

Spoon-leaved Moss

Ontario Government Response Statement



Protecting and Recovering Species at Risk in Ontario

Species at risk recovery is a key part of protecting Ontario's biodiversity. *The Endangered Species Act, 2007* (ESA) is the Ontario government's legislative commitment to protecting and recovering species at risk and their habitats.

Under the ESA, the government must ensure that a recovery strategy is prepared for each species that is listed as endangered or threatened. A recovery strategy provides science-based advice to government on what is required to achieve recovery of a species.

Generally, within nine months after a recovery strategy is prepared, the ESA requires the government to publish a statement summarizing the government's intended actions and priorities in response to the recovery strategy. The response statement is the government's policy response to the scientific advice provided in the recovery strategy. In addition to the strategy, the government response statement considers (where available) input from Indigenous communities and organizations, stakeholders, other jurisdictions, and members of the public. It reflects the best available local and scientific knowledge, including Indigenous Knowledge where it has been shared by communities and Knowledge Holders, as appropriate, and may be adapted if new information becomes available. In implementing the actions in the response statement, the ESA allows the government to determine what is feasible, taking into account social, cultural and economic factors.

The Recovery Strategy for the Spoon-leaved Moss (*Bryoandersonia illecebra*) in Ontario was completed on September 6, 2022.

Spoon-leaved Moss is a medium-sized moss with colouring that varies from shiny-green to greenish yellow-brown. Its cylindrical creeping stems have concave leaves, resembling the bowl of a spoon. The species can be found on a variety of substrates including bare mineral soils in wet depressions, slopes and hummocks, on tree bases, exposed roots and decaying branches, or on calcium rich rocks.

Protecting and Recovering Spoon-leaved Moss

Spoon-leaved Moss is listed as a threatened species under the ESA, which protects both the plant and its habitat. The ESA prohibits harm or harassment of the species and damage or destruction of its habitat without authorization or complying with the requirements of a regulatory exemption.

Spoon-leaved Moss' global distribution is restricted to eastern North America. The species range extends from Kansas to southern Ontario and to Massachusetts in the north, and from Texas to Florida in the south. Within the United States (U.S.), species occurrences have been documented in most of the eastern states. In Canada, Spoon-leaved Moss is limited almost exclusively to southern Ontario's Carolinian Zone. The only exception to this is an occurrence near Goderich, Ontario.

Spoon-leaved Moss is considered a common species throughout many parts of its range, particularly in the southern U.S. In Ontario there are 29 known or presumed extant subpopulations (geographically distinct colonies or groups in the population). These subpopulations are fairly evenly distributed throughout most of the Carolinian Zone and span 22 lower-tier municipalities. In addition to the 29 extant subpopulations, there are four previously documented subpopulations in three different municipalities, that have been identified as possibly extirpated and a fifth that is extirpated.

The habitat types occupied by Spoon-leaved Moss vary considerably as the species has been found in deciduous forests (various stages of succession), plantations (coniferous and deciduous), treed swamps, thickets, savannahs and meadows. The species can occupy sites that differ in light penetration (closed to open canopy), moisture regimes (dry to seasonally wet), vegetation ground cover (none to dense) and depth of leaf litter (none to 6 cm). Spoon-leaved Moss is frequently found on features where mineral soil is exposed, such as on hummocks, small mounds, slopes or wet depressions. It has also been found on calcium rich rocks, on tree roots, branches and at the bases of trees.

Although Spoon-leaved Moss is found in a wide array of habitats, evidence suggests that it may prefer second-growth wooded areas (forest that has re-grown after being cleared), that are partially shaded and have imperfectly drained soils (wet soils that drain slowly). Many subpopulations seem to occur in sites that were used as agricultural lands in the past 30 to 50 years. The possible connection between prior agricultural land use and Spoon-leaved Moss occurrence suggests that the species may benefit from minor disturbances; however, further research is needed. These minor disturbances may include the use of agricultural or forestry equipment, which may act as a vector for spore dispersal, or more likely, vegetative fragment dispersal.

Spoon-leaved Moss is capable of both sexual and asexual reproduction. It is thought that sexual reproduction occurs very rarely in Spoon-leaved Moss, since no sporophytes (fertilized structures) or male plants have ever been documented in Ontario and few have been documented elsewhere. This may be because Spoon-leaved Moss is a dioicous species, meaning the male and female reproductive structures occur on separate individuals, and it is thought that its sperm are typically capable of traveling (via rain, dew or mist) only very short distances (millimeters to a few centimeters). Thus, if male and female plants do not exist in close proximity, sexual reproduction is unlikely to occur. In these cases, Spoon-leaved Moss likely relies predominantly on asexual reproduction for regeneration.

