

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

1 **Carolina Mantleslug**

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 Carolina Mantleslug (*Philomycus carolinianus*) in Ontario
24 was completed on July 12, 2023.

25 Carolina Mantleslug is a terrestrial slug with an adult size of 6 to 10 cm and an ash- 26 coloured mantle (the protective cover on the top of a slug) covering the entire body. It 27 has a fragmented range in southwestern Ontario.
--

28 **Protecting and Recovering Carolina Mantleslug**

29 Carolina Mantleslug is listed as a threatened species under the ESA, which protects
30 both the animal and its habitat. The ESA prohibits harm or harassment of the species

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

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

33 Carolina Mantleslug is native to eastern North America. Its east-west distribution ranges
34 from Maine to Minnesota in the north and Florida to Texas in the south. The species is
35 secure in most of its U.S. range, except Michigan, where it is a species of special
36 concern under state legislation. In Canada, the species has a highly fragmented
37 distribution and is found only in southwestern Ontario.

38 The Ontario distribution of Carolina Mantleslug includes seven known subpopulations
39 across Pelee Island (three subpopulations), Grape Fern Woods (in the County of
40 Lambton), Wheatley Provincial Park, Rondeau Provincial Park and Sinclair's Bush (in
41 the Municipality of Chatham-Kent). The species also historically occurred at a site near
42 Leamington (in the County of Essex), but its status has not been confirmed since 1994
43 due to lack of access. Current population trends or viability of the extant subpopulations
44 is unknown.

45 In Ontario, Carolina Mantleslug is mostly found in riparian areas or in low, wet, older-
46 growth forests with sandy or rocky soil and abundant well-decayed wood. Similar to
47 other slug species, Carolina Mantleslug likely requires specific moist microhabitat
48 conditions, such as those found beneath decaying logs or in leaf litter. A diverse
49 mushroom and lichen community is present at all known occupied sites and is believed
50 to be an important habitat requirement.

51 Carolina Mantleslug is an air-breathing, egg-laying terrestrial slug that can be difficult to
52 differentiate from related slugs without genetic analysis. The species is believed to
53 reach sexual maturity within one year, and each individual slug has both male and
54 female reproductive organs. Both members of a mating pair may exchange sperm and
55 produce eggs. The generation time is estimated to be two years, and the species'
56 maximum lifespan is believed to be three to four years based on other similarly sized
57 slugs. From laboratory studies, it is believed that Carolina Mantleslug hibernates in the
58 winter and mates in the spring, with eggs usually hatching in the summer (though eggs
59 laid in the fall may overwinter and hatch the following spring). The species generally
60 lays one to two clutches of 65 to 75 eggs, with hatching success ranging from 40 to 75
61 percent.

62 The species is mostly inactive and likely has very limited dispersal capability. In dry
63 summers it is only found in or under logs, but in moist conditions it can also be found in
64 leaf litter. Carolina Mantleslug is most active at dawn, dusk, or at night. Its diet is
65 uncertain, but it likely eats fungi and lichen. It may also feed on decaying wood or other

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

66 decaying plant material, and therefore serve a role in local nutrient cycling. Carolina
67 Mantleslug may be a host to a number of parasitic mites and nematodes, and may
68 serve as prey to a variety of taxa, including reptiles, amphibians, birds, insects and
69 small mammals.

70 Additional research is required to better understand the current threats to Carolina
71 Mantleslug. Habitat loss and fragmentation were historical threats that contributed to
72 population declines, but the ongoing impacts are likely negligible where Carolina
73 Mantleslug is known to occur in Ontario. Due to its low dispersal ability and dependence
74 on specific microhabitats, Carolina Mantleslug may be particularly vulnerable to climate
75 change and associated severe weather events such as droughts, floods and extreme
76 temperatures. Prescribed burns are an important habitat management tool for many
77 species and ecosystems, but fires can affect survival of ground-dwelling animals such
78 as slugs by altering or destroying microhabitat.

