Ontario Species at Risk Evaluation Report for Golden-eye Lichen (*Teloschistes chrysophthalmus*) Great Lakes population

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

Assessed by COSSARO as Endangered

November 2017

Final

Téloschiste ocellé (population des Grands Lacs) (*Teloschistes chrysophthalmus*)

Le téloschiste ocellé est un lichen distinctif dont la couleur varie de l'orange vif au gris verdâtre. L'espèce se distingue par ses abondants organes de fructification orange aux marges ciliées. Il existe deux populations de téloschiste ocellé en Ontario : la population boréale et des Prairies, et celle des Grands Lacs. La première se trouve dans des secteurs définis situés entre la frontière du Manitoba et le lac à la Pluie, et la deuxième, autrefois répandue dans le Sud de l'Ontario, est maintenant limitée au parc provincial Sandbanks du lac Ontario.

Le téloschiste ocellé nécessite un habitat bien éclairé et humide; on le trouve souvent en milieu riverain. Dans le Nord-Ouest de l'Ontario, il pousse habituellement en très faible densité sur l'épinette blanche, le peuplier faux-tremble, le pin gris, le sapin baumier et le chêne à gros fruits dans les forêts relativement clairsemées de conifères ou les landes rocheuses. Il a aussi été observé à l'orée de forêts et dans un cimetière. Dans le Sud de la région ontarienne des Grands Lacs, le seul endroit où se trouve encore le téloschiste ocellé est une ancienne forêt côtière caducifoliée composée d'érables à sucre, d'ostryers de Virginie et de chênes rouges, où il pousse sur l'écorce de ces derniers.

La population des Grands Lacs a probablement toujours été restreinte, et elle persiste dans seulement l'un des quatre ou cinq sites où on la recensait jadis.

Le téloschiste ocellé (population des Grands Lacs) est classifié comme espèce en voie de disparition en Ontario puisqu'il n'est maintenant présent qu'à un endroit, dont il pourrait éventuellement disparaître, ce qui augmente ses risques d'extinction dans la province.

Note

Deux unités désignables de téloschiste ocellé ont été identifiées en Ontario : la population boréale et des Prairies (UD 1) et celle des Grands Lacs (UD 2).

Le CDSEPO a évalué les deux UD de l'Ontario pour la première fois en mai 2017. Ayant ensuite été informé de nouvelles observations concernant la population boréale et des Prairies, il a reporté l'évaluation de cette population à la rencontre de mai 2018 afin de tenir compte des nouvelles données. C'est pourquoi cette évaluation ne vise que la population des Grands Lacs.

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Executive summary

Golden-eye Lichen (*Teloschistes chrysophthalmus*) is a distinctive bright orange to greenish-grey lichen. The abundant orange fruiting bodies with ciliate margins distinguish this species. There are two populations of Golden-eye Lichen in Ontario: Prairie/Boreal and Great Lakes. The Prairie/Boreal population occurs in localized areas from the Manitoba border to Rainy Lake. The Great Lakes population was once more widespread in southern Ontario, but is now restricted to Sandbanks Provincial Park on Lake Ontario.

Golden-eye Lichen requires well-lit, humid habitats and is often found along shorelines. In northwestern Ontario, it generally grows at very low density in relatively open, conifer-dominated woods and rocky barrens on White Spruce, Trembling Aspen, Jack Pine, Balsam Fir and Bur Oak. It has also been found along the edges of forests, rocky barrens and in a cemetery. In the southern Great Lakes region of Ontario, the only extant site grows on the bark of Red Oak in a remnant old-growth coastal deciduous forest of Sugar Maple, Eastern Hop-hornbeam and Red Oak.

The Great Lakes population has probably always been small, and only one of the four or five sites where it has been documented remain.

Golden-eye Lichen Great Lakes population is classified as Endangered in Ontario because there is only one remaining location that could be lost, making it vulnerable to extirpation from the province.

