

**Ontario Species at Risk Evaluation Report for
Spoon-leaved Moss (*Bryoandersonia illecebra*)**

Committee on the Status of Species at Risk in Ontario
(COSSARO)

Assessed by COSSARO as Threatened

August 2020

Andersonie charmante (*Bryoandersonia illecebra*)

L'andersonie charmante est la seule espèce du genre *Bryoandersonia*. Elle est répandue dans l'est de l'Amérique du Nord, mais se limite en Ontario à quelque 20 peuplements connus. Elle pousse dans une variété d'habitats perturbés et de succession. Les observations des mâles de cette espèce sont rares, et seules celles de plantes femelles sont documentées en Ontario. Des relevés effectués depuis la précédente évaluation ont révélé une présence plus répandue de l'espèce qu'on l'avait d'abord cru. Le nombre d'individus observés directement en Ontario atteint les seuils du statut d'espèce en voie de disparition. Toutefois, les découvertes croissantes de nouvelles sous-populations et l'absence de recensements complets des emplacements connus indiquent que la population réelle atteindrait plus probablement le seuil d'un statut d'espèce menacée. De plus, aucune donnée ne porte à croire que la population diminue ou qu'elle est confrontée à de grandes menaces.

Par conséquent, le CDSEPO estime que cette espèce est menacée. Cette décision concorde avec la plus récente évaluation du COSEPAC. Cela ne constitue pas une rétrogradation à proprement parler de l'espèce par rapport à son statut précédent d'espèce en voie de disparition en Ontario, ce changement de statut n'indiquant pas une réelle augmentation de la taille de la population dans la province, mais le fait que de récents travaux sur le terrain ont enregistré des individus qui avaient été ignorés.

Cette publication hautement spécialisée «COSSARO Candidate Species at Risk Evaluation for Spoon-leaved moss» n'est disponible qu'en anglais conformément au Règlement 671/92, selon lequel il n'est pas obligatoire de la traduire en vertu de la Loi sur les services en français. Pour obtenir des renseignements en français, veuillez communiquer avec le ministère l'Environnement, de la Protection de la nature et des Parcs au cossarosecretariat@ontario.ca.

Executive summary

Spoon-leaved moss is the only species in the genus *Bryoandersonia*. It is widespread in eastern North America, but in Ontario is restricted to only 20 known sites. It grows in a variety of disturbed and successional habitats. Males of this species are rarely observed, and only female plants have been documented in Ontario. Surveys completed since the previous assessment have revealed that this species is more common than originally thought. The number of individuals directly observed in Ontario meets the thresholds for Endangered status. However, the increasing success of field botanists in discovering new subpopulations, and the lack of comprehensive censuses at known sites, indicates that the actual population would most likely meet the threshold for Threatened status. Furthermore, there is no data to suggest the population is declining, or that it faces severe threats.

Accordingly, COSSARO lists this species as Threatened, based on criterion D1, very small and restricted population. This is supported by a population size estimate between 250 and 1000 individuals. This decision is in agreement with the most recent COSEWIC evaluation. It represents a non-genuine down-listing from the previous Ontario status of Endangered. That is, the change in status does not indicate an actual increase in the size of the Ontario population, but rather that recent field work has documented previously overlooked individuals.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

Spoon-leaved Moss is the only species in the genus *Bryoandersonia*. Morphological (Robinson 1962) and genetic (Ignatov & Huttunen 2002) data show it is a distinct species, and there is no dispute as to its taxonomic status.

1.1.2. Designatable units

In Ontario, Spoon-leaved Moss is only found in southwestern Ontario, and is assessed as a single designatable unit. There is no evidence for genetically distinct or naturally disjunct populations in Canada.

1.1.3. Native status

The earliest specimen of Spoon-leaved Moss in Ontario was collected in 1825 (COSEWIC 2017). This species is endemic to eastern North America, and the Ontario subpopulations are at the north end of a continuous distribution. There is no question that this is a native species in the province.

1.1.4. Occurrence

Spoon-leaved Moss is known from at least 20 sites in Ontario, and some of these subpopulations are known to have persisted for more than 35 years.

