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**Botrychium campestre** W.H. Wagner & Farrar ex W.H. & F. Wagner

Prairie Moonwort

**MN Status:**  
special concern  
**Federal Status:**  
none  
**CITES:**  
none  
**USFS:**  
none

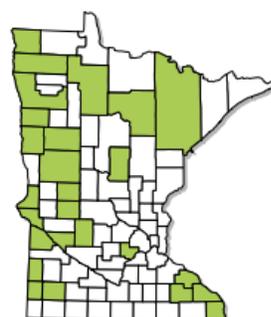
**Group:**  
vascular plant  
**Class:**  
Ophioglossopsida  
**Order:**  
Ophioglossales  
**Family:**  
Ophioglossaceae  
**Life Form:**  
forb  
**Longevity:**  
perennial  
**Leaf Duration:**  
deciduous  
**Water Regime:**  
terrestrial  
**Soils:**  
sand, loam  
**Light:**  
full sun  
**Habitats:**  
[Upland Prairie](#)

**Basis for Listing**

*Botrychium campestre* was first discovered in 1982 and described eight years later (Wagner and Wagner 1990). Until that time, no one knew that *Botrychium* spp. (moonworts) occurred in prairies. The discovery sparked considerable interest among botanists in finding more sites of this species, and in trying to find out if other undescribed moonworts could be found. Results have been quite impressive; we now know that *B. campestre* ranges across the whole continent. Botanists have also discovered previously undescribed species of *Botrychium* from prairies and a variety of prairie-like habitats. The actual rarity of *B. campestre* is difficult to judge at this time. There are now numerous records, but they are the result of an unprecedented search effort. Further searches will undoubtedly discover additional sites, and it is possible that at some time in the future *B. campestre* will be thought of as relatively common. *Botrychium campestre* was listed as a special concern species in Minnesota in 1996.



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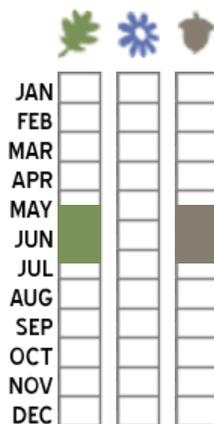


[Map Interpretation](#)



[Map Interpretation](#)

**Best time to see:**



**Description**

*Botrychium campestre* is a small, inconspicuous fern that can be very difficult to find. All that is seen above ground is a single leaf divided into a sterile photosynthetic portion and a fertile spore-bearing portion. The shape of the sterile portion is diagnostic for *Botrychiums*. In *B. campestre*, the sterile portion is sessile, oblong in outline, and longitudinally folded. The maximum size is normally about 4 cm (1.6 in.) in length and 1.3 cm (0.5 in.) in width, and it has a fleshy texture. It is normally divided into 5 pairs of linear or linear-spatulate segments. The margins of each segment are crenate or dentate and are usually notched or cleft into 2 or several secondary segments. Positive identification will likely require the aid of a specialist who has experience with this species. In every case, a leaf specimen will need to be collected, carefully pressed, and dried. Photographs are not adequate.

**Habitat**

As its name implies, *B. campestre* is primarily a prairie species. It is found in coarse, well-drained glacial till or in thin loess over bedrock in plant communities that include dry prairies, dry hill prairies, dry bedrock bluff prairies, and sand-gravel prairies. The dominant species are usually clump-forming grasses such as *Schizachyrium scoparium* (little bluestem), *Andropogon gerardii* (big bluestem), and *Bouteloua curtipendula* (side oats gramma). In nearly all cases, the prairie habitats where *B. campestre* is found are fairly high quality, in ecological terms, and have no history of agriculture. Habitats also tend to be free of non-native sod-forming grasses such as *Bromus inermis* (smooth brome). In addition to prairies, there are a cluster of *B. campestre* records from the Iron Range in northeastern Minnesota, which is within the forested region of the state. Specifically, the records are from sediment basins used by iron ore and taconite processing plants. When the basins become filled with sediments, they are drained of their water and gradually become





colonized by early successional plant species, primarily grasses, forbs, and tree saplings. At this point, the texture of the sediments and the structure of the plant community create an ideal habitat for many species of *Botrychium*, including *B. campestre*. Exactly how *B. campestre* arrives at these sites and where it comes from remains somewhat of a mystery.

#### Biology / Life History

*Botrychium campestre* is a small, terrestrial fern with a complex and poorly understood life history. The single leaf is the only part of the plant that appears above ground, and it is divided into a spore-bearing portion and a photosynthetic portion. The leaf appears in early spring and dies-back in late spring or early summer. In drought years, the leaf may die-back sooner or it may not appear above ground at all. In some cases, this may result in mortality; in other cases the plant survives and sends up a leaf the following year, if moisture conditions have improved (Johnson-Groh 1999). It has been reported that *B. campestre* is mycorrhizal, meaning it receives a portion of its nutrients from soil fungi that inhabit all native prairies. Sexual reproduction is achieved by spores that are dispersed by wind currents, although the spores generally travel no more than a few meters. Asexual reproduction is achieved by gemmae. These are small, spherical vegetative propagules that are produced in dense clusters at the root bases (Farrar and Johnson-Groh 1990). *Botrychium campestre* is one of four moonwort species that commonly produce gemmae.

The best time to search for *B. campestre* is from mid-May to the end of June; by mid-summer the plants will have disappeared.

#### Conservation / Management

Prairie habitats need to be maintained in a healthy condition, especially the soil biotic environment. *Botrychium campestre* is known to be susceptible to fire, so prescribed burns should be scheduled for early spring before the plants emerge from the ground. The conservation value of *B. campestre* populations that occur in tailings basins is difficult to determine, but should not be dismissed. Such habitats are presumably in a rapid state of vegetative succession, that is, in transition from an open prairie-like habitat to a closed forest habitat. The transition period may exist for a relatively short period of time, perhaps only 20-40 years. It is not known for sure, but it is hypothesized that when these habitats begin to resemble a forest, the populations of *B. campestre* will disappear. The role of these short-lived populations in the ecology of the species is difficult to determine, but they may serve as a source of spores or vegetative propagules for the colonization of other nearby habitats.

#### Conservation Efforts in Minnesota

A number of *B. campestre* habitats occur on public or private lands that are being preserved for their ecological or environmental values. Although there is little supporting documentation, it seems that *B. campestre* is thriving at several of these sites.

#### References

- Chadde, S., and G. Kudray. 2001. Conservation Assessment for Iowa Moonwort (*Botrychium campestre*). United States Forest Service, Eastern Region, Milwaukee, Wisconsin. <[http://www.fs.fed.us/r9/wildlife/tes/ca-overview/docs/plant\\_Botrychium\\_campestre-Iowa\\_Moonwort.pdf](http://www.fs.fed.us/r9/wildlife/tes/ca-overview/docs/plant_Botrychium_campestre-Iowa_Moonwort.pdf)>. Accessed 16 September 2009.
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- Johnson-Groh, C. L. 1999. Population biology of *Botrychium* (moonworts): Status report on Minnesota *Botrychium*. Permanent plot monitoring. Unpublished report to the Minnesota Department of Natural Resources.
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***Botrychium pallidum*** W.H. Wagner

**Pale Moonwort**

**MN Status:**  
endangered  
**Federal Status:**  
none  
**CITES:**  
none  
**USFS:**  
yes

**Group:**  
vascular plant  
**Class:**  
Ophioglossopsida  
**Order:**  
Ophioglossales  
**Family:**  
Ophioglossaceae  
**Life Form:**  
forb  
**Longevity:**  
perennial  
**Leaf Duration:**  
deciduous  
**Water Regime:**  
terrestrial  
**Soils:**  
loam  
**Light:**  
full sun, full shade, partial shade  
**Habitats:**  
**Fire Dependent**  
**Forest, Mesic**  
**Hardwood Forest**

**Basis for Listing**

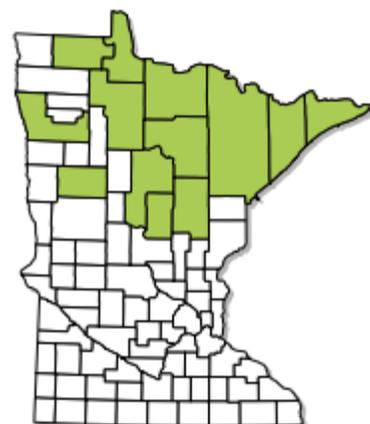
This baffling species has been reported as one of the rarest moonworts in North America, occurring only sporadically in Canada, Montana, Colorado, Wyoming, South Dakota, Minnesota, Wisconsin, Michigan, and Maine (Wagner and Wagner 1993). *Botrychium pallidum* was first discovered in Minnesota in 1992 in Lake County. Since then, it has been observed in a great variety of habitats in northern Minnesota. It is difficult to determine if the known populations are stable because most populations have been located only recently and little is known about their life history. Due to its tiny size, the species is easily overlooked and additional populations may yet be located. When *Botrychium pallidum* was listed as a state endangered species in 1996, only six populations had been documented in Minnesota. As of August 2009, that number had risen to 65. In light of this, downgrading the species' status to special concern is currently being considered.