Asexual reproduction occurs in Spoon-leaves Moss when fragments of an individual's vegetative structures break off, establish themselves in a suitable site and produce a clone of the parent individual. Given the species' likely reliance on asexual reproduction, it is suspected that some of the Spoon-leaved Moss colonies in Ontario are genetically identical. It is thought that a lack of genetic diversity in the species' populations may be a limiting factor in the species' recovery and its ability to adapt to threats; however, this is an area of uncertainty as, to date, no research has been conducted to investigate genetic diversity in Spoon-leaved Moss populations in either Ontario or the U.S.

The two most significant threats to Spoon-leaved Moss are habitat loss and habitat degradation. Additional possible threats to the species include incidental impacts or mortality, ecological succession and climate change. While this species can be identified by Ontario environmental professionals and naturalists relatively easily, many are not familiar with it. This may lead to the species going undetected and result in unintentional harm during activities such as development, forest operations, herbicide applications, and recreational activities such as hiking. The effect of ecological succession on Spoon-leaved Moss is not well-understood, but it has been suggested that the species prefers mid-succession woodlands. If so, successional progress towards more mature forest would negatively impact Spoon-leaved Moss. Finally, the effect of climate change on Spoon-leaved Moss is also uncertain, but the species' vulnerability to this threat is likely to be determined mainly by its cold tolerance. The species seems to display some intolerance to low winter temperatures; however, it has not been studied comprehensively.

The protection and recovery of Spoon-leaved Moss will require assessing threats to the species and developing strategies to address them. Unfortunately, many of the threats to the species are not currently well-understood. As such, additional monitoring and research is needed to fill these knowledge gaps. The results of these efforts will inform the implementation of subsequent recovery efforts for Spoon-leaved Moss.

Finally, raising awareness of Spoon-leaved Moss, its habitat and how to reduce threats to the species will help promote and encourage the protection and recovery of the species.

Government's Recovery Goal

The government's goal for the recovery of Spoon-leaved Moss is to maintain existing subpopulations in Ontario, and increase their size where biologically and technically feasible.

Actions

Protecting and recovering species at risk is a shared responsibility. No single agency or organization has the knowledge, authority or financial resources to protect and recover all of Ontario's species at risk. Successful recovery requires inter-governmental co-operation and the involvement of many individuals, organizations and communities. In developing the government response statement, the government considered what actions are feasible for the government to lead directly and what actions are feasible for the government to support its conservation partners to undertake.

Government-led Actions

To help protect and recover Spoon-leaved Moss, the government will directly undertake the following actions:

- Continue to protect Spoon-leaved Moss and its habitat through the ESA.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario (e.g. through Ontario Parks Discovery Program, where appropriate).
- Continue to monitor the population and mitigate threats to the species and its habitat in provincially protected areas.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Continue to support conservation, agency, municipal and industry partners, and Indigenous communities and organizations to undertake activities to protect and recover Spoon-leaved Moss. Support will be provided where appropriate through funding, agreements, permits and/or advisory services.
- Work with all levels of government, communities and sectors to take action on climate change, and to report on progress in reducing greenhouse gas emissions.
- Encourage the submission of Spoon-leaved Moss data to the Ontario's central repository through the NHIC (Rare species of Ontario) project in iNaturalist or directly through the Natural Heritage Information Centre.
- Conduct a review of progress toward the protection and recovery of Spoon-leaved Moss within five years of the publication of this document.

Government-supported Actions

The government endorses the following actions as being necessary for the protection and recovery of Spoon-leaved Moss. Actions identified as “high” may be given priority consideration for funding under the Species at Risk Stewardship Program. Where reasonable, the government will also consider the priority assigned to these actions when reviewing and issuing authorizations under the ESA. Other organizations are encouraged to consider these priorities when developing projects or mitigation plans related to species at risk.

Focus Area: Monitoring and Research

Objective: Increase knowledge of the distribution, limiting factors, and habitat preferences of Spoon-leaved Moss in Ontario.

There are several knowledge gaps concerning Spoon-leaved Moss including the total number of existing Ontario subpopulations, their population viability, dynamics and distribution, and how environmental, reproductive and genetic factors influence them. There are also knowledge gaps concerning detectability and recovery approaches. Filling these knowledge gaps may help determine the factors influencing the species’ ability to recover, and inform where protection and recovery efforts should be focussed.