79 Carolina Mantleslug habitat may also be degraded by invasive species, such as various
80 types of non-native earthworms and plants (e.g. Garlic Mustard [*Alliaria petiolata*] and
81 European Common Reed, also known as invasive Phragmites [*Phragmites australis*
82 ssp. *australis*]). Several invasive snails and slugs (e.g. Draparnaud's Glass Snail
83 [*Oxychilus draparnaudi*] and Leopard Slug [*Limax maximus*]) may also threaten
84 Carolina Mantleslug through direct competition for food or shelter, but the interactions
85 between the species are poorly understood. Ring-necked Pheasant (*Phasianus*
86 *colchicus*) and Wild Turkey (*Meleagris gallopavo*) in Ontario may also impact Carolina
87 Mantleslug as both bird species are known to include gastropods (slugs and snails) in
88 their diet, but there is currently no evidence of these birds feeding on Carolina
89 Mantleslug.

90 Significant knowledge gaps remain about Carolina Mantleslug in Ontario, including its
91 distribution, status and viability of subpopulations, habitat requirements, ecological
92 interactions and threats. Current and historical occurrences of Carolina Mantleslug are
93 limited to small patches of highly fragmented habitat, and the species requires specific
94 microhabitat conditions while having limited dispersal ability. Recovery of Carolina
95 Mantleslug will require research to better understand threats to the species and
96 appropriate mitigative actions, monitoring to confirm where the species is present, and
97 protection and maintenance of existing habitat to ensure the persistence of existing
98 subpopulations.

99

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

100 **Government's Recovery Goal**

101 The government's goal for the recovery of Carolina Mantleslug is to maintain or restore
102 self-sustaining subpopulations, where feasible, where the species currently exists in
103 Ontario.

104 **Actions**

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

112 **Government-led Actions**

113 To help protect and recover Carolina Mantleslug, the government will directly undertake
114 the following actions:

- 115
- Continue to protect Carolina Mantleslug and its habitat through the ESA.
 - 116 • Undertake communications and outreach to increase public awareness of
117 species at risk in Ontario (e.g. through Ontario Parks Discovery Program, where
118 appropriate).
 - 119 • Continue to monitor populations and mitigate threats to the species and its
120 habitat in provincially protected areas, where feasible and appropriate.
 - 121 • Educate other agencies and authorities involved in planning and environmental
122 assessment processes on the protection requirements under the ESA.
 - 123 • Encourage the submission of Carolina Mantleslug data to Ontario's central
124 repository through the [NHIC \(Rare species of Ontario\) project in iNaturalist](#) or
125 directly through the [Natural Heritage Information Centre](#).
 - 126 • Continue to support conservation, agency, municipal and industry partners, and
127 Indigenous communities and organizations to undertake activities to protect and
128 recover Carolina Mantleslug. Support will be provided where appropriate through
129 funding, agreements, permits and/or advisory services.

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

- 130 • Work with all levels of government, communities and sectors to take action on
131 climate change, and to report on progress in reducing greenhouse gas
132 emissions.

- 133 • Continue to implement Ontario's Invasive Species Act, 2015 to prevent the
134 introduction and spread of invasive species (e.g. invasive Phragmites) that
135 threaten Carolina Mantleslug and its habitat by applying the prohibitions set out in
136 the Act and as prescribed through the associated Regulations.

- 137 • Continue to implement the Ontario Invasive Species Strategic Plan (2012) to
138 address the invasive species (e.g. Garlic Mustard [*Alliaria petiolata*], invasive
139 Phragmites) that threaten Carolina Mantleslug and its habitat.

- 140 • Conduct a review of progress toward the protection and recovery of Carolina
141 Mantleslug within five years of the publication of this document.

142 **Government-supported Actions**

143 The government endorses the following actions as being necessary for the protection
144 and recovery of Carolina Mantleslug. Actions identified as “high” may be given priority
145 consideration for funding under the Species at Risk Stewardship Program. Where
146 reasonable, the government will also consider the priority assigned to these actions
147 when reviewing and issuing authorizations under the ESA. Other organizations are
148 encouraged to consider these priorities when developing projects or mitigation plans
149 related to species at risk.

150 Focus Area:	Research
151 Objective:	Fill knowledge gaps related to Carolina Mantleslug biology, threats 152 and management techniques.

