

1 **Golden-eye Lichen (Great Lakes population)**

2 **Ontario Government Response Statement**

3 **Protecting and Recovering Species at Risk in Ontario**

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

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

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

23 The [Recovery Strategy for the Golden-eye Lichen \(*Teloschistes chrysophthalmus*\) –](#)
24 [Great Lakes population in Ontario](#) was completed on July 22, 2019.

25 Golden-eye Lichen is a distinctive bright orange to greenish-grey lichen that typically
26 inhabits trees. The main body of the lichen (thallus) appears shrub-like and often has
27 upright cup-like fruiting bodies (apothecia) with hair-like projections (cilia) around the
28 rims. The lichen attaches to surfaces via a central point referred to as a holdfast.

29 **Protecting and Recovering Golden-eye Lichen**

30 Golden-eye Lichen (Great Lakes population) is listed as an endangered species under
31 the ESA, which protects both the lichen and its habitat. The ESA prohibits harm or

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32 harassment of the species and damage or destruction of its habitat, without
33 authorization. Such authorization would require that conditions established by the
34 Ontario government be met.

35 Golden-eye Lichen has a global distribution with observations on five continents. In
36 North America, Golden-eye Lichen has a patchy distribution which includes records on
37 the western and eastern coasts, and throughout much of the Great Plains region. In
38 Canada, it is located in both Manitoba and Ontario, and occurs as three distinct
39 populations (Prairie, Boreal, and Great Lakes populations). Two of the populations
40 occur within Ontario – the Boreal population, which occurs in northwestern Ontario and
41 Manitoba, and the Great Lakes population, which occurs only in southern Ontario. The
42 Prairie population is found only in Manitoba.

43 The Prairie and Boreal populations of Golden-eye Lichen were assessed as one unit by
44 the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
45 because they occur within a similar geographic area, and the same types of habitat. The
46 Great Lakes population was considered separately from the Prairie and Boreal
47 populations because the populations are widely separated, occupy different
48 ecogeographic zones, and display unique habitat preferences, suggesting that they are
49 locally adapted and ecologically significant. The two populations found within Ontario
50 were also assessed separately by the provincial Committee on the Status of Species at
51 Risk in Ontario (COSSARO); only the Great Lakes population is classified as at risk
52 under Ontario's ESA.

53 The Great Lakes population consists of only one known colony of Golden-eye Lichen,
54 located in Sandbanks Provincial Park on the shoreline of Lake Ontario. The size of the
55 colony has declined since its discovery in 1994, with at least six individuals having been
56 lost in the last 10 years. The population now consists of only two thalli (individuals), and
57 is at very high risk of extirpation from Ontario. Although it is likely that the Great Lakes
58 population was always rare, it occurred historically at several locations along the
59 shorelines of Lake Erie and Ontario, as well as near Niagara Falls. Recent surveys in
60 these areas have not detected the species. Golden-eye Lichen is considered rare, and
61 likely to be in decline, in jurisdictions neighbouring the Great Lakes region, as well, thus
62 reducing the likelihood that these neighbouring occurrences could rescue the Ontario's
63 Great Lakes population.

64 Lichens are organisms that are composed of a fungus and a type of alga or a
65 cyanobacterium. The alga or cyanobacterium produces food for the lichen through
66 photosynthesis while the fungus provides structure to the lichen, absorbs nutrients from
67 the host structure, and plays an important role in the lichen's reproduction. The green

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68 alga *Trebouxia* is believed to be the photosynthesizing component of Golden-eye
69 Lichen.

70 Golden-eye Lichen is able to reproduce in two ways – vegetatively (asexually), through
71 fragments of the hair-like projections on its fruiting bodies or pieces of the lichen itself,
72 or sexually, through the release of spores which are distributed by air currents, and land
73 on potential new hosts. In both circumstances, successful reproduction is entirely
74 dependent on arrival on an appropriate host in a suitable environment (including the
75 presence of the *Trebouxia* in the latter method). Golden-eye Lichen lacks the types of
76 specialized structures (soredia or isidia) that are present on many other lichens,
77 suggesting that it may have a lower capacity for vegetative reproduction compared to
78 other species of lichen.