1.2. Eligibility results

Spoon-leaved Moss (*Bryoandersonia illecebra*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G5 (NatureServe 2018)
- NRANK Canada: N2
- COSEWIC: Threatened (December 2017)
- SARA: Endangered (Schedule 1)
- ESA 2007: Endangered (2008)
- SRANK: S2 (ranked in 2012)

2.2. Distribution in Ontario

Spoon-leaved Moss is restricted to southwest Ontario, in an area stretching from the Michigan border from Lake Erie to Grand Bend, and eastward to Hamilton and Niagara. There are 20 extant subpopulations within this area; seven additional subpopulations have not been relocated since 2003 and are considered “historical” (COSEWIC 2017). The NHIC database contains three extant and five historical element occurrences. However, there are an additional 35 EO Candidates that have not been processed yet. These are plotted in Figure 1. Two sites documented as extant by COSEWIC (2017) are not in the NHIC database: Shipka (south of Grand Bend) and Longwood (south of Strathroy), and the location of several historical sites around London appear to differ between the two sources. Given these discrepancies, and since the entire Canadian population is in the province of Ontario, we use the EOO and IAO estimates from COSEWIC (2017) here, rather than calculate new values on incomplete data.

The number of individual plants at each subpopulation is apparently low. No more than 20 plants have been recorded at any single site. However, few of the sites have been exhaustively searched. Additionally, it is likely that additional subpopulations remain undiscovered (COSEWIC 2017). Consequently, COSEWIC (2017) considered the available data (67 individuals at 20 subpopulations) to underestimate the actual population size of Spoon-leaved Moss in Ontario. They considered it plausible that at least an additional 30 subpopulations, with an average of 5 mature individuals at each, remained to be found in the province. From these assumptions, they concluded that the actual population of Spoon-leaved Moss in Ontario was at least 250 individuals (i.e., 1.5 times more subpopulations, and 3.7 times more individuals, than the number supported by direct observation). They considered it unlikely that the full population exceeded 1000 individuals.

The primary threat to Spoon-leaved Moss is habitat destruction via property development. As each of the 20 extant populations is found on land owned and managed by different entities, no single development is likely to impact more than one subpopulation. Accordingly, each of the 20 subpopulations is considered to be a distinct “location” for the purposes of status assessment.

2.3. Distribution, broader biologically relevant geographic range and status outside Ontario

Spoon-leaved Moss is found across the eastern United States, from east Texas to Florida, and north to New York, Vermont and New Hampshire (Ignatov 2014). It is reportedly more abundant south of the glacial boundary (Bill McKnight, pers. comm. reported in COSEWIC 2017). It is ranked S1 (critically imperilled) in Vermont. However, its status is uncertain in much of its range. No data is available to determine population trends for this species.

2.4. Ontario conservation responsibility

Less than 5% of the global range of Spoon-leaved Moss is in Ontario.

2.5. Direct threats

The greatest threat to Spoon-leaved Moss is habitat destruction due to residential or commercial development. Ten of the twenty extant subpopulations are in close proximity to residential or industrial sites; however, expanded development is suspected at only three of these subpopulations.

Biological resource use (i.e. forestry) is also a threat, as three subpopulations on private property could potentially be lost should the owners decide to clear the forest. Recreation could also have a negative impact. Twelve of the extant subpopulations are found on recreational land. However, only particularly intensive activities (ATV riding, construction of visitor infrastructure) are likely to have a serious impact (COSEWIC 2017).

COSEWIC (2017) identified air and water pollution as low impact threats to Spoon-leaved Moss. Because air quality has been improving in the province, local residential or industrial run-off is now considered to present a greater threat than air pollution. COSEWIC (2017) included a 'threats calculator', which concluded that Spoon-leaved Moss faced a Medium-Low level of threat, based on the problems listed above.