153 To support effective protection and recovery efforts of Carolina Mantleslug, further
154 information is needed regarding the causes of the species' decline. Investigating the
155 species' response to various known and potential threats will help focus recovery efforts
156 on actions that will have the most benefit for the species. Further understanding of
157 Carolina Mantleslug's biology, such as life history, food requirements and dispersal
158 ability, is required to support management of the species and its habitat. Development
159 of genetic tools to confidently identify the species will be important to facilitate
160 monitoring efforts. Given the rarity of Carolina Mantleslug and its limited distribution,
161 work is also required to determine whether active population management may be
162 necessary, and, if so, the feasibility of implementing such measures. Any research

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

163 activities undertaken should consider potential impacts on the Ontario population if they
164 may impact wild individuals.

165 **Actions:**

- 166 1. **(High)** Investigate the effects and severity of known and potential threats
167 to Carolina Mantleslug and its habitat, and identify potential mitigation
168 measures as appropriate. Targeted areas of research may include:
- 169 i. impacts of invasive, native and introduced species, such as exotic
170 slugs, non-native earthworms, invasive plants, Wild Turkey and Ring-
171 necked Pheasant
 - 172 ii. feasibility of reducing or controlling invasive and problematic native
173 species
 - 174 iii. effects of climate change and severe weather on the species and its
175 habitat, and the extent of the species' ability to adapt to climate
176 variation
- 177 2. **(High)** Research and develop genetic analysis tools, such as barcoding
178 and environmental DNA assessment methods, to reliably distinguish
179 presence of Carolina Mantleslug from similar looking slugs (e.g.
180 *Philomycus*, *Pallifera* and *Megapallifera* species).
- 181 3. Conduct research to improve knowledge on Carolina Mantleslug biology
182 and ecology, such as life history traits, population size fluctuations,
183 minimum viable population size, genetic diversity, diet, dispersal ability
184 and home range territory size.
- 185 4. Investigate the necessity, feasibility and outcomes of population
186 augmentation measures (e.g. captive breeding, assisted reproduction,
187 head-starting).

188 Focus Area:	Monitoring
189 Objective:	Investigate Carolina Mantleslug distribution in Ontario, and monitor 190 existing subpopulations, their habitat and site-specific threats.

191 In order to better focus actions to support protection and recovery of Carolina
192 Mantleslug, it is important to understand where this species is present in the province.
193 The use of standard survey methods and undertaking surveys in areas where the
194 species has previously been found or where suitable habitat exists will help address
195 knowledge gaps about the species' distribution and status of subpopulations. Continued
196 monitoring of extant sites, habitat conditions and site-specific threats will aid in
197 understanding appropriate management actions required for each site. It will also be

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

198 important to monitor effectiveness of management activities and adjust recovery
199 approaches as appropriate.

200 **Actions:**

201 5. **(High)** Develop and implement a standardized survey and monitoring
202 protocol for Carolina Mantleslug in Ontario. The survey and monitoring
203 protocol should document and monitor:

204 i. presence or absence at a site, including sites that are currently
205 considered occupied, sites that were historically occupied but still
206 have suitable habitat, and potential new sites within the species'
207 historical range that have not yet been surveyed but may be
208 occupied based on the presence of suitable habitat

209 ii. subpopulation characteristics (e.g. abundance, demographics,
210 viability)

211 iii. site-specific threats

212 iv. effectiveness of management activities at occupied sites

213 v. genetic verification of species presence at new sites

214 Focus Area:	Management
215 Objective:	Maintain or improve Carolina Mantleslug habitat and mitigate
216	threats to extant subpopulations in Ontario.

217 Carolina Mantleslug may be impacted by several threats, including climate change and
218 severe weather, pollutants, and invasive and problematic native species. Management
219 efforts should be focused on maintaining or enhancing habitat and minimizing threats to
220 support the protection and recovery of the species where it is known to exist. Where
221 appropriate to support natural dispersal, efforts should also be taken to improve
222 connectivity and enhance suitable habitat immediately surrounding existing
223 occurrences. If research determines that population augmentation is necessary to
224 achieve the recovery goal, and feasible methods are available that are likely to result in
225 self-sustaining subpopulations, augmentation measures should be considered.