**Description**

This tiny plant is 2.5-7.6 cm (1-3 in.) high and has a pale green leaf with up to 5 pairs of whitish, kidney-shaped pinnae (lobes of the leaf). Each pair of pinnae may be folded towards each other. The bottom, largest pair of pinnae often split into 2 unequal lobes with rounded tips and with veining like the ribs of a fan, with no central midrib. Spore capsules, while typically occurring on the fertile or spore-bearing frond, can also occasionally be found on the lobes of the trophophore or non-spore-bearing frond. *Botrychium pallidum* commonly produces dense clusters of minute, spherical gemmae at the root bases. *Botrychium pallidum* can be distinguished from small plants of other *Botrychium* species by the often-folded pinnae and pale green to



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**Map Interpretation**
**Best time to see:**

 JAN   

*Botrychium pallidum* commonly produces dense clusters of minute, spherical gemmae at the root bases. *Botrychium pallidum* can be distinguished from small plants of other *Botrychium* species by the often-folded pinnae and pale green to



Map Interpretation

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whitish color (Wagner and Wagner 1993). Although most populations contain only a few plants, up to 50 individuals have been recorded at a single site.

### Habitat

In Minnesota, *B. pallidum* has been found in a diversity of habitats ranging from open fields, dry sand and gravel ridges, roadsides, wet depressions, marshy lakeshores, and tailings basins, as well as second-growth forests and shaded, moist, mixed deciduous-hardwood forests. It is often found growing in disturbed, weedy areas and in forest areas without an overstory. *Botrychium pallidum* also grows in the shade in mixed forests of *Acer saccharum* (sugar maple), *Alnus* spp. (alder), *Betula* spp. (birch), *Picea mariana* (black spruce), *Populus grandidentata* (big-toothed aspen), *P. balsamifera* (balsam poplar), *P. tremuloides* (quaking aspen), *Quercus rubra* (northern red oak), *Thuja occidentalis* (northern white cedar), and *Tilia americana* (basswood). It is often found growing with other *Botrychium* species, especially *B. matricariifolium* (matricary grapefern), *B. minganense* (Mingan moonwort), *B. multifidum* (leathery grapefern), *B. simplex* (least moonwort), and *B. virginianum* (rattlesnake fern).



### Biology / Life History

Gametophytes and young nonemergent sporophytes exist underground for many years (possibly 10 years) before producing the first frond. Mortality can be high during this time (U.S. Forest Service 1999). *B. pallidum* has been found only in association with other *Botrychium* species; it has not been found by itself (Wagner and Wagner 1990).

The best time to search for *B. pallidum* is in late spring and early summer when the leaves come out. However, in some years plants do not show above the ground.

### Conservation / Management

This is an unusually tiny plant, and its small size may cause it to be overlooked. Little is known about its habitat requirements, however, it may require early or mid-successional habitats where competition for light is minimal (U.S. Forest Service 1999). The primary threat to *B. pallidum* is loss of habitat, but it is unclear how suitable habitat should be managed or maintained.

### Conservation Efforts in Minnesota

There have been no known conservation efforts directed towards this species in Minnesota.

### References

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***Botrychium rugulosum*** W.H. Wagner

**St. Lawrence Grapefern**
**MN Status:**

threatened

**Federal Status:**

none

**CITES:**

none

**USFS:**

yes

**Group:**

vascular plant

**Class:**

Ophioglossopsida

**Order:**

Ophioglossales

**Family:**

Ophioglossaceae

**Life Form:**

forb

**Longevity:**

perennial

**Leaf Duration:**

evergreen

**Water Regime:**

terrestrial

**Soils:**

sand

**Light:**

full sun, partial shade

**Habitats:**
[Fire Dependent Forest](#)
**Basis for Listing**

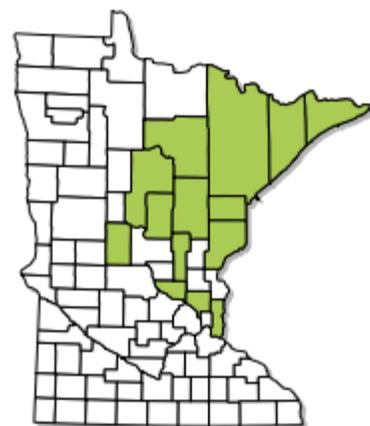
Like several other species of *Botrychium*, our knowledge of *Botrychium rugulosum* is constantly evolving. This species appears to be very rare in Minnesota and apparently throughout its range, however, it is chronically confused with the common *B. multifidum* (leathery grapefern). In fact, most of the purported records of *B. rugulosum* submitted to the Minnesota DNR for confirmation turn out to be *B. multifidum*. In order to get a reasonably certain identification, a carefully preserved herbarium specimen must be made and examined by a specialist. Photographs are not adequate documentation. Complicating the issue is the uncertain taxonomic relationship between these two closely related species. The habitat requirements of *B. rugulosum* are still not thoroughly understood, but most of the known Minnesota locations are either in open pine forests or in moist, grassy areas within a pine or oak ecosystem. As with many other threatened species, habitat alteration is a primary and continuing threat to the perpetuation of this species in the state. *Botrychium rugulosum* was listed as a threatened species in Minnesota in 1996.

**Description**

In habit, *B. rugulosum* resembles *B. dissectum forma obliquum* (cutleaf grapefern) and *B. multifidum* with which it commonly grows, but its leaf emerges from the ground in late May before the former and after the latter. Sterile deltoid leaf blades average 4-8 cm (1.6-3.1 in.) long, with the stalk more or less the same length (shorter in sun forms and longer in shade forms). Unlike the rounded lobes of the leaf of *B. multifidum*, the *B. rugulosum* leaf has angular lobes, mostly 2-5 mm (0.08- 0.2 in.) wide, with



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**Map Interpretation**
**Best time to see:**




**Map Interpretation**

the edge of the leaf mostly coarsely and irregularly toothed. *Botrychium rugulosum*'s teeth are dentate (wide-based, squarish, outward-pointing) as opposed to the serrate (narrow, sharp, forward pointing, saw-like) teeth of *B. dissectum forma obliquum*. The leaf of *B. rugulosum* may maintain its green color, while the leaf of *B. dissectum* can turn a drab, reddish color and then become bronze-colored in autumn.

### Habitat

*Botrychium rugulosum* grows in low, moist habitats in brushy or grassy areas and in open forest areas. It can be found growing in mossy areas in forests of *Pinus banksiana* (jack pine) or *P. resinosa* (red pine). *Botrychium rugulosum* also occurs in the transition zone between these habitats and adjacent habitats. In most locations, there may be only 1 or a few individuals occurring with relatively more common species of *Botrychium*, especially *B. dissectum* and *B. multifidum*, with which it is often confused.

### Biology / Life History

The leaf of *B. rugulosum* is semi-evergreen and persists through the winter. When summer approaches, the old frond deteriorates as the new frond emerges (U.S. Forest Service 1999). The species epithet *rugulosum* refers to its tendency to become more or less wrinkled and convex (Wagner and Wagner 1993). Another common name for this species is ternate grape fern.

The best time to search for *B. rugulosum* is from early spring, when snow melts and reveals plants, to late autumn before snowfall covers plants. *Botrychium* species may not emerge every year, especially during drought.

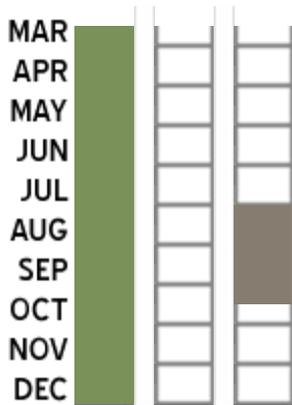
### Conservation / Management

The preference of *B. rugulosum* for open habitats and openings within forests suggests that it may be adapted to exploit certain habitats in early successional communities. This could complicate management, because the natural dynamics of early successional and rapidly evolving communities are notoriously difficult to mimic with artificial means. These habitats normally rely on a complex interaction of events as varied as an insect outbreak, windstorm, fire, and erosion. Very few of the known habitats of *B. rugulosum* are large enough or wild enough to support such ecosystem processes. Immediate threats include development projects, habitat alteration, herbicide, and water level manipulation (U.S. Forest Service 1999).

### Conservation Efforts in Minnesota

The design of a Minnesota DNR off-highway-vehicle park near the town of Gilbert was modified to preserve some *B. rugulosum* habitat.

### References





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## *Caltha natans*

Pallas ex Georgi

## Floating Marsh-marigold

### MN Status:

endangered

### Federal Status:

none

### CITES:

none

### USFS:

yes

### Group:

vascular plant

### Class:

Dicotyledoneae

### Order:

Ranunculales

### Family:

Ranunculaceae

### Life Form:

forb

### Longevity:

perennial

### Leaf Duration:

deciduous

### Water Regime:

aquatic, wetland

### Light:

full sun

### Habitats:

[Small Rivers and Streams](#), [Medium Rivers and Streams](#), [Wet Meadow/Carr](#), [Non-forested Rich Peatland](#)

### Basis for Listing

*Caltha natans* is a circumboreal species that is generally rare or local throughout its North American range. This is especially true south of the Canadian border, where it has been found at only a few sites in St. Louis County, Minnesota, and at only one location in Wisconsin. An additional cause for concern in Minnesota is the local extirpations recently suffered by this species. The reason for the extirpations is largely habitat loss, which is a well-documented problem for aquatic species statewide.