Note: Two designatable units of Golden-eye Lichen have been identified in Ontario. Prairie and Boreal populations have been grouped into a single designatable unit (DU1), and the Great Lake population is a separate designatable unit (DU2).

Both Ontario DUs were originally assessed by COSSARO in May 2017. However, after this assessment, new observations for the Prairie/Boreal population were presented to the Committee. As a result, the Committee has deferred assessment of the Prairie/ Boreal population to the May 2018 meeting to include this new information in the assessment. As a result, this assessment is only considering the Great Lakes population of Golden-eye Lichen.

1. Eligibility for Ontario status assessment

1.1. Eligibility conditions

1.1.1. Taxonomic distinctness

There is no taxonomic uncertainty around the status of this species.

1.1.2. Designatable units

Three populations have been identified in Canada: Prairie, Boreal, and Great Lakes subpopulations. Prairie and Boreal populations have been grouped into a single designatable unit (DU1), and the Great Lakes population is a separate designatable unit (DU2).

The Prairie population is the largest and most concentrated, mainly on the central portion of the Assiniboine Delta of south-central Manitoba. It appears to be contiguous with populations to the south in the U.S. as a population was found as far south as Turtle Mountain bordering North Dakota.

The Boreal population is much more diffuse and scattered, found sparingly in southeastern Manitoba and extending into northwestern Ontario in the Lake of the Woods and Rainy Lake regions, bordering Voyageurs National Park in northern Minnesota. The gap between the Prairie and Boreal populations seems in part due to a lack of White Spruce in southern Manitoba along with extensive habitat loss throughout the prairie region.

The Great Lakes population is currently confined to the shoreline of Lake Ontario but historically included Lake Erie and Niagara Falls, now represented only by 19th century herbarium specimens. It is not known if these historic Lake Erie locations represented a separate DU.

1.1.3. Native status

Native to Ontario. It was first documented over 150 years ago by John Macoun.

1.1.4. Occurrence

Golden-eye Lichen currently occurs in Ontario. There are observations from the Great Lakes subpopulation from 2015 (COSEWIC 2016).

1.2. Eligibility results

The Great Lakes population of Golden-eye Lichen (*Teloschistes chrysophthalmus*) is eligible for status assessment in Ontario.

2. Background information

2.1. Current designations

- GRANK: G4G5 (Apparently Secure to secure) (NatureServe 2017)
- NRANK Canada: N3N4 (Vulnerable to Apparently Secure)
- COSEWIC: Endangered (Great Lakes population) (November 2016)
- SARA: pending
- ESA 2007: Not assessed
- SRANK: S2S3 (ranked in 2013)

2.2. Distribution in Ontario

In Ontario, the Golden-eye Lichen occurs in two regions. Golden-eye Lichen requires well-lit, humid habitats and is often found along shorelines.

The Great Lakes population occurs in a single location in Sandbanks Provincial Park on Lake Ontario. The only extant site grows on the bark of Red Oak (*Quercus rubra*) in a remnant old-growth coastal deciduous forest of Sugar Maple (*Acer saccharum*), Eastern Hop-hornbeam (*Ostrya virginiana*) and Red Oak (*Quercus rubra*).

A separate population (Prairie/Boreal) also occurs in northwestern Ontario from the Manitoba border to Rainy Lake north to the Dryden area. In northwestern Ontario, it generally grows at very low density in relatively open, conifer-dominated woods and rocky barrens on White Spruce (*Picea glauca*), Trembling Aspen (*Populus tremuloides*), Jack Pine (*Pinus banksiana*), Balsam Fir (*Abies balsamea*) and Bur Oak (*Quercus macrocarpa*). It has also been found along the edges of forests, rocky barrens and in a cemetery.

2.3. Distribution and status outside Ontario

The Golden-eye Lichen is found around the world on five continents (except for Asia and Antarctica). It occurs throughout North America and in scattered occurrences in South America, especially Argentina and Chile. Other records include southern portions of Australia and New Zealand, North Africa, the Canary and Cape Verde Islands as well as western, central and southern Europe.