2.6. Specialized life history or habitat use characteristics

The Ontario population of Spoon-leaved Moss appears to consist entirely of female plants. Sporophytes (the structures responsible for producing and releasing spores) are rare in this species, and have never been documented in Ontario. This likely limits the capacity of Spoon-leaved Moss to disperse to new areas. However, its Ontario distribution includes young habitats such as fallow fields and plantation forests. This indicates that it can still colonize new sites, whether by fragmentation, rare (and undetected) spore-production, or long-term persistence of spores in the soil (COSEWIC 2017).

Spoon-leaved Moss has quite broad habitat tolerances, including forests, wetlands, meadows, lawns and edge habitats (COSEWIC 2017), and has been described as "quite common, almost weedy" in part of its US range (Hunter 2011). In southern Ontario, its typical habitat is successional woodland, including hawthorn-juniper scrub and plantation forest (COSEWIC 2017). This kind of habitat is common in southwestern Ontario. However, where it does occur in Ontario, Spoon-leaved Moss only occupies a small proportion of the apparently suitable habitat, suggesting that some as-yet unknown factors are limiting its capacity to establish large subpopulations (COSEWIC 2017).

3. Ontario status assessment

3.1. Application of endangered/threatened status in Ontario

3.1.1. Criterion A – Decline in total number of mature individuals

Not applicable, no evidence of decline in number of mature individuals.

3.1.2. Criterion B – Small distribution range and decline or fluctuation

Not applicable. EOO of 25,140 km² exceeds the threshold for Threatened (20,000 km²). The IAO of 72 km² meets the threshold for Endangered (< 500 km²), but none of the required conditions apply: the number of locations (20) exceeds the threshold for Threatened (10); there is no evidence of decline; and there are no extreme fluctuations.

3.1.3. Criterion C – Small and declining number of mature individuals

Not applicable, as there is no evidence of decline in number of mature individuals.

3.1.4. Criterion D – Very small or restricted total population

Meets the criteria for Threatened under D1: the total population is estimated to be more than 250 (the threshold for Endangered), but less than 1000 individuals (the threshold for Threatened; COSEWIC 2017). While only 67 individuals have been recorded in Ontario, this is considered an underestimate due to the cryptic nature of this species and the lack of comprehensive surveys at most known sites.

3.1.5. Criterion E – Quantitative analysis

Not performed.

3.2. Application of Special Concern in Ontario

Not applicable.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Ontario's conservation authority for the Spoon-leaved moss is low, with only a small fraction (0.3%) of the species range in the province. However, the Ontario occurrence of the species is the only occurrence in Canada.

3.3.2. Status modification based on rescue effect

Rescue effect is unknown or unlikely. Of only 4 of the 9 adjacent jurisdictions have confirmed present of spoon-leaved moss, and none of those have sufficient data to document trends in the populations. Canadian habitat is contiguous with suitable habitat in the US, and the closest American record is just 45 km from subpopulations in the Niagara Region. Spores are rare in the northern portion of this species' range, although this species can also reproduce asexually via plant fragments that can be transported by animals, water or wind.

3.4. Other status categories

3.4.1. Data deficient

Not applicable. Habitat within the range of this species in Ontario has been thoroughly surveyed over the past 200 years. While it is likely that additional subpopulations of Spoon-leaved Moss remain undetected, the available data indicates that this is indeed a very rare species, restricted to very small subpopulations in Ontario.

3.4.2. Extinct or extirpated

Not applicable.

3.4.3. Not at risk

Not applicable.

4. Summary of Ontario status

Spoon-leaved moss (*Bryoandersonia illecebra*) is classified as Threatened in Ontario based on meeting criterion D1 (Criterion D – Very small or restricted total population) with only 67 individuals recorded in Ontario. This is likely an underestimate but remains well below the 1000 mature individual threshold for threatened. This assessment is consistent with the COSEWIC assessment (2017).

Status of this species is consistent with the definition of threatened under the Endangered Species Act, 2007.

The change in status of this species from the 2008 assessment is considered a **non-genuine** change based on increased survey effort revealing previously undetected subpopulations.