*Caltha natans* is an aquatic species that was first collected in Minnesota near the town of Tower on Vermillion Lake in St. Louis County at the turn of the 20th century. It has been documented only sporadically since that time. Most populations discovered in the 1940s and 1950s have not been relocated. Despite the fact that there are many acres of apparently suitable habitat in northeastern Minnesota, only a handful of sites have been found since 1954. Several of these sites are at risk because of habitat alteration. *Caltha natans* was listed as an endangered species in Minnesota in 1996.

### Description

*Caltha natans* is a distinctive plant that bears only superficial resemblance to the more familiar *C. palustris* (common marsh marigold), which is larger and has yellow flowers. *Caltha natans* has small, white flowers about 1 cm (0.4 in.) across. Leaves are simple, thin, and



Map Interpretation



Map Interpretation

### Best time to see:



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FEB	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

MAR			
APR			
MAY	■		
JUN	■	■	
JUL	■	■	■
AUG	■		
SEP			
OCT			
NOV			
DEC			

subentire. The leaves and petioles commonly float in shallow water, but when water recedes the entire plant may be stranded in mud.

### Habitat

*Caltha natans* occurs in shallow (often 6-7.6 dm (2-2.5 ft.)), slow-moving water in streams, creeks, pools, ditches, sheltered lake margins, swamps, and beaver ponds. It typically roots in mud, silt, or clay, and it spreads when stems root at the nodes. Some sites may support only a few scattered individuals but other sites may have a dense mat consisting of many plants. In Minnesota, *C. natans* is associated with *Glyceria* spp. (manna grass), *Carex* spp. (sedges), *Potamogeton* spp. (pondweed), and *Utricularia* spp. (bladderwort), with an overstory of *Fraxinus nigra* (black ash) or *Salix* spp. (willow).



### Biology / Life History

Unlike the other species of *Caltha* in North America, *C. natans* is relatively invariable morphologically and has not been divided into segregated taxa (Ford 1997). It is a perennial herb and is insect-pollinated.

The best time to search for *C. natans* is from May into September, when flowers or leaves are present.

### Conservation / Management

*Caltha natans* is very sensitive to habitat disturbances, especially alteration of naturally-occurring water level fluctuations, herbicides, nutrient enrichment, sedimentation, and non-native species invasion such as *Lythrum salicaria* (**purple loosestrife**). Clearing of vegetation in the riparian area of streams and on shorelines of lakes without an adequate buffer also presents a potential threat. Many of the habitats where *C. natans* is found are open to use by motorized vehicles and wake control is needed. Public water access and private ownership of lakeshore property combine to make conservation management more difficult (U.S. Forest Service 2000). Without collective stewardship by various dispersed interests, the cumulative impacts of land use and lake level changes could negatively impact *C. natans*.

### Conservation Efforts in Minnesota

The **Minnesota County Biological Survey** is in progress in northern Minnesota and *C. natans* is a targeted species.

### References

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## *Eleocharis nitida* Fern.

## Neat Spike-rush

### MN Status:

threatened

### Federal Status:

none

### CITES:

none

### USFS:

yes

### Group:

vascular plant

### Class:

Monocotyledoneae

### Order:

Cyperales

### Family:

Cyperaceae

### Life Form:

graminoid

### Longevity:

perennial

### Leaf Duration:

deciduous

### Water Regime:

wetland

### Soils:

sand, clay, peat

### Light:

full sun, partial shade

### Habitats:

[Lake Shore](#), [Wet Meadow/Carr](#)

### Basis for Listing

*Eleocharis nitida* was originally proposed for state endangered listing in 1984 because it was known only by historical records from 6 locations, all but 1 on the north shore of Lake Superior. Nearly all records were from wetlands immediately adjacent to major state highways that had undergone improvements since the collections were made. However, given the absence of verified records in 1984, the species was not listed at that time. Since 1984, that part of the state has continued to experience rapid expansion of recreational use, resulting in increased roads and development. For these reasons, and because 1 of the 6 historical locations had been rediscovered, *E. nitida* was listed as state threatened in 1996. Between 1996 and 2007 a renewed interest in this species resulted in approximately 35 additional sites being discovered and documented.

### Description

All 17 species of *Eleocharis* in Minnesota are wetland plants with characteristic leafless stems that arise from matted or creeping rhizomes or from an annual root system. *Eleocharis nitida* can be reliably distinguished from the other species only by a careful examination of the achene. It is trigonous (3-angled), pale yellow to orange, minutely roughened on the surface, without bristles, and has a distinctive saucer-shaped tubercle with a very short, central apiculus. Scales are elliptic-oblong with rounded tips and they often

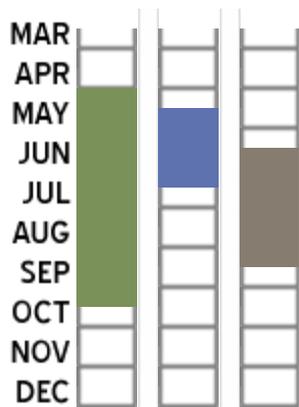


**Map Interpretation**



### Best time to see:





fall from the plant early, leaving persistent achenes. Stems are 4-angled, thin and delicate, and the rhizome is cordlike and purplish. *Eleocharis nitida* typically forms rather dense low carpets.

### Map Interpretation

### Habitat

*Eleocharis nitida* occurs in both wet soil and in shallow water, but is absent from deeper water and marshy areas where there is dense vegetation. Though historically it was found along Lake Superior, the preferred habitat is not the typical rocky shoreline favored by many Lake Superior species. Rather, *E. nitida* prefers a less common habitat that is associated with small streams. It may occur in sand, gravel, clay, or peaty substrates. Rock crevices and moss-lined pools along the north shore of Lake Superior have also been described in the historical records and in several recent Minnesota DNR County Biological Survey records. The species may also occur in disturbed moist sites, such as logging roads, ruts in trails, and road ditches. It favors full sun and open canopies. *Eleocharis nitida* has been associated with mixed deciduous and conifer forest, cedar-ash (*Thuja-Fraxinus*) forest, cedar-fir (*Thuja-Abies*) uplands, *Picea mariana* (black spruce), and sedge marshes. Associated species may include *Agrostis scabra* (ticklegrass), *Carex* spp. (sedges), *Cyperus diandrus* (sedge galingale), *Drosera rotundifolia* (round-leaved sundew), *Danthonia spicata* (poverty grass), *E. acicularis* (least spikerush), *Equisetum* spp. (horsetails), *Euthamia graminifolia* (grass-leaved goldenrod), *Glyceria striata* (fowl manna grass), *Hypericum boreale* (northern St. John's wort), *Juncus* spp. (rushes), *Liparis loeselii* (Loesel's twayblade), *Platanthera huronensis* (tall northern bog orchid), *Parnassia palustris* (marsh grass-of-Parnassus), *Ranunculus acris* (tall buttercup), and *Scirpus* spp. (bulrush).



### Biology / Life History

*Eleocharis nitida* is a short, carpet-forming, rhizomatous species. Patches may range from a few dozen stems to many thousands or more. Fertile stems produce a single terminal spike. Yellowish achenes are persistent and visible after scales fall. The species appears to be very mobile, occurring in many of the potential wet, disturbed habitat types in the North Shore Highlands region, even those that have been disturbed less than 20 years previous. Plants have been observed in flower during May through late June, and in fruit from July to mid-September.

The best time to search for *E. nitida* is when achenes are mature from the middle of June to the middle of September.

### Conservation / Management

Potential threats are difficult to assess because *E. nitida* requires dynamic habitats and ecotones that are sometimes associated with both human activities and natural processes. It would be misleading to suggest that the species prefers habitats disturbed by human activities such as logging, road building, and land clearing, but *E. nitida* does manage to maintain a short-term presence under those circumstances. Yet, the natural equivalent of human alterations to the landscape such as beaver activity, wind and ice storms, and fires and floods probably offer a better range of habitats and more consistently favorable conditions.

### Conservation Efforts in Minnesota

Many of the newly discovered sites occur inland from Lake Superior, and several occur in state forests and state parks. This may provide some additional level of protection for the habitat of *E. nitida*, although no specific management actions have been undertaken to protect this species.

## References

- Lakela, O. 1947. The occurrence of *Eleocharis nitida* in the Lake Superior region. *Rhodora* 49:81-82.
- Smith, G. S., J. J. Bruhl, M. S. Gonzalez-Elizondo, and F. J. Menapace. 2002. *Eleocharis*. Pages 60-120 in *Flora of North America* Editorial Committee, editors. *Flora of North America north of Mexico*. Volume 23. Oxford University Press, New York, New York.