In North America, most recent Golden-eye Lichen records occur from the interior Midwest south to Texas, in the Great Lakes region and from coastal California and Mexico. On the east coast of the USA, there are historical records from Maine south to New Jersey with recent sightings only in North Carolina.

2.4. Ontario conservation responsibility

Not calculated, but clearly less than one percent given its global range and abundance.

2.5. Direct threats

The results of the COSEWIC threats calculator assessment indicate that threats to the entire Golden-eye Lichen population in Canada are “medium to high”.

The Great Lakes population that has now been reduced to a single host tree is particularly vulnerable to several threats. Severe weather events that could damage the host tree threaten this subpopulation. Recreational activities that occur immediately adjacent to the one remaining occurrence could damage the host tree and compromise this last known occurrence. Invasive species such as Common Buckthorn (*Rhamnus cathartica)* and Dogstrangling Vine (*Vincetoxicum rossicum*) are common in alvar habitats near the Great Lakes DU and may have created dense growing conditions that are unfavourable for the establishment of Golden-eye Lichen. Lichen are sensitive to the acidifying effects of some forms of air pollution. Although levels of sulphur dioxide have decreased over the past three decades (CCME 2013), high levels of acid deposition had been documented in southern Ontario, and may account for the near disappearance of the Great Lakes population of Golden-eye Lichen.

2.6. Specialized life history or habitat use characteristics

Golden-eye Lichen appears to have a narrow range of habitat parameters including humid, stable microsites. These habitat conditions are not uncommon in Ontario, however despite targeted searches, it has not been found in other areas of the province that appear to provide suitable habitat.

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

Meets Endangered, A2a, as there is an observed decline in the total number of mature individuals greater than 50% (In 2009, there were 8 thalli, 6 in 2013 and 1 in 2015). The causes of the decline are not necessarily reversible, understood or ceased.

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

Meets Endangered, B1ab(iii,v) + B2ab(iii,v), because the area of EOO and IAO for this single location are well below the thresholds, there are fewer than 5 locations and there is a continuing decline in the area/quality of habitat and number of mature individuals.

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

Meets Endangered, C2a(i,ii), as the subpopulation is made up of a single individual.

3.1.4. Criterion D – Very small or restricted total population

Meets Endangered, D1, as the population consists of a single individual.

3.1.5. Criterion E – Quantitative analysis

Insufficient information.

3.2. Application of Special Concern in Ontario

Not applicable. Meets criteria for Endangered.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Not calculated, but would be <1% based on range maps and population information. It is ranked as globally secure by NatureServe.

3.3.2. Rescue effect

Not applicable. Rescue is not likely for the Great Lakes population. There has also been a decline in Golden-eye Lichen populations in its northeastern U.S. range. The nearest source population for the single extant site is in central Ohio roughly 650 km to the southwest from the only extant site. Small remnant or founder populations in this region, if they exist, could theoretically provide rescue effect with prevailing southern and western winds, though this is very unlikely given the lack of recent sightings in the region.

3.4. Other status categories

3.4.1. Data deficient

Not applicable.

3.4.2. Extinct or extirpated

Not applicable.

3.4.3. Not at risk

Not applicable.

4. Summary of Ontario status

Golden-eye Lichen (*Teloschistes chrysophthalmus*) Great Lakes population (DU2) is classified as Endangered in Ontario based on meeting criterion A2a, B1ab(iii,iv) + B2ab(iii,iv), C2a(i,ii) and D1. The Great Lakes population has been reduced to a single host tree making it very vulnerable to extirpation from the province.

5. Information sources

CCME. 2013. Progress report on the Canada-wide acid rain strategy for post 2000. Ottawa: Canadian Council of Ministers of the Environment, 35.

COSEWIC. 2016. COSEWIC assessment and status report on the Golden-eye Lichen *Teloschistes chrysophthalmus*, Prairie / Boreal population and Great Lakes population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xv + 50 pp. (Species at Risk Public Registry website).

