



To: Mayor Evans and Members of Council

From: Tim Leitch, Director of Public Works
Public Works Department

Prepared By: Tim Leitch, Director of Public Works
Public Works Department

Report Number: PWR-017-26

Meeting Date: 22 Apr 2026

Subject: **Environment and Climate Change of Canada (ECCC) Species at Risk Act (SARA) - Lake Huron Grasshopper**
Our File No:

Recommendation

THAT Public Works Report PWR-017-26 regarding Environment and Climate Change of Canada (ECCC) Species at Risk Act (SARA) - Lake Huron Grasshopper be received;

AND THAT Council directs staff to reply to ECCC by May 4th, 2026 - Option 1.

Background/Analysis

Public Works received a letter from Environment and Climate Change of Canada (ECCC) (Appendix 1) referencing the Species at Risk Act (SARA) for the Recovery Strategy for the Lake Huron Grasshopper.

The purpose of this letter was to inform the Township of Tiny that the Lake Huron Grasshopper has been located and noted within areas of the Township. Specifically, as shown in detail in Appendix 2 is on Giants Tomb (Location B-8) and sections of Tiny Beaches between Concession 11 West and Concession 14 West (Location B-9).

The PW Director met with staff at Awenda Provincial Park for advise and suggestions on how we respond and ensure we support this objective of supporting the Recovery Strategy. During the meeting many items we documented about the history of the discovery and also what Tiny's role can be.

Some high level points include:

- This endemic species is found in very limited places which include Lake Huron and Georgian Bay.
- They are predominantly located along the fore dunes and back dunes of the dynamic beaches.
- They were initially discovered in 1908 and then found in the 2 locations noted in Tiny in 2017.
- They like open barren dunes with typical beach grasses and dynamic beaches due to the sparseness and absence of competition.
- This is a Schedule 1 Species, and the Federal Government needs to create a Recovery Strategy.

- Mating season is typically late August/September.
- In Appendix 1 provides a description of the grasshopper.
- Staff to inform the SSEA at this time.

In the meeting we discussed what role can Tiny play in the Recovery Strategy. Here are some high-level items that we can assist and work in partnership with Awenda Provincial Park:

- Make the public aware of this species, Recovery Objectives, contacts.
- Provide pictures (Appendix 3).
- Identify the locations and habitat (Appendix 2).
- Provide the public with contact information.
- Post information on our website.
- Post information for further public education and awareness.
- Continue to work with Awenda Provincial Park
- Advise when additional areas are noted.
- Look for further direction from the ECCC.
- Loop in the SSEA.

Appendix 4 provides further indepth details as it relates to the Lake Huron Grasshopper.

Reviewed By Other Departments

Not applicable.

Options/Alternatives

Option #1:

Staff to provide feedback to ECCC feedback by May 4. Included will be the items noted above for roles Tiny will play and manage. This will also include any relevant resident feedback received prior to May 4.

Option #2:

Council provide further direction.

Financial Implications

Option #1:

There are no financial implications associated with this item at this time.

Option #2:

There are no financial implications associated with this item at this time.

Relationship to Strategic Plan

- Environment and Public Land Management

Conclusion

Public Works Report PWR-017-26 regarding Environment and Climate Change of Canada (ECCC) Species at Risk Act (SARA) - Lake Huron Grasshopper be received and that Council directs staff to reply to ECCC by May 4th, 2026 Option 1.

Appendices

[PWR-017-26 - Appendix 1 - Canada Natural Heritage Statement - SARA - Lake Huron Grasshopper](#)

[PWR-017-26 - Appendix 2 - Giants Tomb-Tiny Beaches Locations](#)

[PWR-017-26 - Appendix 3 - Lake Huron Grasshopper Picture](#)

[PWR-017-26 - Appendix 4 - Lake Huron Grasshopper Detail](#)

Haley Leblond, Director of Corporate Services/Deputy CAO Approved - 14 Apr 2026

Robert Lamb, Chief Administrative Officer Approved - 14 Apr 2026



Environment and Climate Change Canada
Canadian Wildlife Service
4905 Dufferin Street
Toronto ON, M3H 5T4

March 09, 2026

Re: Seeking your input and involvement on the proposed Recovery Strategy for the Lake Huron Grasshopper (*Trimerotropis huroniana*) in Canada.

