

DRAFT Government Response Statement
to the
Recovery Strategy for the White-rimmed Shingle Lichen in Ontario

1 **White-rimmed Shingle Lichen**

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 Ontario government's legislative
6 commitment to protecting and recovering species at risk and their habitats.

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

11 Generally, within nine months after a recovery strategy is prepared, the ESA requires
12 the government to publish a statement summarizing the government's intended actions
13 and 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 considers (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 Indigenous Knowledge where it has been shared by communities
19 and Knowledge Holders, as appropriate, and may be adapted if new information
20 becomes available. In implementing the actions in the response statement, the ESA
21 allows the government to determine what is feasible, taking into account social, cultural
22 and economic factors.

23 The Recovery Strategy for the White-rimmed Shingle Lichen (*Fuscopannaria*
24 *leucosticta*) in Ontario was completed on January 25, 2023.

25 White-rimmed Shingle Lichen is composed of many small densely overlapping lobes,
26 which create a shingle-like appearance. The lobes are generally 2 to 3mm in size and
27 are dark grey to chestnut brown with white edges. The lichen can be found almost
28 exclusively on the bark of trees in wet old-growth forests and swamps.

29 **Protecting and Recovering White-rimmed Shingle Lichen**

30 White-rimmed Shingle Lichen is listed as an endangered species under the ESA, which
31 protects both the plant and its habitat. The ESA prohibits harm or harassment of the

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32 species and damage or destruction of its habitat without authorization or complying with
33 the requirements of a regulatory exemption.

34 White-rimmed Shingle Lichen has a disjointed global distribution that spans most
35 continents as it can be found in North America, Central America, South America,
36 Europe, Africa and Asia. It is thought that the species was once present throughout its
37 global distribution, but that it has been lost from many areas, resulting in sparse relict
38 populations. These remaining populations are most common in North America and
39 Northern Pacific Asia.

40 Within Canada there are four distinct sub-populations – one in Nova Scotia, one in New
41 Brunswick and two in Ontario. The two Ontario subpopulations are found at sites
42 scattered across the southern regions of the Thunder Bay and Rainy River Districts. In
43 Ontario, there are currently seven known sites where White-rimmed Shingle Lichen is
44 extant (currently exists) and one historical site where the species was previously found.
45 Each site contains about 12.8 thalli (individuals) on average. The viability of the lichen
46 colonies at these sites is unknown since the critical population threshold is also
47 unknown. All of these sites were identified by a single expert which signals that there
48 are likely additional undiscovered occupied sites. Based on a [2020 evaluation report](#) by
49 the Committee on the Status of Species at Risk in Ontario, although there are 77 known
50 thalli in Ontario, the total provincial population of White-rimmed Shingle Lichen is
51 estimated at 639 thalli. Results from additional surveys may inform future re-
52 assessments of the status of this species in Ontario.

53 Lichens are organisms that are composed of a fungus and a type of alga or a
54 cyanobacterium (a phylum of photosynthetic bacteria). The alga or cyanobacterium
55 produces food for the lichen through photosynthesis while the fungus provides structure
56 to the lichen, absorbs nutrients from the host structure, and plays an important role in
57 the lichen's reproduction. In White-rimmed Shingle Lichen, the fungal element is in the
58 Pannariaceae family and the cyanobacterial element is believed to be in the *Nostoc*
59 genus.

60 White-rimmed Shingle Lichen reproduces sexually via ascospores (spores capable of
61 developing into a new lichen) that are carried by the wind to a new location. Dispersal
62 distances and survival rates of ascospores are unknown. There is some evidence to
63 suggest that vegetative (asexual) reproduction may also be occurring based on
64 observations of fragmented pieces of vegetation in Nova Scotia. This is likely to be rare
65 since this species lacks the vegetative structures typically needed for this type of
66 reproduction. Asexual reproduction in White-rimmed Shingle Lichen should be further
67 investigated to confirm its reproductive contribution.

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68 Ontario's White-rimmed Shingle Lichen appear to be limited to nutrient-rich, high-
69 moisture ecosystems as the plant has been found exclusively in old-growth wet forests
70 and undisturbed treed-swamps. The extant sites in Ontario typically feature raised
71 hummocks and scattered pools and do not contain an excessive amount of standing
72 water.