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## *Juncus stygius* var. *americanus* Buch.

## Bog Rush

### MN Status:

special concern

### Federal Status:

none

### CITES:

none

### USFS:

yes

### Group:

vascular plant

### Class:

Monocotyledoneae

### Order:

Juncales

### Family:

Juncaceae

### Life Form:

graminoid

### Longevity:

perennial

### Leaf Duration:

deciduous

### Water Regime:

wetland

### Soils:

peat

### Light:

full sun

### Habitats:

[Non-forested Acid](#)

[Peatland, Non-](#)

[forested Rich](#)

[Peatland](#)

### Synonyms

*Juncus stygius* ssp. *americanus*

### Basis for Listing

*Juncus stygius* var. *americanus* is a plant of specialized peatland habitats in northern Minnesota. It is most commonly associated with large patterned peatlands but also occurs near boggy ponds in smaller peatlands. The vegetation of these habitats is rather species-poor, meaning that relatively few plant species dominate large areas. As it turns out, *J. stygius* ssp. *americanus* is not one of the dominant species; in fact, it is one of the rarest. In large patterned peatland settings, it usually occurs as scattered individuals in rather isolated colonies (Wright et al. 1992), and the colonies are few and far between. It is even rarer in the small bog pond fens.

Population trends of *J. stygius* var. *americanus* are difficult to assess. Habitat conditions in the larger peatlands seem to have been relatively stable over the past 30 years, which is the period of time ecologists have studied fen habitats in Minnesota. However, actual populations of *J. stygius* var. *americanus* are not being monitored anywhere in Minnesota, so their current status compared to 30 years ago is not known. Serious, but unquantifiable, threats are posed by climate warming, water diversion, and invasion of non-native species. *Juncus stygius* var. *americanus* was listed as a special concern species in Minnesota in 1984.

### Description

*Juncus stygius* var. *americanus* is a perennial, grass-like plant. The stems are round in cross-section, loosely clumped, and 2-4 dm (7.9-15.7 in.) tall. The rhizomes are short and sparingly branched. There are 1-2 leaves at the base of the stem and 1-3 leaves on the length of the stem. The leaf blades lack septae, which are raised cross-partitions, or they may have inconspicuous or incomplete septae. The leaves are round in cross-section or slightly flattened, 8-18 cm (3.1-7.1 in.) long, and 0.5-1 mm (0.02-0.04 in.) wide. The inflorescence consists of 1-3 glomerules, which are small, compact clusters of flowers; each glomerule has 1-3 flowers. The primary bracts are about equal in length to the glomerules and there are no bracts subtending the individual flowers. There are 6 tepals which are about equal in length, lanceolate to lanceolate-ovate in shape, and 4-5 mm (0.16-0.20 in.) long. The filaments are 2.5-3.5 mm (0.10-0.14 in.) long and the anthers are 0.4-0.5 mm (0.016-0.020 in.) long; the style is 1-1.2 mm (0.04-0.05 in.) long. The seed capsules are ellipsoid in shape and 5.5-9 mm (0.22-0.35 in.) long. The seeds are pale yellow and fusiform in shape. The body of the seed is 0.8-1.1 mm (0.03-0.04 in.) long with tails 1-1.4 mm (0.04-0.06 in.) long (Brooks and Clemants 2000).

There are approximately 25 species of *Juncus* in Minnesota. *Juncus stygius* var.



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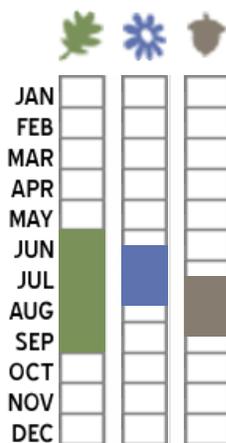


Map Interpretation



Map Interpretation

### Best time to see:





*americanus* can be distinguished from the others by the following combination of characters: flowers occurring in small clusters (glomerules) rather than singly, bracts at the base of the flower absent, leaf blades not flat or septate-nodulose, seed capsules and seeds relatively large, and seeds having long tails (Clemants 1983).

#### Habitat

In Minnesota, *J. stygius* var. *americanus* occurs only in open **rich peatlands** and **acid peatlands**. These are permanent wetlands with a substrate of deep, saturated peat. The peatlands where *J. stygius* var. *americanus* is found are generally classified as fen rather than bog, meaning they are influenced to some extent by mineralized ground water. The largest populations of the species appear to occur in the water tracks of **northern rich fens** and **northern poor fens** within the large patterned peatlands in Beltrami and Koochiching counties. Water tracks are treeless sedge fens composed of watery depressions called flarks and narrow, sinuous, subtly-raised and somewhat less wet fingers of peat called strings (Wheeler and Glaser 1979). *Juncus stygius* var. *americanus* shows a preference for the flarks in Minnesota (Wright et al. 1992). Even when it occurs in small non-patterned peatlands, it appears to be restricted to the narrow and wettest zone on the margin of a bog pond.

#### Biology / Life History

*Juncus stygius* var. *americanus* is a slender, low-statured plant with a shallow root system. It apparently does not compete well in dense vegetation. The species is reportedly able to maintain a presence in late-successional habitats because it can exploit areas where recent water level changes create small gaps in otherwise dense vegetation. Similar conditions are sometimes created along game trails (Wright et al. 1992).

The flowers of *J. stygius* var. *americanus* are wind-pollinated, and the seeds are animal-dispersed. The prominent tails on the seeds may act as elaiosomes, which are fleshy structures rich in proteins and lipids. Elaiosomes attract ants which take the seeds to their nests to feed the elaiosomes to their larvae. The seeds are left intact and discarded. In this way the seeds are dispersed short distances from the parent plant. While this process has not been reported in *J. stygius* var. *americanus*, it seems probable considering the structure of the seed.

The best time to search for *J. stygius* var. *americanus* is when the inflorescence has reached maximum development, from mid-July to mid-September. However, *J. stygius* var. *americanus* is a fairly inconspicuous plant, requiring a careful eye to distinguish it from the sedges and other grass-like plants it shares its wet peatland habitat with.

#### Conservation / Management

When addressing the conservation needs of *J. stygius* var. *americanus*, the primary consideration must be habitat integrity, particularly hydrologic integrity. This pertains to the quality, quantity, and flow patterns of water, both surface water and subsurface water. Since inflow and outflow from a peatland is critically important, it is imperative to consider hydrologic issues beyond the boundaries of the actual peatland. An impoundment or diversion several miles from a fen could have unforeseen effects that would be difficult to mitigate.

Peatland vegetation is actually quite sensitive to changes such as flooding, drying, or nutrient enrichment. Since *J. stygius* var. *americanus* is one of the rarest members of peatland vegetation, it would likely be one of the first species to be affected.

#### Conservation Efforts in Minnesota

Several large peatland habitats of *J. stygius* var. *americanus* have been designated as **Scientific and Natural Area**, which receive a high degree of protection.

#### References

- Brooks, R. E., and S. E. Clemants. 2000. *Juncus*. Pages 211-255 in *Flora of North America* Editorial Committee, editors. *Flora of North America north of Mexico*. Volume 22. Oxford University Press, New York, New York.
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- Wheeler, G. A., and P. H. Glaser. 1979. Notable vascular plants of the Red Lake Peatland, northern Minnesota. *The Michigan Botanist* 18:137-142.

Wright, H. E., Jr., B. A. Coffin, and N. E. Aaseng, editors. 1992. The patterned peatlands of Minnesota. University of Minnesota Press, Minneapolis, Minnesota. 544 pp.

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***Platanthera clavellata*** (Michx.) Luer

**Club-spur Orchid**
**MN Status:**

special concern

**Federal Status:**

none

**CITES:**

yes

**USFS:**

yes

**Group:**

vascular plant

**Class:**

Monocotyledoneae

**Order:**

Orchidales

**Family:**

Orchidaceae

**Life Form:**

forb

**Longevity:**

perennial

**Leaf Duration:**

deciduous

**Water Regime:**

wetland

**Soils:**

peat

**Light:**

full shade, partial

shade

**Habitats:**
[Forested Rich](#)[Peatland](#), [Forested](#)[Acid Peatland](#)
**Synonyms**
*Habenaria clavellata*, *Gymnadeniopsis clavellata*
**Basis for Listing**

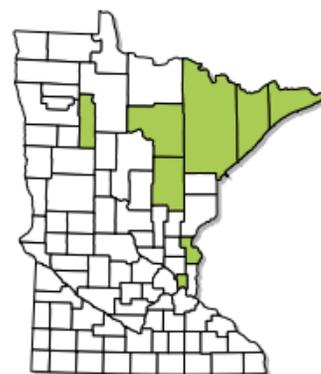
Between 1991 and 2008, more than 50 previously unknown populations of *Platanthera clavellata* were discovered in Minnesota. These discoveries make it tempting to declare *P. clavellata* more common than previously thought. While this may be true, the recent discoveries did not happen without a major effort. They were the result of a number of highly directed field searches by experienced field botanists. Even then, success came only after a better understanding of the species' habitat was gained, and techniques for finding that habitat were developed. Unfortunately, all these discoveries were from the core of *P. clavellata*'s range in Minnesota; in fact most were from a relatively small area in central Lake County. No additional populations were found at the periphery of the species' range in southern and central Minnesota, and none of the previously known populations from that area were successfully relocated. *Platanthera clavellata* was listed as a special concern species in Minnesota in 1984.

