

DRAFT Government Response Statement
to
Recovery Strategy for the Shagreen and Toothed Globe in Ontario

1 **Shagreen and Toothed Globe**
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 Shagreen (*Inflectarius inflectus*) and Toothed Globe
24 (*Mesodon zaletus*) in Ontario was completed on January 25, 2023. Given their similar
25 distribution and threats, the recovery efforts for the Shagreen and Toothed Globe are
26 addressed collectively in a single government response statement.

27 Shagreen is a medium-sized terrestrial snail with a depressed, yellow to brown shell
28 that has three tooth-like projection in the opening. Its body is dark grey in colour and
29 rarely extends out of the shell.

30 Toothed Globe is a large terrestrial snail with a depressed, spherical, yellow shell that
31 has a tooth-like projection in the opening. Its body is greyish-brown or black, and paler
32 underneath.

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33 **Protecting and Recovering Shagreen and Toothed Globe**

34 Shagreen and Toothed Globe are listed as endangered species under the ESA, which
35 protects both the animals and their habitats. The ESA prohibits harm or harassment of
36 these species and damage or destruction of their habitat without authorization or
37 complying with the requirements of a regulatory exemption.

38 Shagreen occurs only in eastern North America. Its range extends north to Michigan
39 and Ontario, east to New York, south to Florida and Texas and west to Texas, Kansas
40 and Oklahoma. In Canada, the species is currently thought to be restricted to Pelee
41 Island and Middle Island in Lake Erie. There are a total of 10 known extant locations
42 across the two islands. The species is presumed extirpated from sites on Middle Sister
43 Island, East Sister Island, and North Harbour Island in Lake Erie, as well as the
44 southwestern Ontario mainland.

45
46 Toothed Globe has a similar global distribution, ranging north to Michigan and Ontario,
47 east to New York, south to South Carolina and Texas, and west to Texas, Oklahoma
48 and Iowa. In Canada, there are no currently known occurrences. However, the species
49 is historically known from several Lake Erie islands and the southwestern Ontario
50 mainland. It may still occur at historical locations on Hen Island in Lake Erie, and on the
51 mainland in Essex and Middlesex counties, where intact habitat remains, but recent
52 surveys have not been conducted due to lack of access.

53
54 In Ontario, Shagreen can be found in rocky or open woods and wooded alvar, and has
55 only been found under logs. However, in parts of the species' U.S. range, it can be
56 found under other natural objects such as rocks and leaf litter (the layer of decomposing
57 leaves and debris found on top of the soil), or human-made objects such as railroad
58 ties. Historically, Toothed Globe was common in deciduous forests and along river
59 bluffs, ravines and on mountainsides, preferring slopes with thick leaf litter over a rich
60 humus. Like other terrestrial snails, Shagreen and Toothed Globe likely have very
61 specific microhabitat requirements, such as moist, temperature-buffered refuges that
62 provide shelter against extreme weather. These microhabitat requirements likely vary
63 based on lifecycle stage or season, but further investigation is required.

64
65 Little is known about the biology of Shagreen and Toothed Globe. Both snails are air-
66 breathing, egg-laying terrestrial snails. These species are believed to reach sexual
67 maturity within one to three years and each individual snail has both male and female
68 reproductive organs. Both members of a mating pair may exchange sperm and produce
69 eggs. The generation time (which is the approximate average age of parents in the
70 generation) is estimated to be two years for Shagreen and five to six years for Toothed

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71 Globe. The hibernation period for both species likely occurs from early October until
72 mid-April, depending on environmental conditions. Hibernation sites likely include
73 shallow depressions in the forest floor covered with leaf litter, or in soil at depths of 5 to
74 10 cm. Like many other snail species that live in leaf litter, Shagreen and Toothed Globe
75 may feed on decaying plants or microfungi on logs under which they are found, and
76 may play an important role in the nutrient cycle in ecosystems where they occur.
77 Dispersal ability of these species is not well understood, but is believed to be extremely
78 limited (for example, the related Oregon Forestsnail was measured to travel no more
79 than 32 m from where it was first found over a three-year period).