5. Information sources

COSEWIC. 2017. In Press. COSEWIC assessment and status report on the Spoon-leaved Moss *Bryoandersonia illecebra* in Canada. Committee on the Status of

Endangered Wildlife in Canada. Ottawa. xi + 40 pp. (<http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1>).

Hunter, M. 2011. Musings in macro, part 2, August 8 & 9, 2011. In Smokies Blog at <https://hikinginthesmokies.wordpress.com/2011/09/13/musings-in-macro-part-2-august-8-9-2011/> (accessed November 2016).

Ignatov, M.S. 2014. *Bryoandersonia*. pp 431-431 in Flora of North America North of Mexico. Vol. 28. New York, USA. 736 pp.

Ignatov, M.S. and S. Huttunen. 2002. Brachytheciaceae (Bryophyta) – A family of sibling genera. *Arctoa* 11:245-296.

NatureServe. 2018, NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. <http://explorer.natureserve.org>.

Robinson, H.A. 1962. Generic revision of the North American Brachytheciaceae. *The Bryologist* 65:73-146.

¹ A change in the classification of a species during reassessment by COSSARO may be for genuine or non-genuine reasons. Genuine reasons may include a reduction in threats to a species such that status of the species has improved, or the continuation of threats to the species such that the status of the species has further deteriorated. Non-genuine reasons may include new information on population size or threats that was not available during a previous assessment, the use of previous COSSARO criteria that may have yielded a different result or, taxonomic revisions that result in changes in range, population sizes or designatable units.

Appendix 1: Technical summary for Ontario

Species: Spoon-leaved moss (*Bryoandersonia illecebra*)

*This section is intended as a short tabular summary with brief responses (i.e usually one word or up to one sentence of explanation, if necessary). Additional supporting information and sources should be included in the text above. If the species only occurs in Ontario in Canada, the summary may be pasted from the COSEWIC report. If not, please fill out using information from Ontario only. In some cases the **Red** font indicates an option for selection.*

Demographic information

Demographic attribute	Value
Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.	20 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	No
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Not applicable
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Unknown
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future.	Unknown
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a. not applicable b. not applicable a. not applicable
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Estimated extent of occurrence (EEO). <i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	24 140 km ²
Index of area of occupancy (IAO).	72 km ²

Extent and occupancy attributes	Value
<i>If value in COSEWIC status report is not applicable, then use geocat.kew.org. State source of estimate.</i>	
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy in habitat patches that are: (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. No b. No
Number of locations. <i>See Definitions and Abbreviations on COSEWIC and IUCN websites for more information on the term "location". Use plausible range to reflect uncertainty if appropriate.</i>	20
Number of NHIC Element Occurrences <i>Request data from MNRF.</i>	Officially, 3 extant EOs,. However, the database is clearly out of date.
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	No
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	No
Is there an observed, inferred, or projected continuing decline in number of sub-populations or EOs?	No
Is there an observed, inferred, or projected continuing decline in number of locations?	No
Is there an observed, inferred, or projected continuing decline in [area, extent and/or quality] of habitat?	No
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of mature individuals in each sub-population or total population (if known)

Sub-population (or total population)	Mature individuals *	Total area of sub-population
Pelee Island 1	At least** 1	6.72 m ²
Pelee Island 2	At least 1	2.25 m ²
Pelee Island 3	At least 2	32.23 m ²
Point Pelee	At least 3	1.72 m ²
Kingsville	At least 3	36.42 m ²
Bickford	At least 1	0.004 m ²

Ladysmith 1	10	unknown
Ladysmith 2	5	unknown
Shipka	At least 1	unknown
Sylvan	At least 2	25.8 m ²
Longwood	At least 20	0.3 m ²
Paynes Mills	At least 3 ^{***}	48.16 m ²
Marburg	At least 1	1.9 m ²
Canfield	At least 2	2.28 m ²
Hannon	At least 1	3.36 m ²
Wellandport	At least 1	0.66 m ²
Willoughby Marsh 1	1	0.04 m ²
Willoughby Marsh 2	4	0.38 m ²
Willoughby Marsh 3	3	1.01 m ²
Willoughby Marsh 4	2	0.07 m ²
Total	At least 67	163 m ²

* An individual was defined as a single continuous patch of Spoon-leaved moss. Patch sizes varied from ca. 6 cm² to over > 24 m²

**“At least” indicates that comprehensive searches have not been completed for these locations, and more individuals may be found.