79 As a species, Golden-eye Lichen lives in well-lit, humid environments, and is typically
80 found along shorelines, on the branches and twigs of tree species, including White
81 Spruce (*Picea glauca*), Trembling Aspen (*Populus tremuloides*), Jack Pine (*Pinus*
82 *banksiana*), Balsam Fir (*Abies balsamea*), Bur Oak (*Quercus macrocarpa*), and Red
83 Oak (*Quercus rubra*). The Great Lakes population is located within a mature coastal
84 deciduous forest, on the bark of a single Red Oak.

85 The extremely small size of the Great Lakes population makes it highly susceptible to
86 threats such as severe weather events, physical damage or becoming dislodged, and
87 intentional collection. The species is highly vulnerable to being dislodged from its host
88 due to pressure or abrasion because it attaches to its host via a single central point. The
89 lichen could be dislodged during human recreational activities (such as the use of a
90 nearby trail) or due to natural causes (such as abrasion caused by branches of nearby
91 vegetation or wildlife use of the host tree). The species may also be impacted by plant
92 pathogens (e.g., Oak Wilt *Ceratocystis fagacearum*) which affect the health of its host
93 tree. Other threats to the species may include declines in air quality, and changes in
94 habitat suitability resulting from the growth of invasive woody plants, such as Common
95 Buckthorn (*Rhamnus cathartica*).

96 In the absence of additional colonies within the Great Lakes population, the vulnerability
97 of the known colony suggests that the risk of extirpation for Golden-eye Lichen will
98 remain high, for the foreseeable future. Surveys, to determine whether additional
99 colonies are present in Ontario, are needed. Given the extreme rarity of the Great Lakes
100 population, the rarity of the species in the larger Great Lakes region, and the
101 uniqueness of this population relative to other Golden-eye Lichen occurrences in
102 Canada, protection and recovery efforts will be focused on supporting the persistence of
103 this population in Ontario. In the event that research indicates that population

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104 management actions such as augmentation or reintroduction are likely to be successful,
105 appropriate implementation of these types of efforts may be the best approach to
106 minimize the risk of extirpation of Golden-eye Lichen from Ontario.

Government's Recovery Goal

107 The government's goal for the recovery of Golden-eye Lichen (Great Lakes population)
108 is to support the persistence of the Great Lakes population in Ontario. The government
109 supports investigating the feasibility and appropriateness of reintroduction and/or
110 augmentation of the Great Lakes population in Ontario.
111

112 Actions

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

120 Government-led Actions

121 To help protect and recover Golden-eye Lichen (Great Lakes population), the
122 government will directly undertake the following actions:

- 123 • Consistent with the *Sandbanks Provincial Park Management Plan (1993)* and the
124 *Sandbanks Vegetation Management Plan (2009)*, continue to protect provincially
125 significant ecosystems (including rare and endangered species) at Sandbanks
126 Provincial Park while offering compatible opportunities for visitors to participate in
127 recreational activities.
- 128 • Continue to implement the *Ontario Invasive Species Strategic Plan (2012)* to
129 address the invasive species (e.g. Common Buckthorn) that threaten Golden-eye
130 Lichen.
- 131 • Educate other agencies and authorities involved in planning and environmental
132 assessment processes on the protection requirements under the ESA.
- 133 • Encourage the submission of Golden-eye Lichen data to the Ontario's central
134 repository through the citizen science projects that they receive data from (i.e.,
135 iNaturalist.ca) and directly through the [Natural Heritage Information Centre](#).