80 Additional research is required to gauge a full understanding of the current threats to
81 Shagreen and Toothed Globe. Habitat loss and degradation, primarily resulting from the
82 impacts of hyperabundant and invasive species, is a threat to both species. Double-
83 crested Cormorants (*Phalacrocorax auritus*) may be a key reason Shagreen and
84 Toothed Globe have been extirpated from several Lake Erie islands. Double-crested
85 Cormorant nesting colonies have increased in recent decades, and the guano of these
86 birds is known to lead to changes in soil chemistry, tree dieback and changes in species
87 communities. Habitat of these snails may also be degraded by invasive species such as
88 various types of non-native plants (e.g., Japanese Chaff Flower [*Achyranthes japonica*],
89 Garlic Mustard [*Alliaria petiolate*], European Common Reed, also known as Invasive
90 Phragmites [*Phragmites australis* ssp. *australis*]) and earthworms. Several invasive
91 snails (e.g., Leopard Slug [*Limax maximus*]) may also threaten Shagreen and Toothed
92 Globe through direct competition for food or shelter, but the interactions between the
93 species are poorly understood. The introduction of Ring-necked Pheasant (*Phasianus*
94 *colchicus*) for hunting, and restoration of Wild Turkey (*Meleagris gallopavo*) in Ontario
95 may also impact Shagreen and Toothed Globe as both bird species are known to
96 include snails in their diet. Other potential threats are described in the Recovery
97 Strategy for the Shagreen (*Inflectarius inflectus*) and Toothed Globe (*Mesodon zaletus*)
98 in Ontario.

99
100 Significant knowledge gaps remain about both Shagreen and Toothed Globe, including
101 their distribution, subpopulation statuses, habitat requirements, ecological interactions
102 and threats. Current and historical occurrences of these species are limited to small
103 patches of highly fragmented habitat, and both species likely require specific
104 microhabitat conditions and have limited dispersal ability. Recovery of Shagreen will
105 require monitoring to confirm where the species is present, protection and maintenance
106 of existing habitat to ensure the persistence of existing subpopulations and allow for
107 natural expansion, and research to better understand threats to the species and
108 appropriate mitigative actions. Targeted surveys are necessary to determine if and

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109 where Toothed Globe still occurs in the province. If it is found to be extant (still present)
110 in Ontario, recovery actions for Toothed Globe will be similar to those required for
111 Shagreen.

112 **Government's Recovery Goal**

113 The government's goal for the recovery of Shagreen is to maintain or increase its
114 distribution in Ontario. The government's goal for the recovery of Toothed Globe is to
115 determine whether the species is present in Ontario, and, if the species is found to
116 occur in the province, maintain or increase its distribution. The government supports
117 investigating the necessity and feasibility of augmenting existing populations of
118 Shagreen and Toothed Globe.

119 **Actions**

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

127 **Government-led Actions**

128 To help protect and recover Shagreen and Toothed Globe, the government will directly
129 undertake the following actions:

- 130
- 131 • Continue to protect Shagreen and Toothed Globe and their habitat through the
ESA.
 - 132 • Undertake communications and outreach to increase public awareness of
133 species at risk in Ontario.
 - 134 • Educate other agencies and authorities involved in planning and environmental
135 assessment processes on the protection requirements under the ESA.
 - 136 • Encourage the submission of Shagreen and Toothed Globe data to Ontario's
137 central repository through the [NHIC \(Rare species of Ontario\) project in](#)
138 [iNaturalist](#) or directly through the [Natural Heritage Information Centre](#).

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- 139 • Continue to support conservation, agency, municipal and industry partners, and
140 Indigenous communities and organizations to undertake activities to protect and
141 recover Shagreen and Toothed Globe. Support will be provided where
142 appropriate through funding, agreements, permits and/or advisory services.
- 143 • Work with all levels of government, communities and sectors to take action on
144 climate change, and to report on progress in reducing greenhouse gas
145 emissions.
- 146 • Continue to implement Ontario’s *Invasive Species Act* to control the spread of
147 invasive species (i.e., Invasive Phragmites) that threaten Shagreen and Toothed
148 Globe by restricting the importation, deposition, release, breeding/growing,
149 buying, selling, leasing or trading of Invasive Phragmites.
- 150 • Continue to implement the Ontario Invasive Species Strategic Plan (2012) to
151 address the invasive species (e.g. Garlic Mustard [*Alliaria petiolate*]) that threaten
152 Shagreen and Toothed Globe and their habitat.
- 153 • Conduct a review of progress toward the protection and recovery of Shagreen
154 and Toothed Globe within five years of the publication of this document.

155 **Government-supported Actions**

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

163 Focus Area:	Inventory and Monitoring
164 Objective:	Investigate where Shagreen and Toothed Globe are present in 165 Ontario, and, if located, monitor existing sites, their habitat and site- 166 specific threats.