Fryday, A M, and C M Wetmore. 2002. "Proposed List of Rare and/or Endangered Lichens in Michigan." The Great Lakes Botanist 41 (3): 89-93.

NatureServe. 2017. NatureServe Explorer: An online encyclopedia of life [web application]. *Teloschistes chrysophthalmus*. NatureServe. [website accessed December 2017].

Ohio Moss and Lichen Association. 2012. *Teloschistes chrysophthalmus.* [website accessed March 7, 2018].

Wisconsin Department of Natural Resources. 2016. Wisconsin's rare lichens. [website accessed April 2017].

Appendix 1: Technical summary for Ontario

Species: Golden-eye Lichen (*Teloschistes chrysophthalmus*): Great Lakes population (DU2)

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.	10 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Yes based on observations that there has been a progressive loss of mature individuals since 1994. In 2009, there were 8 thalli recorded, 6 in 2013 and only one in 2015.
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Unknown
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	>70% reduction
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.	>70% reduction
Are the causes of the decline (a) clearly reversible, and (b) understood, and (c) ceased?	a) No b) No c) No
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario

Extent and occupancy attributes	Value
Index of area of occupancy (IAO).	4 km^2
Is the total population severely fragmented? i.e., is >50% of its total area of occupancy is in habitat patches that are: (a) smaller than would be required to support a viable population, and	a. No b. No

Extent and occupancy attributes	Value
(b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	
Number of locations.	1
Number of NHIC Element Occurrences	1
Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Yes
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 populations?	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?	Yes
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)	Number of mature individuals
Great Lakes population	1

Quantitative analysis (population viability analysis conducted)

Probability of extinction in the wild is unknown.

Threats

A threats calculator for the entire Canadian population was prepared for the COSEWIC assessment by Mary Sabine, David Richardson, Chris Lewis, Sam Brinker and Janet Marsh (COSEWIC 2016).

The Great Lakes population is extremely small. It has been reduced to a single host tree, and could be affected by several types of threats including severe weather, recreational activities, invasive species, and air pollution.

Rescue effect

Rescue effect attribute	Value
Status of outside population(s) most likely to provide immigrants to Ontario	Closest potential source population is in central Ohio which is also small and isolated (only 2 thalli). Two further potential source populations are further in Wisconsin and Illinois though these populations may not be viable.
Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possibly
Would immigrants be adapted to survive in Ontario?	Possibly
Is there sufficient suitable habitat for immigrants in Ontario?	Probably
Are conditions deteriorating in Ontario?	Probably
Is the species of conservation concern in bordering jurisdictions?	Probably
Is the Ontario population considered to be a sink?	No
Is rescue from outside populations likely?	Possibly

Sensitive species

Yes, given that it only occurs in one location that is publicly accessible.

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding rank and decline for Golden-eye Lichen (*Teloschistes chrysophthalmus*)

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S2S3	Great Lakes subpopulation has declined	(COSEWIC 2016)
Quebec	Not present	Not applicable	(NatureServe 2017)
Manitoba	S3S4	Unknown	(COSEWIC 2016)
Michigan	Not in NatureServe, but occurs	Only known from lower peninsula	(Fryday and Wetmore 2002)
Minnesota	Not present	Not applicable	(NatureServe 2017)
Nunavut	Not present	Not applicable	(NatureServe 2017)
New York	Not present	Not applicable	(NatureServe 2017)
Ohio	Not in NatureServe, but occurs	Trend unknown. Only one post-1965 location known from southern Ohio.	(Ohio Moss and Lichen Association 2012)
Pennsylvania	SNR	Unknown	(NatureServe 2017)
Wisconsin	S1	Listed as Special Concern	(Wisconsin Department of Natural Resources 2016)

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
GRANK: global conservation status assessments
IAO: index of area of occupancy
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
S3: Vulnerable
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