Actions:

1. **(High)** Develop and implement standardized survey and long-term monitoring protocols and undertake:
 - i. targeted surveys in areas with high habitat suitability including areas where there have been previous records of the species and in areas where it has not been found, in order to improve understanding of its distribution.
 - ii. develop long-term monitoring protocols and establish monitoring sites at all existing and newly identified Spoon-leaved Moss subpopulations. It is recommended that monitoring be repeated depending on resource availability. Monitoring information collected may include: light conditions, substrate type, coverage by bare soil, coverage by leaf litter, coverage by other mosses and herbaceous plants.
2. Conduct research on the biology and ecology of Spoon-leaved Moss including:
 - i. **(High)** genetic relatedness of subpopulations and genetic diversity of Ontario subpopulations relative to range-wide genetic diversity
 - ii. **(High)** population viability, including meta-population dynamics
 - iii. preferred site conditions (e.g. light and moisture regimes) including soil properties (e.g. pH, texture, etc.)

- iv. colony response to changes in biophysical conditions (e.g. light conditions, competition)
 - v. winter hardiness
 - vi. optimal techniques and feasibility of propagating or transplanting Spoon-leaved Moss.
3. Develop habitat suitability and population viability models to direct future surveys and further assess species vulnerability.

Focus Area: Threat Mitigation

Objective: Improve understanding of and mitigate threats to Spoon-leaved Moss.

There is a considerable amount of uncertainty surrounding Spoon-leaved Moss and the threats impacting the species and its habitat. The impacts and severity of threats may also differ by colony. Undertaking localized threat assessments will improve understanding of the specific threats affecting a location while also filling general knowledge gaps surrounding threats. Addressing identified threats by implementing mitigation measures or management techniques is important for species recovery.

Actions:

- 4. **(High)** In collaboration with landowners, land managers, municipal governments, stewardship organizations, and Indigenous communities and organizations, undertake site-specific threat assessments for Spoon-leaved Moss and implement and evaluate mitigation measures or management techniques to address assessed threats.
- 5. If techniques for propagating or transplanting Spoon-leaved Moss are successfully established and prove to be feasible, develop best management practices (BMP) guidance for applying these techniques.

Focus Area: Awareness

Objective: Increase awareness of the species and ways to minimize its threats to promote protection and recovery.

Spoon-leaved Moss is known to occur in protected areas like provincial parks and conservation areas, as well as on private and municipal lands. As some of these lands may be candidates for development activities, improving awareness of the species by individuals likely to be surveying sites will help to ensure the species and its habitat are not overlooked and incidentally harmed during activities. It is also important to improve awareness of conservation partners who may be interested in undertaking stewardship efforts.

Actions:

6. Promote awareness of Spoon-leaved Moss among environmental professionals, naturalists, landowners, land users, land managers and industry partners (e.g. forestry, development, agriculture) by sharing information regarding:
 - i. how to identify the species
 - ii. the species' distribution and habitat associations
 - iii. protection afforded to the species and its habitat under the ESA
 - iv. actions that can be taken to reduce threats to the species and its habitat (e.g. by distributing best management practices).

Implementing Actions

Financial support for the implementation of actions may be available through the Species at Risk Stewardship Program. Conservation partners are encouraged to discuss project proposals related to the actions in this response statement with Ministry of the Environment, Conservation and Parks staff. The Ontario government can also provide guidance about the requirements of the ESA, whether an authorization or regulatory exemption may be required for the project and, if so, the authorization types and/or conditional exemptions for which the activity may be eligible.

Implementation of the actions may be subject to changing priorities across the multitude of species at risk, available resources and the capacity of partners to undertake recovery activities. Where appropriate, the implementation of actions for multiple species will be coordinated across government response statements.

Reviewing Progress

The ESA requires the Ontario government to conduct a review of progress towards protecting and recovering a species no later than the time specified in the species' government response statement, which has been identified as five years. The review will help identify if adjustments are needed to achieve the protection and recovery of Spoon-leaved Moss.

Acknowledgement

We would like to thank all those who participated in the development of the Recovery Strategy and Government Response Statement for Spoon-leaved Moss (*Bryoandersonia illecebra*) in Ontario for their dedication to protecting and recovering species at risk.

For additional information:

Visit the species at risk website at ontario.ca/speciesatrisk

Contact the Ministry of the Environment, Conservation and Parks

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