Dear Landowner or Land Manager,

Wildlife species and ecosystems are part of Canada's natural heritage and are an integral part of its identity and history. Environment and Climate Change Canada (ECCC) is mandated, among other things, to preserve and enhance the quality of the natural environment, including flora and fauna. The primary federal legislative mechanism for delivering on this responsibility is the federal *Species at Risk Act* (SARA). The purpose of SARA is to prevent wildlife species from becoming extirpated (lost from the wild in Canada); help in the recovery of extirpated, endangered or threatened species; and to ensure that species of special concern do not become endangered or threatened.

ECCC's Canadian Wildlife Service has proposed a national Recovery Strategy for the Lake Huron Grasshopper (*Trimerotropis huroniana*) in Canada, as per requirements under the federal SARA. We are writing to you today to invite your input on the proposed federal addition (Part 1) of the document. You are receiving this invitation because part of the proposed critical habitat for the species is located on or near your land.

The Lake Huron Grasshopper (*Trimerotropis huroniana*), is listed as Threatened under the federal SARA. Under SARA, the federal government is required to develop a Recovery Strategy for endangered and threatened species to help guide the actions needed to stop or reverse their decline. ECCC's Canadian Wildlife Service is proposing to adopt the Government of Ontario's *Recovery Strategy for the Lake Huron Grasshopper in Ontario* (Part 2) and the corresponding *Ontario Government Response Statement* (Part 3), with a federal addition to meet the requirements of SARA (Part 1). The proposed Recovery Strategy provides information about the species, identifies major threats to the species and their habitat, and recommends strategies to conserve and recover the species. The proposed federal addition (Part 1), also identifies critical habitat for the species, which is the habitat that is necessary for the species' survival or recovery. For more information on the protection of critical habitat under SARA, please visit: <https://www.canada.ca/en/environment-climate-change/services/species-risk-education-centre/your-responsibility/your-responsibility-guide.html>.

We want to hear from you!

Landowners who have species at risk on or near their land have an important stewardship role to play with respect to these species. Having habitat for this species on your land suggests that you are currently managing it in a way that is helpful to this species. We encourage you to review and provide input on the proposed federal addition (Part 1) to the Recovery Strategy to ensure your land continues to support this species.

Enclosed, you will find a summary of the proposed Recovery Strategy to help guide your review. You can find the full proposed Recovery Strategy and provide your comments by visiting the Species at Risk (SAR) public registry at <https://species-registry.canada.ca/index-en.html#/species/1297-947>.

The public comment period is open until **May 04, 2026**. Your comments are very important to us. All comments received will be considered in drafting the final version of the Recovery Strategy, which will be made available at the link above. If you would like to learn more about species at risk in Canada and what you can do to help them, please visit the SAR public registry's Education Centre (<https://www.canada.ca/en/environment-climate-change/services/species-risk-education-centre.html>).

You can also provide feedback on the proposed federal addition (Part 1) and request a hard copy of the full proposed Recovery Strategy by contacting ECCC via e-mail: SpeciesAtRisk.Ontario@ec.gc.ca; or by mail: Environment and Climate Change Canada, Canadian Wildlife Service, 4905 Dufferin Street, Toronto, ON, M3H 5T4.

We appreciate your participation in this process.

Sincerely,



Lesley Dunn
Regional Director
Canadian Wildlife Service – Ontario

Enclosed:

- Summary of the proposed Recovery Strategy for Lake Huron Grasshopper (*Trimerotropis huroniana*) in Canada.

Summary of the proposed Recovery Strategy for the Lake Huron Grasshopper

Under the federal *Species at Risk Act* (SARA), a recovery strategy must be developed for species listed as Extirpated, Endangered, or Threatened to help guide the actions needed to stop or reverse their decline.