**Description**

The stems of *P. clavellata* are 15-33 cm (5.9-13.0 in.) tall, and arise from slender, fleshy roots. There is 1 principal leaf, which is attached somewhat below the middle of the stem. The leaf is obovate to oblanceolate or oblong in shape, 5-14 cm (2.0-5.5 in.) long, and 1-2.8 cm (0.4-1.1 in.) wide. There are an additional 1-3 vestigial bract-like leaves usually present on the stem above the principal leaf. The inflorescence is a short, terminal raceme, 1.5-4.5 cm (0.6-1.8 in.) long, with 5-20 greenish yellow or greenish white flowers. Each flower is twisted into a more or less horizontal position and subtend by a lanceolate bract that is up to 1.1 cm (0.4 in.) long. The sepals are ovate in shape, and 2-4.5 mm (0.08-0.18 in.) long. The petals are similar to the sepals. The floral lip is oblong in shape, shallowly toothed at the apex, 2.5-5.5 mm (0.10-0.22 in.) long, and 1.5-2.5 mm (0.06-0.10 in.) wide. The spur of the lip is club-shaped, and 9-11 mm (0.35-0.43 in.) long (Smith 1993).

**Habitat**


© MN DNR, Jim Whitfield


**Map Interpretation**

**Map Interpretation**
**Best time to see:**


	Leaf	Flower	Seed
JAN			
FEB			
MAR			
APR			
MAY			
JUN	█		
JUL		█	
AUG			
SEP	█		
OCT			
NOV			
DEC			



The habitat of *P. clavellata* includes swamp forests that have a continuous or interrupted canopy of *Picea mariana* (black spruce) or *Larix laricina* (tamarack). The species also occurs in nonforested poor fens that often ring peatland lakes. These habitats usually have hummocks of *Sphagnum* spp. (sphagnum moss) interspersed with water-filled hollows. The soils are saturated, well-decomposed peat, and the surface water is acidic with a pH of 4.2-5.5 (Minnesota Department of Natural Resources 2003).

### Biology / Life History

*Platanthera clavellata* is a perennial, insect-pollinated orchid of mossy peatlands. The fleshy root/tuber system tends to be confined to the layer of living moss rather than the actual peat below, and it renews itself each year. This process of annual regeneration does not result in reproduction since only one bud is produced; reproduction is accomplished only by seed. The seeds of *P. clavellata* are very small and carried on the wind, potentially for great distances. Germination requires the presence of certain mycorrhizal fungi, which are generally habitat specific.

The best time to search for *P. clavellata* is when it is in flower, typically from July 11 to July 30.

### Conservation / Management

The primary objectives in managing the habitat of *P. clavellata* are to maintain the structure and integrity of the biotic community, and to safeguard the delicate hydrology. With these objectives in mind, the impacts of logging must be carefully considered. The loss of canopy trees and the damage to the ground layer caused by heavy equipment (even in winter) would pose significant threats to *P. clavellata* populations. Alterations to the hydrologic regime may be even more serious, and often more difficult to anticipate. It will be necessary to evaluate the effects of projects on the movement of both ground water and surface water in the general area of known populations. Even activities several miles from a site could disrupt the hydrological processes that are needed to sustain habitat for *P. clavellata*.

### Conservation Efforts in Minnesota

Several of the known populations of *P. clavellata* occur on state and federal land. In most cases, the sites are within timber management zones where they could be subjected to logging operations. Established procedures do allow the presence of *P. clavellata* to influence land management decisions, although the efficacy of these procedures is not being uniformly monitored.

### References

- Minnesota Department of Natural Resources. 2003. Field guide to the native plant communities of Minnesota: the Laurentian mixed forest province. Ecological Land Classification Program, Minnesota County Biological Survey, and Natural Heritage and Nongame Research Program. Minnesota Department of Natural Resources, St. Paul, Minnesota. 352 pp.
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## Pyrola minor L.

## Small Shinleaf

### MN Status:

special concern

### Federal Status:

none

### CITES:

none

### USFS:

yes

### Group:

vascular plant

### Class:

Dicotyledoneae

### Order:

Ericales

### Family:

Pyrolaceae

### Life Form:

forb

### Longevity:

perennial

### Leaf Duration:

evergreen

### Water Regime:

terrestrial,  
wetland

### Soils:

loam, rock, peat

### Light:

full shade,  
partial shade

### Habitats:

[Forested Rich Peatland](#), [Fire Dependent Forest](#), [Forested Acid Peatland](#)

### Basis for Listing

*Pyrola minor* is a circumpolar species occurring across Canada and many western states in boreal and alpine habitats. It is considered rare in the northeastern states of Maine, Vermont, New York, and Wisconsin ([NatureServe 2010](#)), and is infrequent or absent elsewhere in the United States. One of the earliest collections of *P. minor* in Minnesota was made in 1914 by N.L. Huff from the woods near the North Kawishiwi River in Lake County. The species remained poorly collected until the mid 1990s. Due to recent survey efforts in northeastern Minnesota, there are now approximately 35 documented occurrences. *Pyrola minor* is only known to occur in Minnesota in the **Northern Superior Uplands**, which includes Cook, Lake, and portions of St. Louis counties. Over 75% of the populations occur in Cook County. The species has also been reported from Carlton County, but the two apparent locations have not been further verified. *Pyrola minor* was listed as a special concern species in Minnesota in 1996.

### Description

*Pyrola minor* has 3-11, white, radially symmetric flowers. Although the petals are primarily white, they may show hints of green or pink. The inflorescence is a raceme, with individual flowers occurring all around the peduncle. The style is both straight and short, 0.8-1.5 mm (0.03-.006 in.) long. Leaves are thin and evergreen, remaining on the plant throughout the winter.

Five species of *Pyrola* occur in Minnesota in addition to the quite similar appearing *Orthilia secunda* (one-sided pyrola). *Pyrola minor* is distinct from these other species in having a combination of radially symmetric flowers and a straight, short style. All other *Pyrola* species have bilaterally symmetric flowers with bent and longer styles. The inflorescence of *O. secunda* is a 1-sided raceme and the styles are nearly twice as long as those of *P. minor*.

### Habitat

In Minnesota, *P. minor* most typically occurs in **rich black spruce swamps** and **poor conifer swamps**, although it has also been documented from other habitats including **cedar swamps** and Lake Superior's **spruce-fir woodlands**. Plants are sometimes found along moist ecotones, including transitions between cool north-facing cliff/slopes and streams, and between conifer swamps and uplands. The assorted occurrences found along canoe portages likely have more to do with the



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Map Interpretation



Map Interpretation

### Best time to see:



	Leaf	Flower	Seed
JAN			
FEB			
MAR			
APR			
MAY			
JUN	█		
JUL		█	
AUG			█
SEP			
OCT			



habitat types bisected by the portage than by disturbances associated with the portage trail.



Associated species include *Picea mariana* (black spruce), *Thuja occidentalis* (white cedar), *Abies balsamea* (balsam fir), *Larix laricina* (tamarack), *Alnus incana* (speckled alder), *Gaultheria hispidula* (creeping snowberry), *Linnaea borealis* var. *longiflora* (twinflower), *Vaccinium myrtilloides* (velvet-leaved blueberry), and *Orthilia secunda* (one-sided pyrola).

### Biology / Life History

*Pyrola minor* is a rhizomatous plant pollinated by insects. Pollen is released from the anther via two pores. The Minnesota occurrences of the species range in number from several stems to several hundred stems. Most records suggest occurrence sizes of several dozen stems including both flowering and non-flowering stems. Like other rhizomatous species, accurately counting individuals can be difficult to impossible since multiple above ground stems may share the same root system.



The best time to search for *P. minor* is when it is in flower in mid-July. The species can also be identified while in fruit, which dries and often remains on the plant for the rest of the season.

### Conservation / Management

Although the current health and population status of many of the known occurrences of *P. minor* in Minnesota is not known, the species is not presently believed to be in decline. However, the ever increasing demands being placed on ecosystems and natural resources are a serious conservation concern. Boreal and alpine species occurring near the outer fringes of their distributions, such as *P. minor*, are also more vulnerable to environmental perturbations such as climate change.



Several apparently healthy populations of *P. minor* have been documented from black spruce swamps that were harvested around 20 years prior to the species' observation. No information is available on the size and health of these populations prior to the black spruce harvest, so it is difficult to assess and draw conclusions regarding the effects of harvest. There are also several populations found along well traveled portage routes that have persisted for years. Although the populations are apparently surviving, individual plants growing adjacent to portages and landings are subject to trampling and potential competition from non-native species.