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- 136 • Undertake communications and outreach to increase public awareness of
137 species at risk in Ontario.
- 138 • Continue to protect Golden-eye Lichen (Great Lakes population) and its habitat
139 through the ESA.
- 140 • Support conservation, agency, municipal and industry partners, and Indigenous
141 communities and organizations to undertake activities to protect and recover
142 Golden-eye Lichen (Great Lakes population). Support will be provided where
143 appropriate through funding, agreements, permits (including conditions) and/or
144 advisory services.
- 145 • Encourage collaboration, and establish and communicate annual priority actions
146 for government support in order to reduce duplication of efforts.
- 147 • Conduct a review of progress toward the protection and recovery of Golden-eye
148 Lichen (Great Lakes population) within five years of the publication of this
149 document.

150 **Government-supported Actions**

151 The government endorses the following actions as being necessary for the protection
152 and recovery of Golden-eye Lichen (Great Lakes population). Actions identified as
153 “high” may be given priority consideration for funding under the Species at Risk
154 Stewardship Program. Where reasonable, the government will also consider the priority
155 assigned to these actions, when reviewing and issuing authorizations under the ESA.
156 Other organizations are encouraged to consider these priorities when developing
157 projects or mitigation plans related to species at risk.

158	Focus Area:	Research
159	Objective:	Improve understanding of potential population management 160 techniques and mechanisms for dispersal for Golden-eye Lichen.

161 Given that the Great Lakes population is anticipated to remain at high risk of extirpation,
162 it is important to explore the feasibility of population management actions (i.e.,
163 augmentation or reintroduction) that may support its persistence. Other species of
164 lichens have successfully been propagated in controlled laboratory environments and in
165 natural settings, but the ability to propagate Golden-eye Lichen has not yet been
166 evaluated. It is important to understand whether, if an individual lichen or piece of lichen
167 is dislodged from the existing colony, or the host tree’s health fails, the lichen (or a part
168 of it) may be feasibly relocated to another suitable environment. All actions undertaken
169 to assess the feasibility of augmentation, reintroduction, or relocation must consider

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170 potential impacts on existing populations; collections from Ontario's Great Lakes
171 population are not recommended to support these efforts.

172 Although some evidence suggests that Golden-eye Lichen may be transported to new
173 areas through the movement of nursery trees, this method of dispersal warrants further
174 investigation.

175 **Actions:**

- 176 1. **(High)** Investigate the feasibility of relocating thalli at risk of
177 being lost (e.g., due to failing host tree health) to substrate in
178 appropriate natural environments. Related actions may include:
- 179 ○ reviewing and summarizing current scientific literature;
 - 180 ○ identifying and documenting techniques and best
181 practices;
 - 182 ○ identifying suitable locations and host trees or surfaces;
183 and,
 - 184 ○ undertaking experimental transplants under appropriate
185 circumstances, and using appropriate stock.
- 186 2. **(High)** Undertake appropriate actions to investigate the
187 feasibility of population management actions for the Great
188 Lakes population of Golden-eye Lichen. Potential actions may
189 include assessing the feasibility of:
- 190 ○ propagating new thalli in controlled environments; and,
 - 191 ○ propagating new thalli via vegetative reproduction (e.g.,
192 from fragments) in suitable natural environments.
- 193 3. Investigate habitat requirements (e.g., moisture, light and
194 canopy conditions) in order to inform stewardship actions to
195 maintain or enhance habitat.
- 196 4. Examine lichen communities on woody plants at nurseries and
197 evaluate how nursery stock is moved across the landscape, to
198 better understand whether its movement may play a role in the
199 dispersal of Golden-eye Lichen.

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201 **Focus Area: Inventory and Monitoring**
202 Objective: Increase knowledge of the status and distribution of Golden-eye
203 Lichen (Great Lakes population) in Ontario.