73 White-rimmed Shingle Lichen's wet forested habitat is usually dominated by the plant's
74 host species, Eastern White Cedar (*Thuja occidentalis*). Eastern White Cedar is the only
75 known host to White-rimmed Shingle Lichen in Ontario. Outside of Ontario, the lichen
76 has been recorded a few times on Red Maple (*Acer rubrum*) bark, Black Ash (*Fraxinus*
77 *nigra*) bark and on rock. It is possible these types of substrates are also used by the
78 species in Ontario but this remains a knowledge gap due to limited number of known
79 occurrences in the province. Eastern White Cedar trees provide a uniquely suitable
80 substrate for White-rimmed Shingle Lichen due to the tree's soft and spongy bark,
81 neutral pH level (White-rimmed Shingle Lichen prefer non-acidic substrates) and
82 structural attributes that increase its water retention. Water retention tends to be high in
83 Eastern White Cedar trees due to their ability to grow after being blown over and their
84 twisted growth habit that causes the trunk to lean. Leaning trees provide an ideal
85 environment for White-rimmed Shingle Lichen colonies to grow on the upper side of the
86 tree. The microhabitat created by these characteristics provides a unique light regime,
87 prevents desiccation (drying out) and increases access to rainwater.

88 While the type of habitat the species occupies is generally understood, there are several
89 knowledge gaps related to specific habitat characteristics and preferences. It is
90 important to further clarify the species' preferred soil type and hydrological regime as, to
91 date, no studies have been conducted to investigate factors such as soil texture,
92 organic material depth, water table variability, water transfer mechanisms and surface
93 water depth at occupied sites. White-rimmed Shingle Lichen also has several
94 knowledge gaps related the age, size and lean angle of the host tree, tree stand age as
95 well as the species' preferred location on the host tree. Some of these knowledge gaps
96 regarding habitat preference may be the key to understanding which factors limit White-
97 rimmed Shingle Lichen's ability to colonise a new area and influence distribution
98 pattern. Currently it is unclear why thalli occur in such low densities and why there are
99 significant distances between occurrences even when the habitat is considered suitable.

100 Additional knowledge gaps surrounding White-rimmed Shingle Lichen include the
101 genetic diversity between occupied sites, the feasibility of propagation and transfer,
102 generation time (average age of reproductively active individuals), the effects of
103 browsing and grazing by wildlife like White-tailed Deer (*Odocoileus virginianus*) and

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104 Porcupine (*Erethizon dorsatum*) and the extent of the effects of air quality on the
105 species.

106 There are five primary threats to White-rimmed Shingle Lichen that contribute to the
107 loss of host trees, loss of habitat or changes to the species' preferred microhabitat
108 conditions. These threats include habitat loss, habitat degradation, changes to the
109 hydrological regime, climate change and air pollution. White-rimmed Shingle Lichen is
110 particularly vulnerable to these threats in part due to its habitat: old growth swamp and
111 wet forested habitat are highly sensitive to disturbance.

112 Changes to the hydrological regime can dramatically increase or decrease the water
113 level in an ecosystem. These changes can produce periods of excessive flooding or
114 drying of habitat, leading to a decline in host trees. Climate change is also projected to
115 have considerable impacts on White-rimmed Shingle Lichen through alterations to
116 temperature and moisture. White-rimmed Shingle Lichen are likely to experience an
117 increased risk of desiccation and heat stress as the mean annual temperate increases
118 and summer precipitation decreases in northern Ontario. Regional changes in
119 temperature and precipitation regimes may result in alterations to the composition of the
120 vegetation communities and increases in wildfires.

121 Air pollution can result in direct effects to White-rimmed Shingle Lichen when particulate
122 matter (tiny particles in the air) dissolves and is absorbed into the lichen. These
123 chemicals can cause physical damage and interrupt photosynthesis. Air pollution may
124 also have indirect effects on White-rimmed Shingle Lichen through habitat degradation.
125 Acidification, which often results from air pollution, can lead to acid rain. Acid rain
126 degrades White-rimmed Shingle Lichen habitat by leaching calcium from tree bark or
127 soil, altering the pH level of the host substrate. Coniferous trees like White-rimmed
128 Shingle Lichen's host plant are particularly vulnerable to acidification due to their thin
129 bark.