*** Note that the COSEWIC report listed two individuals for Paynes Mills in the appendix, and three in the technical summary. This is a typo, and the correct number is three.

Quantitative analysis (population viability analysis conducted)

No quantitative analysis has been completed for this species. Probability of extinction in the wild is unknown.

Threats

A threats calculator was prepared by COSEWIC (2017). It determined that Spoon-leaved moss faced an overall threat level of CD = Medium-Low, based on the following threats:

1. Residential & Commercial Development (D Low)
2. Biological Resource Use (D Low)
3. Pollution (D Low)
4. Human intrusions & Disturbance (D Low)

Rescue effect and broader biologically relevant geographic range

Rescue effect attribute	Value
Does the broader biologically relevant geographic range for this species extend beyond Ontario?	Yes/No/Unknown/Probably/Possibly
Status of outside population(s) most likely to provide immigrants to Ontario	The status of this species in adjacent US jurisdictions is unknown.
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possibly
Would immigrants be adapted to survive in Ontario?	Yes
Is there sufficient suitable habitat for immigrants in Ontario?	Yes
Are conditions deteriorating in Ontario?	Unknown
Is the species of conservation concern in bordering jurisdictions?	Unknown
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Unknown

Sensitive species

This is not a data sensitive species.

Appendix 2: Broader biologically relevant geographic range

Information regarding rank and decline for Spoon-leaved moss (*Bryoandersonia illecebra*)

Adjacent Jurisdictions	Biologically Relevant to Ontario (n/a, yes, no)	Status & Trends	Condition	Notes & Sources
Quebec	No	Not Present	NA	COSEWIC 2017
Manitoba	No	Not Present	NA	COSEWIC 2017
Michigan	n/a	SNR	Unknown	NatureServe 2018
Minnesota	No	Not Present	NA	NatureServe 2018
Nunavut	No	Not Present	NA	NatureServe 2018
New York	n/a	SNR	Unknown	COSEWIC 2017, Ignatov 2014
Ohio	n/a	SNR	Unknown	Ignatov 2014
Pennsylvania	Yes	S5	Unknown	Ignatov 2014
Wisconsin	No	Not Present	NA	Ignatov 2014

Broader Biologically Relevant Geographic Range in Other Jurisdictions

As Ontario is at the northern extent of the species known range, only jurisdictions to the south have known occurrences of the species. Of those, 3 jurisdictions (Michigan, New York, and Ohio) have not assessed the species (SNR – Status Not Reported), and only Pennsylvania has reported it as secure. While it is unknown whether the 3 SNR jurisdictions have biologically relevant range for Ontario, and Pennsylvania may, the remoteness of Ontario populations and the low dispersal ability of the species suggests no relevance to Ontario, aside from potential source populations for introductions.

Global Status and Trends

The spoon-leaved moss is considered globally secure. There is no information on its global population trends.

Acronyms

COSEWIC: Committee on the Status of Endangered Wildlife in Canada
COSSARO: Committee on the Status of Species at Risk in Ontario
ESA: Endangered Species Act
EO: Element occurrence (as defined by NHIC)
EOO: extent of occurrence
GRANK: global conservation status assessments
IAO: index of area of occupancy
IUCN: International Union for Conservation of Nature and Natural Resources
MNRF: Ministry of Natural Resources and Forestry
NHIC: Natural Heritage Information Centre
NNR: Unranked
NRANK: National conservation status assessment
SARA: Species at Risk Act
SNR: unranked
SRANK: subnational conservation status assessment
S1: Critically Imperiled
S2: Imperiled
S3: Vulnerable
S4: Apparently Secure
S5: Secure
IUCN: International Union for Conservation of Nature and Natural Resources
CDSEPO: Le Comité de détermination du statut des espèces en péril en Ontario