167 In order to better focus actions to support protection and recovery of Shagreen and
168 Toothed Globe in Ontario, it is important to understand if and where these species are
169 present in the province. The use of standard survey methods and undertaking surveys
170 in areas where the species have previously been found or where suitable habitat exists
171 will help address knowledge gaps about the species’ distributions. Continued monitoring

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172 of extant sites, habitat conditions and site-specific threats will aid in understanding
173 appropriate management actions required for each site.

174 **Actions:**

- 175 1. **(High)** Develop and implement a standardized survey and monitoring
176 protocol for Shagreen and Toothed Globe in Ontario. Survey and
177 monitoring protocols should document and monitor:
- 178 i. presence or absence at a site, including at sites that are currently
179 considered occupied, sites that were historically occupied but still
180 have suitable habitat, and potential new sites within the species'
181 historical range that have not yet been surveyed but may be
182 occupied based on the presence of suitable habitat
 - 183 ii. habitat use and conditions, with emphasis on identifying habitat
184 features that predict presence or absence of the target species,
185 including suitable Ecological Land Classification ecosite types
 - 186 iii. species abundance and population trends
 - 187 iv. site-specific threats

188 Focus Area:	Research
189 Objective:	Conduct research that fills knowledge gaps related to biology, 190 threats and habitat requirements.

191 Further information related to the decline of these species is needed to support effective
192 protection and recovery efforts. Investigating the species' response to various known
193 and potential threats will help focus recovery efforts on actions that will have the most
194 benefit for the species. In addition to improving knowledge of threats, further
195 understanding of the species' biology, such as life history, food requirements and
196 dispersal ability, is required to support management of the species and their habitats.
197 Given the rarity of these species and their limited distribution, work is also required to
198 determine whether active population management may be necessary, and, if so, the
199 feasibility of implementing such measures.

200 **Actions:**

- 201 2. **(High)** Investigate the effects and severity of known and potential threats
202 to Shagreen and Toothed Globe and their habitats, and identify potential
203 mitigation measures as appropriate. Targeted threats may include:

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- 204 i. impacts of Double-crested Cormorant, Wild Turkey, Ring-necked
205 Pheasant, invasive plants, and non-native earthworms and
206 gastropods
- 207 ii. climate change and severe weather, including short-term and long-
208 term adaptive capacity, and snail performance (e.g., reproduction,
209 feeding, dispersal)
- 210 iii. impacts of prescribed burns
- 211 iv. pollution
- 212 3. Conduct research to improve knowledge on Shagreen and Toothed
213 Globe biology and ecology, such as life history, genetic diversity between
214 subpopulations, diet, dispersal ability and home range territory size.
- 215 4. Investigate the necessity and feasibility of augmenting the species at
216 confirmed locations. Action may include:
- 217 i. conducting population viability analyses to determine if augmentation
218 is necessary
- 219 ii. investigating the possibility of captive breeding, assisted reproduction
220 or head-starting
- 221 iii. developing an action plan to maintain the species' existing population
222 based on research results

223 Focus Area:	Habitat and Threat Management
224 Objective:	Maintain or improve Shagreen and Toothed Globe habitat and 225 mitigate threats to known extant subpopulations in Ontario.

226 Shagreen and Toothed Globe may be impacted by several threats, including invasive
227 and hyperabundant native species, climate change, prescribed burns and pollution. As
228 knowledge gaps are being filled on the effects and severity of these threats,
229 management efforts should be focused on maintaining or enhancing habitat and
230 minimizing threats to support the protection and recovery of these species where they
231 are known to exist. Where appropriate to support natural expansion, efforts should also
232 be taken to improve connectivity and enhance suitable habitat immediately surrounding
233 existing occurrences

234 Successful recovery depends on continued collaboration across multiple levels of
235 government, landowners and other stakeholders. Much of Shagreen's known
236 distribution and Toothed Globe's historical distribution is on land publicly or privately
237 managed for conservation. Conservation organizations and local partners have been

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238 actively involved in the ongoing maintenance and restoration of these areas (e.g.,
239 prescribed burns) to support multiple species at risk. As certain management activities
240 may impact Shagreen (and Toothed Globe, if it is present), working collaboratively on
241 these efforts will enhance the protection and recovery of the species.

