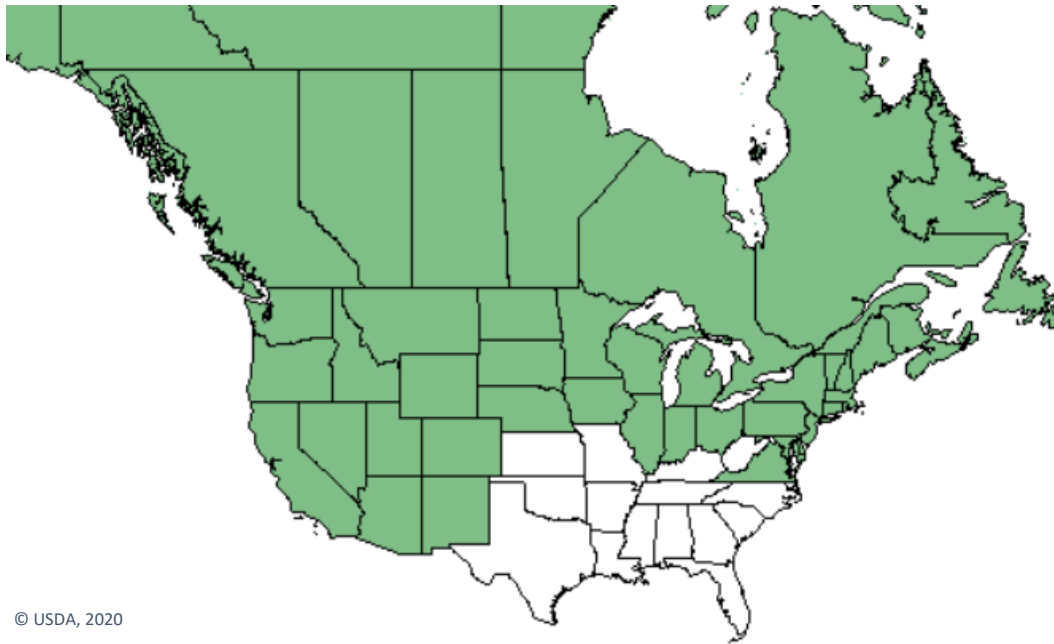
<https://plants.usda.gov/core/profile?symbol=ORSE>

### **Coefficient of Conservatism (Walz et al. 2018)**

CoC=8; Native with a narrow range of ecological tolerances and typically associated with a stable community.

## Distribution and Range

North American Range Map of *Orthilia secunda* (USDA, 2020)



*Orthilia* has a circumboreal distribution. Its North American range is extremely broad and varied from Greenland to Alaska, south to California, Arizona, and New Mexico, with isolated populations in the mountains of Mexico and Central America all the way to western Guatemala at elevations above 1850m. In the Midwest, great plains, and Eastern US its range extends as far south as Iowa and Nebraska, east to New Jersey and south to Virginia. While the range of *Orthilia* is extensive and widespread, it can be regionally uncommon, existing in small rhizomatous colonies rather than consistently present throughout suitable habitat (NatureServe, 2020; Kartesz, 2015; Minnesota Wildflowers, 2020) The conservation ranking for each state/province within its range is as follows: Alaska (SNR), Arizona (SNR), California (SNR), Colorado (SNR), Connecticut (SH) Delaware (SH), District of Columbia (SH) Idaho (SNR), Indiana (SX), Iowa (S1) Maine (SNR), Maryland (SH), Massachusetts (SNR), Michigan (SNR) Minnesota (SNR), Montana (S5), Nebraska (S1), Nevada (SNR), New Hampshire (SNR), New Jersey (S2), New Mexico (SNR) New York (S5), North Dakota (SNR), Ohio (SH), Oregon (SNR), Pennsylvania (SNR), Rhode Island (S1) South Dakota (SNR), Utah (SNR), Vermont (SNR), Virginia (SH), Washington (SNR), Wisconsin (SNR), Wyoming (S4), Alberta (S5), British Columbia (S5), Labrador (S5), Manitoba (S5), New Brunswick (S5), Newfoundland Island (S5), Northwest Territories (SNR), Nova Scotia (S5), Nunavut (SU), Ontario (S5), Prince Edward Island (S5), Quebec (S5), Saskatchewan (S4), Yukon Territory (S5) (NatureServe, 2020).

## **Conservation Status**

### **Status for New Jersey:**

*Orthilia secunda* (S2) (HL)

S2 indicates imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences. Additional occurrence information present in herbaria or other sources and undocumented in the NJNHP Biotics database, may be present for more common species, such as S2 and S3 ranked species. HL indicates protection by the Highlands Water Protection and Planning Act within the jurisdiction of the Highlands Preservation Area (New Jersey Natural Heritage Program, 2020).

### **Global Status:**

*Orthilia secunda* (G5)

Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery (NatureServe, 2020).

## **Threats**

Threats to *Orthilia* include invasive species, OHV activity, habitat loss, and logging of large contiguous forest tracts. Of the 3 occurrences still listed in the Biotics database, one of them was reported nearly wiped out by OHV activity. Habitat loss and encroaching invasive species are the two largest threats and likely the drivers of its decline in New Jersey. Furthermore, recently logged areas can attract deer, create opportunities for biological invasion, and alter the hydrology and movement of sediment in the landscape. Herbicides commonly used after logging can potentially affect occurrences or habitat of *Orthilia* as well. *Orthilia* is most often found in cool, shady habitat with full canopy. Logging operations on or near *Orthilia* habitat can dramatically alter the amount of light reaching the forest floor (New Jersey Natural Heritage Program, 2020).

## **Management Summary and Recommendations**

*Orthilia* lives in shaded swamp margins and rich, woodlands. Management should be directed towards conserving contiguous forest surrounding *Orthilia* occurrences, removing invasive plants before they become well established, and limiting illegal OHV access wherever feasible.

## **Synonyms**

*Orthilia secunda* var. *secunda*

*Pyrola secunda*

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