### Conservation Efforts in Minnesota

Most of the known occurrences (~60%) of *P. minor* are within the Superior National Forest with a handful of records in the Boundary Waters Canoe Area Wilderness (BWCAW) and scattered records on DNR, tribal, and private lands. Several of the records are within multi-jurisdictional boundaries (mix of state and federal ownerships). While the BWCAW and State Park populations presumably receive the highest level of protection, no active conservation or monitoring efforts for *P. minor* are known to be occurring on any of the land ownerships.



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Recreation | Destinations | Nature | Education / safety | Licenses / permits / regs.

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## *Ranunculus lapponicus* L.

## Lapland Buttercup

### MN Status:

special concern

### Federal Status:

none

### CITES:

none

### USFS:

none

### Group:

vascular plant

### Class:

Dicotyledoneae

### Order:

Ranunculales

### Family:

Ranunculaceae

### Life Form:

forb

### Longevity:

perennial

### Leaf Duration:

deciduous

### Water Regime:

wetland

### Soils:

peat, muck

### Light:

full shade

### Habitats:

Forested Rich Peatland

### Basis for Listing

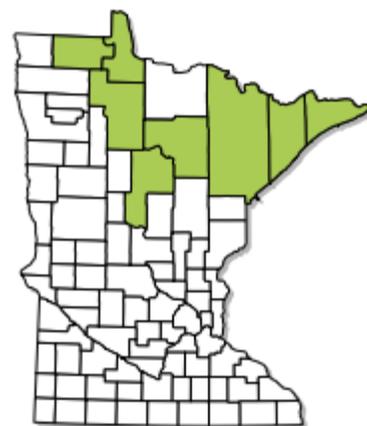
*Ranunculus lapponicus* is considered a circumpolar species, which means it ranges around the earth in arctic and boreal latitudes. In North America it ranges south to Minnesota, Wisconsin, Michigan, and Maine. It is considered rare or endangered in all four of those states. It is certainly rare in Minnesota, although the number of known sites now exceeds 50. The concern is not related directly to the number of plants or populations, but rather to the sensitivity of the wetland habitat upon which it depends. The wetlands, primarily classified as **rich forested swamps**, are typically part of extensive hydrologic systems dependent on a stable and uninterrupted supply of groundwater. Given these concerns, *R. lapponicus* was listed as a special concern species in Minnesota in 1984.

### Description

*Ranunculus lapponicus* is a small, herbaceous perennial only a few inches high. The stems are smooth and grow prostrate on or just below the surface of the ground. The nodes of the stem will root in a moist environment. The leaves are on long, slender petioles with blades 1.1-2.6 cm (0.4-1.0 in.) long and 1.6-4.3 cm (0.6-1.7 in.) wide. Each leaf blade is divided into 3 rounded segments. Each segment is undivided or may have one or a few clefts. The flowers occur singly on long, slender stalks and have 5-8 small, yellow petals, each 5-6 mm (0.20-0.24 in.) long and 2-3 mm (0.08-0.12 in.) wide. There are 3 greenish sepals about the same size as the petals. The fruit is a hemispheric head of achenes 8-10 mm (0.31-0.39 in.) across. The individual achenes are glabrous, 3.8-4.2 mm (0.15-0.17 in.) long and 2-2.2 mm (0.08-0.09 in.) wide. The tip of each achene has a curved



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Map Interpretation

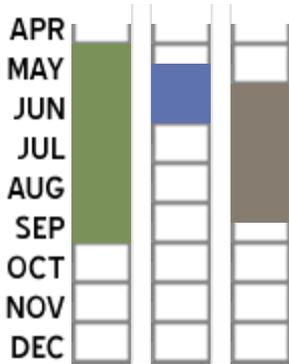
### Best time to see:



JAN	FEB	MAR
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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**Map Interpretation**



or hooked tip 1.6-2.4 mm (0.06-0.09 in.) long (Benson 1948; Whittemore 1997).

*Ranunculus lapponicus* is most likely to be confused with the common *Coptis trifolia* (goldthread). They can be told apart by comparing the leaf, which has small, sharply pointed teeth along the margin in the case of *C. trifolia*, and broad rounded lobes in the case of *R. lapponicus*.

### Habitat

The habitat of *R. lapponicus* in Minnesota falls within the category of **rich forested swamp**, usually under a canopy of *Thuja occidentalis* (**northern white cedar**) or *Picea mariana* (**black spruce**). It is also known to persist in low numbers in **rich alder swamps** where cedars were present in the past. Within these communities, there is typically a carpet of *Sphagnum* mosses or brown mosses, which may form low mounds called hummocks. Muck-bottomed hollows with a few inches of water will be scattered about, and it is likely that *R. lapponicus* can be found on the moss hummocks and at the margins of hollows. The species often occurs in loose carpets or patches (comprised mostly of leaves) in moist hollows that are too shallow to hold standing water.



### Biology / Life History

Stems of *R. lapponicus* have the ability to spread just below the surface of a mossy substrate and root at the nodes. The root crowns that are created in this manner can survive the winter even though the stems that originally connected them die back at the end of each growing season. This process of vegetative reproduction is capable of resulting in large colonies that sometimes cover many square meters.



*Ranunculus lapponicus* is also capable of sexual reproduction, which is accomplished by insect-pollinated flowers. It appears that pollinators are small flying insects, although specific pollinators have not been identified. The seeds are small achenes that have no specialized structures to aid dispersal. At least they do not have tufts of hair that might allow them to float on air currents, or burs to catch in animal fur. It seems likely that they are spread by small animals that might gather them for food, and possibly by water currents that might flow through habitats in the spring after the snow has melted or after especially heavy rains.



The flowers of *R. lapponicus* usually appear during the last part of May through the end of June. Although the flowers are small, their presence may make searching easier. If flowers are not present, the shape of the leaves and the growth form of the plant still make identification possible.



### Conservation / Management

It appears that *R. lapponicus* does not need any special management considerations beyond that which is required to maintain a healthy, full-functioning community of native plants within the wetland habitat where it occurs. Insect pollinators should also be considered an essential part of the community. It is



generally understood that the delicate and sensitive hydrologic regimes of these wetland habitats are extremely vulnerable to disruption. For that reason, any significant land use activity in or near *R. lapponicus* habitat must be given close scrutiny. The two activities most likely to come into conflict with this objective are timber harvesting and road building.



### Conservation Efforts in Minnesota

Perhaps half of the known populations of *R. lapponicus* in Minnesota occur in forests under the jurisdiction of the Minnesota Department of Natural Resources or the U.S. Department of Agriculture. In most cases these forests are managed for timber production, although the swamp forests in which *R. lapponicus* is most likely to occur do not have high-value timber and tend to be on a long-rotation for timber harvest.



### References

- Benson, L. 1948. A treatise on the North American Ranunculii. *The American Midland Naturalist* 40(1):1-261.
- Whittemore, A. T. 1997. *Ranunculus*. Pages 88-134 in *Flora of North America* Editorial Committee, editors. *Flora of North America north of Mexico*. Volume 3. Oxford University Press, New York, New York.

## *Saxifraga paniculata* P. Mill.

## Encrusted Saxifrage

**MN Status:**  
threatened

**Federal Status:**  
none

**CITES:**  
none

**USFS:**  
yes

**Group:**  
vascular plant

**Class:**  
Dicotyledoneae

**Order:**  
Rosales

**Family:**  
Saxifragaceae

**Life Form:**  
forb

**Longevity:**  
perennial

**Leaf Duration:**  
deciduous

**Water Regime:**  
terrestrial

**Soils:**  
rock

**Light:**  
full shade,  
partial shade

**Habitats:**  
**Cliff**

### Synonyms

*Saxifraga aizoon* var. *neogaea*

### Basis for Listing

This arctic-alpine species occurs from the arctic regions of northeastern North America south to rocky areas in northern New England and in rocky places in the Lake Superior region. *Saxifraga paniculata* also occurs across the North Atlantic in Iceland, Greenland, and Norway. Its distribution differs from other amphi-Atlantic arctic-alpine species by occurring in central and southern Europe and in the Caucasus (Voss 1985). There are several varieties of the species in Europe. The populations in Greenland, Iceland, and North America are usually referred to as variety *neogaea* (Butters 1944).

*Saxifraga paniculata* has an unusual history of discovery in Minnesota. From 1932 to 1993, it was only known from the northern border of Cook County. The 1930s marked a period when Fredrick Butters and Ernst Abbe (1953) were researching the flora of Cook County, aided by such notable field botanists as Murray F. Buell, G. W. Burns, and M. J. Hendrickson. Little additional work was done in that region until the 1980s when Minnesota DNR and U.S. Forest Service professionals attempted to relocate historic collection sites of rare plants and assess their status. Between 1980 and 1984, 9 of the 11 historical sites for *S. paniculata* were relocated and 2 additional populations were found.