226 Successful recovery depends on continued collaboration across multiple levels of
227 government, landowners and other stakeholders. Much of Carolina Mantleslug's known
228 distribution is on land publicly or privately managed for conservation. Conservation
229 organizations and local partners have been actively involved in the ongoing
230 maintenance and restoration of these areas (e.g. prescribed burns) to support the
231 protection and recovery of multiple species at risk. As certain management activities

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

232 may impact Carolina Mantleslug, working collaboratively on these efforts will enhance
233 the protection and recovery of all species at risk present.

234 **Actions:**

- 235 6. **(High)** Work collaboratively with municipalities, conservation partners,
236 landowners and land managers to undertake habitat restoration and/or
237 enhancement to mitigate threats and improve habitat quality and
238 availability for Carolina Mantleslug, including:
- 239 i. identifying, protecting, and/or creating suitable microhabitat (e.g.
240 increasing the abundance and diversity of native advanced stage
241 decaying logs, leaf litter and fungi)
 - 242 ii. improving connectivity between occupied habitats (e.g. planting
243 hedgerows, wild grass strips and poly-cultures [multiple plant
244 species])
 - 245 iii. mitigating effects of invasive species and problematic native
246 species using evidence-based approaches (e.g. Best Management
247 Practices that minimize risks to species at risk) whenever possible
 - 248 iv. limiting chemical inputs (e.g. pesticides, heavy metals) into
249 occupied and connecting habitat
- 250 7. Develop and implement site-specific management plans that identify and
251 mitigate threats to Carolina Mantleslug and its habitat, or update existing
252 management plans where appropriate. Plans should consider impacts of
253 ongoing management strategies for other species (e.g. pesticide
254 application, prescribed burns).
- 255 8. If determined necessary and feasible, implement, monitor and adapt
256 augmentation actions for local subpopulations, with a focus on those at
257 high risk of extirpation and high likelihood of becoming self-sustaining.

258 Focus Area:	Awareness and Outreach
259 Objective:	Increase the level of public awareness and engagement in 260 protecting and recovering Carolina Mantleslug.

261 Increasing public awareness of this species and encouraging participation in monitoring
262 will contribute towards recovery efforts by determining where Carolina Mantleslug exists
263 in the province, including where the species may occur on private lands. It is also
264 important to improve awareness of the species and its threats among conservation
265 partners who may be interested in undertaking stewardship efforts or are involved in
266 developing property management plans.

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

- 267 **Actions:**
268 9. Develop an identification tool to illustrate differences between Carolina
269 Mantleslug and similar looking species, and distribute the tool to land
270 managers, naturalist groups and citizen scientists.
- 271 10. Engage volunteers (e.g. naturalists, land managers, experts) to
272 participate in surveys, monitoring and stewardship efforts for Carolina
273 Mantleslug.

274 **Implementing Actions**

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

286 **Performance Measures**

287 Progress towards achieving the government's goal for the recovery of Carolina
288 Mantleslug will be measured against the following performance measure:

- 289
- 290 • By 2034, the total number of subpopulations in Ontario is equal to or greater
291 than seven.

292 **Reviewing Progress**

293 The ESA requires the Ontario government to conduct a review of progress towards
294 protecting and recovering a species no later than the time specified in the species'
295 government response statement, which has been identified as five years. The review
296 will help identify if adjustments are needed to achieve the protection and recovery of
297 Carolina Mantleslug.
298

DRAFT Government Response Statement
to
Recovery Strategy for the Carolina Mantleslug in Ontario

299 **Acknowledgement**

300 We would like to thank all those who participated in the development of the Recovery
301 Strategy and Government Response Statement for the Carolina Mantleslug
302 (*Philomycus carolinianus*) in Ontario for their dedication to protecting and recovering
303 species at risk.

304 **For Additional Information:**

305 Visit the species at risk website at ontario.ca/speciesatrisk
306 Contact the Ministry of the Environment, Conservation and Parks
307 1-800-565-4923
308 TTY 1-855-515-2759
309 www.ontario.ca/environment