The Government of Canada is proposing to adopt the Government of Ontario's *Recovery Strategy for the Lake Huron Grasshopper in Ontario* and the corresponding *Ontario Government Response Statement*, with a federal addition to meet the requirements of SARA. This document highlights the key sections of the Recovery Strategy for the Lake Huron Grasshopper in Canada.

Species Conservation Status

The Lake Huron Grasshopper (*Trimerotropis huroniana*) is listed as Threatened under SARA.

Description and Distribution

The Lake Huron Grasshopper has large back legs, a flat sided head with large eyes, and forewings that close over the hind wings and body. It is mottled silver-grey to brownish in color, and about 24 to 40mm in size. It has clear forewings with randomized speckles and bands, and clear or yellowish hindwings that have a dark band through the middle.

The Lake Huron Grasshopper lives in coastal freshwater dune habitat on Lake Huron, Lake Superior, and Georgian Bay. The species has 14 extant subpopulations within Ontario, more specifically on Manitoulin Island, in southern Georgian Bay, and Northern Lake Huron.

Habitat Needs

Suitable habitat for the Lake Huron Grasshopper consists of bare sand and sparsely vegetated dunes.



Lake Huron Grasshopper (*Trimerotropis huroniana*)
© Allan Harris

Native dune plants act as food sources for the Lake Huron Grasshopper, especially Field Wormwood (*Artemisia campestris*), Marram Grass (*Ammophila breviligulata*), Long-leaved Reed Grass (*Calamovilfa longifolia*), and other dune grasses. Based on the use of sand and beach habitat, it is presumed that female Lake Huron Grasshoppers lay several egg clusters, which overwinter in the sand. Dune habitats are dynamic and subject to sand movement from wind, wave, ice, and lake level action which perpetuates sparse, open vegetation conditions needed for Lake Huron Grasshopper.

Threats to the Species' Survival

Threats to the Lake Huron Grasshopper include, but are not limited to:

- Human intrusions and disturbance such as recreational activities (e.g., ATV use in dune habitat);
- Invasive species and other problematic species and genes (e.g., invasive plant and competition with other native grasshopper species);
- Residential and commercial development (e.g. construction for residential, commercial or tourism and recreation areas within suitable habitat);



- Climate change and severe weather (e.g. temperature extremes, storms, and flooding) which may reduce available suitable habitat.

Population & Distribution Objective

The population and distribution objective for Lake Huron Grasshopper in Canada is to recover the species by:

- Maintaining or increasing the current distribution in Canada by improving habitat quality and addressing threats at extant subpopulations.

Strategies to Help Meet Objective

These strategies include:

- Increase knowledge of Lake Huron Grasshopper distribution, abundance, habitat, and threats in Ontario;
- Maintain or improve habitat and reduce threats to Lake Huron Grasshopper and its dune habitat in Ontario;
- Increase public awareness of the species, its habitat requirements and ways to minimize threats.

Critical Habitat

Critical habitat is the habitat identified in a recovery strategy or action plan that is necessary for the survival or recovery of a listed wildlife species. For a full description of critical habitat, please refer to the recovery strategy.

Critical habitat for the Lake Huron Grasshopper has been identified in this recovery strategy (see map on the next page) as the extent of suitable habitat where Lake Huron Grasshoppers are found at extant subpopulations. Critical habitat includes the presence of the following biophysical attributes:

- Patchy to continuous meadow vegetation cover with tree or shrub cover $\leq 25\%$, with scattered grasses, sedges, and rushes, which supports visibility for courtship behaviours and provides shelter;
- Uncompacted soil with little to no accumulation of organic materials, so that it can be influenced by the dynamic forces that move sand (e.g., wind, wave-wash, ice movement and changes to lake levels) and not become colonized by non-native vegetation or trees. This maintains availability of preferred food plants (e.g. American Beachgrass, Great Lakes Sandreed, and Field Wormwood) and other native dune grasses and exposed sand to support egg-laying.