Ten years later, in 1994, a large but localized population of *S. paniculata* was found in Lake County, the first time the species was found outside of Cook County. With additional



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**Map Interpretation**

### Best time to see:

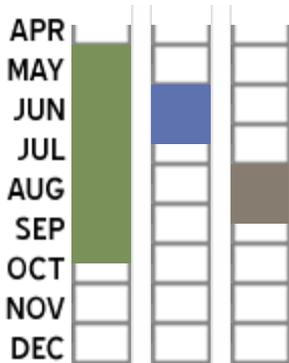


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Ten years later, in 1994, a large but localized population of *S. paniculata* was found in Lake County, the first time the species was found outside of Cook County. With additional



**Map Interpretation**



inventory efforts a few years later, Minnesota County Biological Survey botanists found about 10 new populations in Lake and Cook counties, all on or near the North Shore of Lake Superior. The North Shore locations probably weren't discovered until recently because this species wasn't targeted or expected in earlier studies, it can occur in fairly inaccessible or dangerous locations, and sites are often on private land.

Currently, the known populations of *S. paniculata* contain from 10 to over a 1,000 individuals, typically in scattered small or large patches on rocky ledges and crevices on steep cliffs. Only a few populations have been observed repeatedly over successive years because of the difficulty accessing some of the sites, so it is not possible to estimate any overall trends in population sizes. *Saxifraga paniculata* was listed as a threatened species in Minnesota in 1984.



### Description

*Saxifraga paniculata* is a perennial herb that is most easily and reliably identified by its distinctive basal rosette of leaves. Leaves are 2-3 cm (0.8-1.2 in.) long, and stiff, with margins finely and densely toothed. At the base of each tooth is a white, lime-encrusted pore, hence the common name of the plant. Rosettes of *S. paniculata* grow at the ends of long, horizontal stolons (runners). The flowering stem may rise 10-30 cm (4-12 in.) in height and display most of the small white flowers near the top. Each flower has 5 white petals, 1 inferior ovary, 2 styles, and a 2-beaked capsule.

### Habitat

In Minnesota, *S. paniculata* typically occurs in rock crevices and on small ledges on shady cliffs that generally face northward. The crevices in which the plants are rooted may be fairly dry. In some places the plants are in thin gravelly soil on uppermost ledges, sometimes in full sun for a portion of the day. Most plants are in more mesic portions of a particular cliff. The general bedrock types may be diabase, gabbro/diorite, basalt, or Rove Formation rocks (shale, argillite, greywacke), but there may be localized mineral concentrations in cracks and crevices in which the plants are rooted. Associated plant species include *Aquilegia canadensis* (columbine), *Campanula rotundifolia* (harebell), *Carex eburnea* (ivory sedge), and *Woodsia glabella* (smooth woodsia).

### Biology / Life History

*Saxifraga paniculata* is an herbaceous, perennial plant that forms basal rosettes and an erect flower stalk. Leaves are stiff but not evergreen. New shoots are produced in late summer next to the previous year's rosettes, and they turn green quite early. Plants begin to produce new stolons and rosettes in the spring. Stolons allow this plant to spread vegetatively. Flowers are perfect, having both male and female parts. Plants begin flowering in June and fruits usually begin maturing in late July or early August.



The best time to search for *S. paniculata* is when it flowers, from early June to July, and when it fruits, from late July through August. Rosettes can be seen anytime during the growing season and even through the winter, though they lose most of their green color.

### Conservation / Management

Like the other rare, arctic-alpine plants in Cook and Lake counties, *S. paniculata* has a very limited amount of suitable habitat in which it can survive. Only about half of Minnesota's North Shore populations happen to be on public land in federal or state ownership; many important populations are on privately owned land. Recreational rock climbing is one of the few human activities that directly threaten this species. Indirect impacts could come from changing habitat conditions due to global climate change.

### Conservation Efforts in Minnesota

A fairly thorough inventory by the Minnesota DNR County Biological Survey has been completed for rare plants along Minnesota's North Shore of Lake Superior and in portions of the Border Lakes Ecological Subsection, which includes the Boundary Waters Canoe Area Wilderness. It is possible that additional locations of *S. paniculata* may be found in the Border Lakes Subsection before the survey is complete. The potential discovery of new populations does not alter the need for conservation of this species because of the exceedingly limited amount of suitable habitat.

### References

- Butters, F. K. 1944. The American varieties of *Saxifraga aizoon*. *Rhodora* 46:61-69.
- Butters, F. K., and E. C. Abbe. 1953. A floristic study of Cook County, northeastern Minnesota. *Rhodora* 55:21-201.
- Voss, E. G. 1985. Michigan Flora. Part II: Dicots (Saururaceae-Cornaceae). Cranbrook Institute of Science Bulletin 59 and the University of Michigan Herbarium. University of Michigan, Ann Arbor, Michigan. 727 pp.

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## *Sparganium glomeratum* Laestad. ex Beurling

## Clustered Bur-reed

### **MN Status:**

special concern

### **Federal Status:**

none

### **CITES:**

none

### **USFS:**

yes

### **Group:**

vascular plant

### **Class:**

Monocotyledoneae

### **Order:**

Typhales

### **Family:**

Sparganiaceae

### **Life Form:**

forb

### **Longevity:**

perennial

### **Leaf Duration:**

deciduous

### **Water Regime:**

wetland, aquatic

### **Soils:**

peat, muck, sand, silt

### **Light:**

full sun, partial shade

### **Habitats:**

Marsh, Small

Rivers and Streams, Non-forested Rich

Peatland, Non-forested Acid

Peatland, Forested Acid Peatland,

Littoral Zone of

Lake, Wet Forest

### Basis for Listing

*Sparganium glomeratum* is considered a circumboreal species, meaning it occurs in boreal regions around the world. Although this is true, it is perhaps misleading. The species is actually rare or absent from most of the boreal regions of the world, being common only in parts of northern Europe and Asia. In North America, it is found at several locations in Minnesota, a few sites in adjacent Wisconsin, and at scattered sites across Canada.

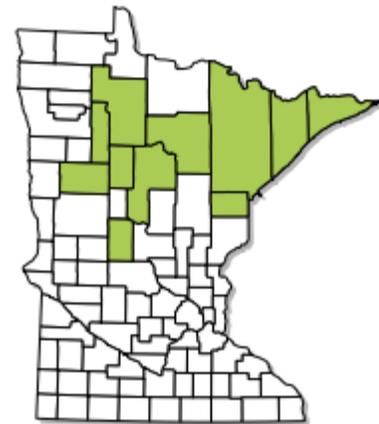
In fact, it appears there are more records of *S. glomeratum* from Minnesota than from the rest of North America combined. Current data would suggest that Minnesota is the North American stronghold of this species. However, it is quite likely that Minnesota botanists have simply done a more thorough job of finding this species. This puts conservation of *S. glomeratum* in Minnesota in a different perspective. Usually when Minnesota is at the edge of a species' range, the concern is how to protect the small outlier or disjunct populations. In this case, trying to protect the small core population is the issue. *Sparganium glomeratum* was listed as a special concern species in Minnesota in 1996.

### Description

*Sparganium glomeratum* is an aquatic plant that grows to be about 30-60 cm (1.0-2.0 ft.) tall with the flowering portion, and at least some of the leaves, standing erect above the water. The



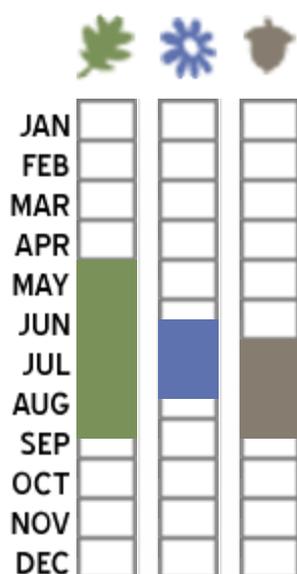
© MN DNR, Lynden B. Gerdes



Map Interpretation



Map Interpretation

**Best time to see:**

leaves are weakly keeled, up to 50 cm (1.6 ft.) long, and 6 mm (0.24 in.) wide. The inflorescence is erect and unbranched with 2-6 female flower heads each 1.2-1.6 cm (0.47-0.63 in.) in diameter, and typically 1 (rarely 2) male flower heads above the female heads. The male flower head is contiguous or almost contiguous with the uppermost head of female flowers. The greenish brown fruits are lustrous, elevated on a stipe, fusiform in shape, slightly constricted near the middle, 3-6 mm (0.12-0.24 in.) long, and 2-3 mm (0.08-0.12 in.) wide, tapering to a straight beak 1.5-2 mm (0.06-0.08 in.) long (Kaul 2000).

There are 8 species of *Sparganium* in Minnesota, and all of them are rather similar in appearance. Among the 8 species, *S. glomeratum* is distinguished by the following combination of characters: flowers with only 1 stigma resulting in a fusiform fruit, emergent leaves, unbranched inflorescence with only 1 male flower head, and female fruiting heads that are relatively small - only 1.2-1.6 cm (0.47-0.63 in.) in diameter. The male flower head falls off once the pollen is released, but the number of heads can be determined by the scars left on the rachis.

**Habitat**

The habitats of *S. glomeratum* in Minnesota are apparently very similar to the habitats it occupies in Europe, which have been described as shallow water in pools, small ponds, margins of streams, and ditches that have varying water levels and that may dry out in summer. Other potential Minnesota habitats include black ash swamps, shrub swamps, vernal pools, margins of rich and poor fens, and marshes. The species is rarely found in large lakes but if so, then it is confined to the edges of very shallow water in protected bays (Cook and Nicholls 1986). Beavers (*Castor canadensis*) frequently create habitat for *S. glomeratum*, often along margins of dammed wetlands of various types and along beaver-excavated channels and moats.