130 Due to the low number of known occurrences in Ontario, the risk of extirpation remains
131 relatively high for White-rimmed Shingle Lichen. The recovery of this species requires
132 the maintenance of existing and newly discovered occupied sites and increasing its
133 abundance and distribution, where possible. To achieve this goal, additional information
134 is needed about what factors might be limiting the species so recovery efforts can be
135 better focused to address them. Raising awareness about White-rimmed Shingle Lichen
136 to both local land managers and users will help to identify new colonies, promote
137 protection and aid in filling knowledge gaps.

138 **Government's Recovery Goal**

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139 The government's goal for the recovery of White-rimmed Shingle Lichen is to maintain
140 or increase the species' distribution and abundance in Ontario.

141 **Actions**

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

149 **Government-led Actions**

150 To help protect and recover White-rimmed Shingle Lichen, the government will directly
151 undertake the following actions:

- 152
- 153 • Continue to protect White-rimmed Shingle Lichen and its habitat through the
ESA.
 - 154 • Undertake communications and outreach to increase public awareness of
155 species at risk in Ontario (e.g., through Ontario Parks Discovery Program, where
156 appropriate).
 - 157 • Continue to monitor populations and mitigate threats to the species and its
158 habitat in provincially protected areas, where feasible and appropriate.
 - 159 • Educate other agencies and authorities involved in planning and environmental
160 assessment processes on the protection requirements under the ESA.
 - 161 • Encourage the submission of White-rimmed Shingle Lichen data to the Ontario's
162 central repository through the [NHIC \(Rare species of Ontario\) project in](#)
163 [iNaturalist](#) or directly through the [Natural Heritage Information Centre](#).
 - 164 • Continue to support conservation, agency, municipal and industry partners, and
165 Indigenous communities and organizations to undertake activities to protect and
166 recover White-rimmed Shingle Lichen. Support will be provided where
167 appropriate through funding, agreements, permits and/or advisory services.

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- 168 • Work with all levels of government, communities and sectors to take action on
169 climate change, and to report on progress in reducing greenhouse gas
170 emissions.
- 171 • Continue to manage Crown forests in a manner that minimizes adverse impacts
172 to species at risk and their habitats.
- 173 • Conduct a review of progress toward the protection and recovery of White-
174 rimmed Shingle Lichen within five years of the publication of this document.

175 **Government-supported Actions**

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

183 Focus Area:	Monitoring
184 Objective:	Increase knowledge of the distribution, limiting factors and habitat 185 preferences of White-rimmed Shingle Lichen.

186 There are several knowledge gaps concerning White-rimmed Shingle Lichen in Ontario
187 including the extent of species distribution, their specific habitat preferences, colony
188 viability. Filling these knowledge gaps may help determine the factors influencing the
189 species’ ability to recover, where protection and recovery efforts should be focused.

190 **Actions:**

- 191 1. **(High)** Conduct intensive surveys of apparently suitable habitat, including
192 across the southern regions of the Thunder Bay and Rainy River
193 Districts, to determine whether additional colonies are present, and
194 document site conditions as well as the characteristics of any new
195 colonies including:
 - 196 i. information about the substrate (e.g. host tree species, size, age,
197 lean angle, tree stand age and the lichen’s location on the host tree
198 etc.)
 - 199 ii. hydrological regime (e.g. variability in water table, surface water
200 depth of occupied sites etc.)

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- 201 iii. habitat conditions (e.g. dominant vegetation, soil texture, organic
202 material depth), and
203 iv. colony characteristics (number of thalli, thalli area (i.e. max
204 length/width) and potential threats).
- 205 2. Conduct long-term monitoring at all existing and newly identified White-
206 rimmed Shingle Lichen subpopulations. Monitoring information collected
207 should include site conditions and the characteristics of colonies (as
208 identified in Action 1).