242 **Actions:**

- 243 5. **(High)** Work collaboratively with municipalities, conservation partners,
244 landowners and land managers to undertake habitat restoration and/or
245 enhancement to improve habitat quality and availability for Shagreen and
246 Toothed Globe, including:
- 247 i. enhancing connectivity between suitable habitats (e.g., planting
248 hedgerows, wild grass strips and poly-cultures [multiple plant
249 species])
 - 250 ii. creating refuges areas for snails to move into in times of extreme
251 temperatures or droughts (e.g., ensuring an abundance and diversity
252 of logs throughout the habitat)
 - 253 iii. monitoring and evaluating habitat management activities and
254 adjusting actions as needed
- 255 6. Develop and implement site-specific management plans that identify and
256 mitigate threats to Shagreen, Toothed Globe and their habitats, or update
257 existing management plans where appropriate. Plans should also
258 consider impacts of ongoing management strategies for other species
259 (e.g., pesticide application, prescribed burns).

260 Focus Area:	Awareness and Outreach
261 Objective:	Increase the level of public awareness and engagement in 262 protecting and recovering the species.

263 Increasing public awareness of these species and encouraging participation in
264 stewardship and monitoring will contribute towards recovery efforts by determining
265 where Shagreen exists in the province, and if and where Toothed Globe exists,
266 including where these species may occur on private lands. Improved knowledge of the
267 species and their distribution is required to better manage threats and habitat. It is also
268 important to improve awareness of conservation partners who may be interested in
269 undertaking stewardship efforts or are involved in developing property management
270 plans.

271 **Actions:**

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- 272 7. Promote awareness of Shagreen and Toothed Globe among
273 environmental professionals, naturalists, landowners, land users and
274 land managers by sharing information regarding:
- 275 i. how to identify the species
276 ii. the species' distribution and habitat associations
277 iii. protection afforded to the species and their habitats under the ESA
278 iv. actions that can be taken to reduce threats to the species and their
279 habitats
- 280 8. Engage volunteers (e.g., naturalists, land managers, experts) to
281 participate in surveys and monitoring efforts for Shagreen and Toothed
282 Globe. Where appropriate, encourage the recording, sharing and transfer
283 of Indigenous Knowledge relating to these snails.

284 **Implementing Actions**

285 Financial support for the implementation of actions may be available through the
286 Species at Risk Stewardship Program. Conservation partners are encouraged to
287 discuss project proposals related to the actions in this response statement with Ministry
288 of the Environment, Conservation and Parks staff. The Ontario government can also
289 provide guidance about the requirements of the ESA, whether an authorization or
290 regulatory exemption may be required for the project and, if so, the authorization types
291 and/or conditional exemptions for which the activity may be eligible. Implementation of
292 the actions may be subject to changing priorities across the multitude of species at risk,
293 available resources and the capacity of partners to undertake recovery activities. Where
294 appropriate, the implementation of actions for multiple species will be co-ordinated
295 across government response statements.

296 **Performance Measures**

297 Progress towards achieving the government's goal for the recovery of Shagreen will be
298 measured against the following performance measures:

- 299 • The index of area of occupancy (a measure of distribution based on occupied
300 2x2 km grid cells) is maintained or increased from 32 km² by 2033.

301 Progress towards achieving the government's goal for the recovery of Toothed Globe
302 will be measured against the following performance measures:

303

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- 304 • By 2028, targeted surveys have been conducted in Ontario to determine
305 whether the species is present in the province.
- 306 • If one or more extant subpopulations are discovered, the distribution of Toothed
307 Globe (as measured against the index of area of occupancy as of 2028) is
308 maintained or increased by 2043.

309 **Reviewing Progress**

310 The ESA requires the Ontario government to conduct a review of progress towards
311 protecting and recovering a species no later than the time specified in the species'
312 government response statement, which has been identified as five years. The review
313 will help identify if adjustments are needed to achieve the protection and recovery of
314 Shagreen or Toothed Globe.

315 **Acknowledgement**

316 We would like to thank all those who participated in the development of the Recovery
317 Strategy and Government Response Statement for the Shagreen (*Inflectarius inflectus*)
318 and Toothed Globe (*Mesodon zaletus*) in Ontario for their dedication to protecting and
319 recovering species at risk.

320 **For Additional Information:**

321 Visit the species at risk website at ontario.ca/speciesatrisk
322 Contact the Ministry of the Environment, Conservation and Parks
323 1-800-565-4923
324 TTY 1-855-515-2759
325 www.ontario.ca/environment