204 While habitats with high suitability have been surveyed in recent years, survey effort has
205 been relatively limited at many sites. Additional intensive survey effort is needed to
206 confirm whether Golden-eye Lichen is present at other locations. The results of these
207 surveys are critical because the discovery of additional occurrences will help to
208 determine where recovery efforts would be best focused. It is important to monitor and
209 assess the status of the existing colony, and any additional colonies discovered, over
210 time, to track the effectiveness of protection and recovery efforts, and inform future
211 efforts.

- 212 **Actions:**
- 213 5. **(High)** Conduct intensive surveys of apparently suitable habitat
214 in the Great Lakes region in Ontario, to determine whether
215 additional colonies are present, and document site conditions as
216 well as the characteristics of any new colonies. Potential survey
217 areas include:
 - 218 ○ Sandbanks Provincial Park;
 - 219 ○ Presqu'île Provincial Park;
 - 220 ○ the western shoreline of Lake Ontario in Prince Edward
221 County; and,
 - 222 ○ mature open woodlands along the shorelines of lakes
223 Ontario, Erie, Huron, and Georgian Bay.
 - 224 6. For the known colony, as well as any additional colonies
225 identified via the action above, develop and implement a
226 monitoring and assessment protocol to track colony status
227 (including number of thalli, thalli size, and fertility), habitat
228 conditions, and potential or confirmed site-specific threats.

229 **Focus Area: Stewardship and Awareness**
230 Objective: Increase awareness of the species, its habitat requirements, and
231 ways to minimize threats.

232 Undertaking appropriate actions to maintain or enhance Golden-eye Lichen habitat will
233 assist in supporting the species' persistence in the province. A collaborative approach to
234 these activities will share responsibilities, improve efficiency, ensure suitable habitat is
235 maintained, and encourage communication about lessons learned. Promoting
236 awareness of the species among relevant individuals may minimize threats to the

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237 species, and increase the likelihood of incidental discovery in areas where Golden-eye
238 Lichen may occur.

239 **Actions:**

240 7. In collaboration with landowners, land managers, municipalities,
241 and interested Indigenous communities and organizations, and
242 where appropriate, undertake habitat stewardship actions to
243 maintain or enhance habitat conditions at locations where the
244 species is likely to disperse, or at new locations where the
245 species is discovered. Actions should be undertaken in a
246 manner that does not negatively impact Golden-eye Lichen, and
247 may include the control of invasive vegetation (e.g., Common
248 Buckthorn).

249 8. Where appropriate, share information with individuals who may
250 encounter the species in Ontario. Information may include:

- 251 ○ how to identify the species;
- 252 ○ the species' habitat requirements;
- 253 ○ how to report observations of the species;
- 254 ○ protection afforded to the species and its habitat under the
255 ESA; and,
- 256 ○ actions that can be taken to avoid or minimize impacts to the
257 species and its habitat.

258 **Implementing Actions**

259 Financial support for the implementation of actions may be available through the
260 Species at Risk Stewardship Program. Conservation partners are encouraged to
261 discuss project proposals related to the actions in this response statement with Ministry
262 of the Environment, Conservation and Parks staff. The Ontario government can also
263 advise if any authorizations under the ESA or other legislation may be required to
264 undertake the project.

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

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269 **Reviewing Progress**

270 The ESA requires the Ontario government to conduct a review of progress towards
271 protecting and recovering a species no later than the time specified in the species'
272 government response statement, or not later than five years after the government
273 response statement is published if no time is specified. The review will help identify if
274 adjustments are needed to achieve the protection and recovery of Golden-eye Lichen
275 (Great Lakes population).

276 **Acknowledgement**

277 We would like to thank all those who participated in the development of the Recovery
278 Strategy for the Golden-eye Lichen (*Teloschistes chrysophthalmus*) – Great Lakes
279 population in Ontario for their dedication to protecting and recovering species at risk.

280 **For Additional Information:**

281 Visit the species at risk website at ontario.ca/speciesatrisk
282 Contact the Ministry of the Environment, Conservation and Parks
283 1-800-565-4923
284 TTY 1-855-515-2759
285 www.ontario.ca/environment
286