**Biology / Life History**

The flowers of *S. glomeratum* are wind-pollinated. The seeds are known to float on water and are very likely dispersed within a watershed or between connected watersheds on water currents. Dispersal vectors that can carry seeds to unconnected watersheds are unknown, but a variety of water birds are known to eat the seeds of *Sparganium* species, and it is possible that seeds are occasionally dispersed in that manner. The mucky substrates often associated with the species' habitat may be an additional factor in helping seeds to be transported on the bodies and feet of waterfowl, beaver, and moose (*Alces alces*).

The best time to search for *S. glomeratum* is when it is in flower or fruit, which may vary depending on local conditions, but is usually from the beginning of July through the middle of September.

**Conservation / Management**

To some extent, the fate of *S. glomeratum* in Minnesota is tied to the fate of shallow wetlands in northern Minnesota. These are often small, isolated wetlands or wetlands within a stream corridor that are only intermittently connected. They are often very dynamic habitats influenced by rapid, and sometimes unpredictable, fluctuations in water levels. Rather than being destructive, these fluctuations are more often constructive. The processes of flooding and drying and erosion and siltation are almost certainly necessary to maintain populations of *S. glomeratum* and the habitats that sustain them. But it should be noted that these processes are closely linked to seasonal weather events and to some extent beaver activities. They are not equivalent to perturbations caused by human activities such as road building, dredging, stormwater impounding, wild rice cultivation, or stream





channelization. Although *S. glomeratum* is sometimes found in habitats created by such activities, it cannot be assumed that such populations are stable over any period of time.

#### Conservation Efforts in Minnesota

*Sparganium glomeratum* has been found in a number of public wetlands where it receives at least a moderate level of protection from negative habitat alteration or destruction.



#### References

- Cook, C. D. K., and M. S. Nicholls. 1986. A monographic study of the genus *Sparganium* (Sparganiaceae). Part 1. Subgenus *Xanthosparganium* Holmberg. *Botanica Helvetica* 96(2):213-267.
- Kaul, R. B. 2000. *Sparganium*. Pages 271-277 in *Flora of North America* Editorial Committee, editors. *Flora of North America north of Mexico*. Volume 22. Oxford University Press, New York, New York.

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## *Woodsia scopulina* D.C. Eat.

## Rocky Mountain Woodsia

### **MN Status:**

threatened

### **Federal Status:**

none

### **CITES:**

none

### **USFS:**

none

### **Group:**

vascular plant

### **Class:**

Filicopsida

### **Order:**

Filicales

### **Family:**

Dryopteridaceae

### **Life Form:**

forb

### **Longevity:**

perennial

### **Leaf Duration:**

deciduous

### **Water Regime:**

terrestrial

### **Soils:**

rock

### **Light:**

full shade,  
partial shade

### **Habitats:**

Cliff, Talus

### Synonyms

*Woodsia scopulina* ssp. *laurentiana*

### Basis for Listing

As its common name implies, this fern is common in the Rocky Mountains of North America with several isolated populations scattered in mountainous or rocky habitats across other parts of the continent. This includes a few populations isolated in the Border Lakes region of Minnesota and Ontario.

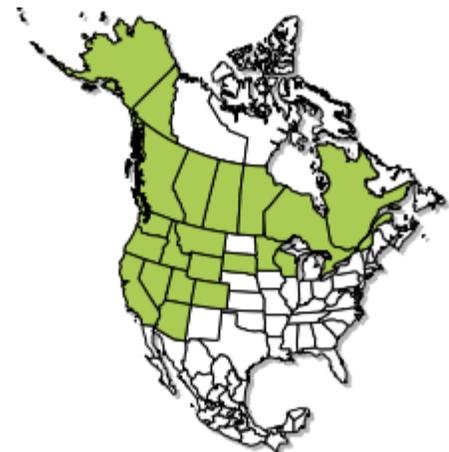
In Minnesota, *Woodsia scopulina* is primarily limited to the Rove Slate Formation at the eastern end of the Border Lakes region in Cook County. This area has landscape features not found elsewhere in Minnesota. There are several series of steep, east-west oriented valleys created by the preferential erosion of exposed slate that occurs between successive layers of harder diabase. The diabase-capped ridges between the valleys slope gently to the south but have precipitous northern faces rising 60-140 m (197-460 ft.) above deep, cold lakes. These north-facing cliffs provide the habitat of *W. scopulina*. Much of this area is now protected in the Boundary Waters Canoe Area Wilderness. In 2008, a new population was also found on a steep, north-facing cliff in the adjacent Vegetable Lakes Till Plain.



© MN DNR



Map Interpretation



Map Interpretation

### **Best time to see:**



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FEB	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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*Woodsia scopulina* was discovered in the Rove Slate region in 1929 (Butters and Abbe 1953). Exploration in the 1930s and 1940s documented about 19 different

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NOV			
DEC			

sites. Frederick Butters and Ernst Abbe first visited many of these sites during their study of the flora of Cook County. They described the species as extremely localized-very abundant on some cliffs, rare on others, and absent from many. Nine of the early collection sites have been relocated since 1980 and 6 others were searched unsuccessfully; botanists have not revisited 4 sites. Seven additional *W. scopulina* sites have recently been documented bringing the current total to 16 (plus 4 possible). The recent additions are the result of several years of intense and highly directed searches. It is not likely that many more sites will be found outside the species' known distribution area. *Woodsia scopulina* was listed as a threatened species in Minnesota in 1984.

## Description

*Woodsia scopulina* looks very similar to other members of the genus and requires close examination for positive identification. Sori (clusters of sporangia) are round and the indusium (flap or covering associated with the sorus) is borne beneath it. After spores are released, the indusium can be seen under a microscope as a few narrow, irregular segments of tissue. The stipe (leaf stalk) is not jointed so old remnant stipes vary in length and lack the thickened ends where a joint might have been (as in some other species in the genus). A distinctive feature of the leaf blade, at least on the underside, is the combined presence of minutely stalked glands and white hairs.

## Habitat

The bedrock in the Rove Formation where Minnesota populations of *W. scopulina* occur is diabase and slate in a Precambrian terrain. It was previously thought that *W. scopulina* preferred calcareous microhabitats in the slate formation, but they have also been found on the diabase. Plants invariably occur in cool, moist and shaded conditions, often on north-facing cliffs. They frequently occur on lower portions of a cliff face in vertical and horizontal cracks, and small ledges and chutes just above the talus slope. Plant associates include many common ferns such as *Cystopteris fragilis* (fragile fern), *Dryopteris fragrans* (fragrant fern), *Polypodium virginianum* (common polypody), *W. ilvensis* (rusty woodsia), and in a few cases, the rare fern, *Asplenium trichomanes* (maidenhair spleenwort) (Gerdes 2001).

## Biology / Life History

*Woodsia scopulina* is a perennial, herbaceous fern that grows in small clumps. The leaves turn brown in the fall but the bases of the stems remain attached to the rhizomes for a year or more. This condition is called marcescent.

The best time to search for *W. scopulina* is from late June to early August, although this is somewhat dependent on exposure and aspect.

## Conservation / Management

This western species has a very limited amount of suitable cliff habitat in the Lake Superior region. Currently known populations are within the boundaries of the Superior National Forest. Even if these sites are protected from development, there is concern for *W. scopulina* because the populations are concentrated in such a small geographic area. The cool, moist conditions they seem to require could be altered by global climate change or by forest management activities that alter the canopy, increase the risk of fire, introduce non-native species, or affect local runoff and erosion events. Also, cliffs are attractive to people for various reasons and cliff species are subject to injury, especially by recreational exploration of cliff bases, slopes, talus, and cliff tops. The fragile, highly unstable, fine talus zone at the base of cliff faces, especially sedimentary cliffs such as the Rove, is most vulnerable. Cliff top rims and edges are also highly vulnerable to trampling and trail



development. It is very common to have trails established along the cliff rims in the Boundary Waters Canoe Area Wilderness Rove and cliffs elsewhere.

### Conservation Efforts in Minnesota

A systematic search of the primary habitat occupied by *W. scopulina* in Minnesota has been nearly completed. As of 2008, only a small area in Cook County remains to be searched. New searches for this species are just beginning to occur in other portions of the Border Lakes subsection, but based on known information, the likelihood of finding many new populations is believed to be low. The survey work completed to date is a great contribution to conservation, giving land managers a sound basis for establishing protection plans.

### References

- Butters, F. K., and E. C. Abbe. 1953. A floristic study of Cook County, northeastern Minnesota. *Rhodora* 55:21-201.
- Gerdes, L. B. 2001. A contribution to the flora of the Rove Slate Bedrock Complex Landtype Association, northern Cook County, Minnesota, USA. Thesis, Michigan Technological University, Houghton, Michigan. 79 pp.