209	Focus Area:	Research
210	Objective:	Improve understanding of aspects of the species' biology, ecology 211 and threats within Ontario.

212 Very little is known about the effects of genetic, reproductive and environmental factors,
213 such as air pollution, on White-rimmed Shingle Lichen and its populations dynamics.
214 Understanding the interaction between these factors and the species will help to reveal
215 additional barriers the species may be facing, the extent of existing threats and uncover
216 additional recovery measures that can be implemented to aid the species' recovery.

- 217 3. **(High)** Develop habitat suitability and population viability models to direct
218 future surveys and further assess species' vulnerability.
- 219 4. Conduct research on the biology and ecology of White-rimmed Shingle
220 Lichen including:
- 221 i. genetic relatedness of subpopulations within Ontario and of Ontario
222 population relative to the Eastern Canada and U.S. populations
223 ii. dispersal distance
224 iii. optimal techniques and feasibility of propagating (including
225 propagation from vegetative fragmentation) or transplanting White-
226 rimmed Shingle Lichen
227 iv. air pollution impacts on White-rimmed Shingle Lichen
228 v. generation time

229	Focus Area:	Awareness
230	Objective:	Increase awareness of White-rimmed Shingle Lichen including its 231 identification, distribution and habitat requirements to promote 232 protection and recovery.

233 White-rimmed Shingle Lichen is known to occur in Thunder Bay District and Rainy River
234 District. There are limited known occurrences of the White-rimmed Shingle Lichen and it
235 is reasonable to assume there may be additional occurrences which have not been

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236 found due to limited awareness of the species. Increasing awareness of White-rimmed
237 Shingle Lichen, its habitat requirements, distribution and threats, to those managing or
238 using the land will increase the likelihood of unknown occurrences being found and
239 protected.

240 **Actions:**

- 241 5. **(High)** Promote awareness of White-rimmed Shingle Lichen among
242 Indigenous organizations and communities, forest industry partners,
243 environmental professionals, naturalists, land managers and by sharing
244 information regarding:
- 245 i. the identification of the species
 - 246 ii. the species' distribution and habitat associations
 - 247 iii. protection afforded to the species and its habitat under the ESA
 - 248 iv. actions that can be taken to reduce threats to the species and its
249 habitat
 - 250 v. how the observations can be reported to NHIC.

251 **Implementing Actions**

252 Financial support for the implementation of actions may be available through the
253 Species at Risk Stewardship Program. Conservation partners are encouraged to
254 discuss project proposals related to the actions in this response statement with Ministry
255 of the Environment, Conservation and Parks staff. The Ontario government can also
256 provide guidance about the requirements of the ESA, whether an authorization or
257 regulatory exemption may be required for the project and, if so, the authorization types
258 and/or conditional exemptions for which the activity may be eligible. Implementation of
259 the actions may be subject to changing priorities across the multitude of species at risk,
260 available resources and the capacity of partners to undertake recovery activities. Where
261 appropriate, the implementation of actions for multiple species will be co-ordinated
262 across government response statements.

263 **Performance Measures**

264 Progress towards achieving the government's goal for the recovery of White-rimmed
265 Shingle Lichen will be measured against the following performance measures:

- 266 • By 2028, the total number of thalli in Ontario is equal to or greater than 639.
- 267 • By 2028, 100% of the occupied sites in Ontario have the same, or an increased
268 number of thalli observed.
- 269 • By 2028, there are seven or more occupied sites in Ontario.

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270 **Reviewing Progress**

271 The ESA requires the Ontario government to conduct a review of progress towards
272 protecting and recovering a species no later than the time specified in the species'
273 government response statement, which has been identified as five years. The review
274 will help identify if adjustments are needed to achieve the protection and recovery of
275 White-rimmed Shingle Lichen.

276 **Acknowledgement**

277 We would like to thank all those who participated in the development of the Recovery
278 Strategy and Government Response Statement for the White-rimmed Shingle Lichen
279 (*Fuscopannaria leucosticta*) in Ontario for their dedication to protecting and recovering
280 species at risk.

281 **For Additional Information:**

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