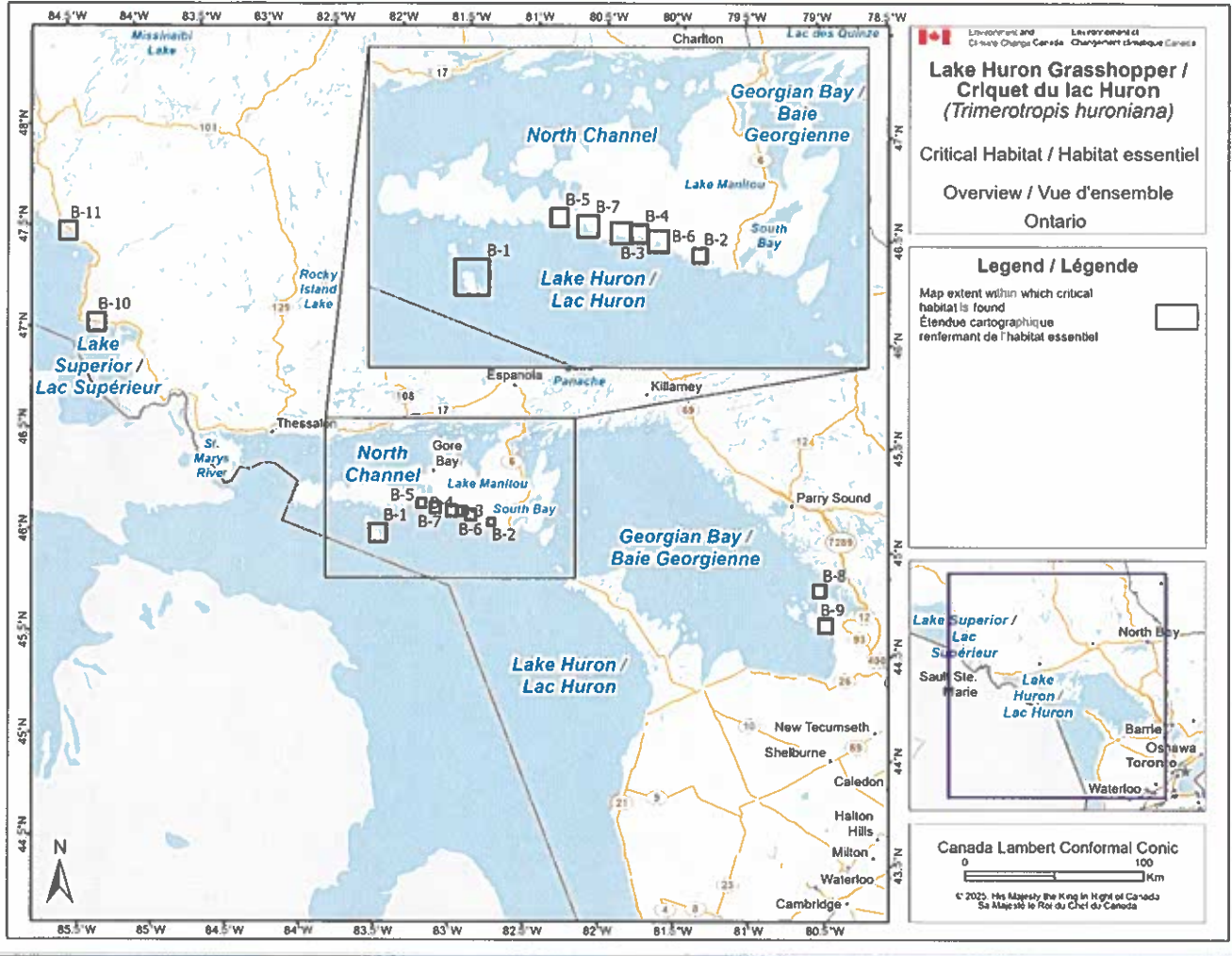
Activities likely to result in the destruction of critical habitat

These activities include, but are not limited to:

- Shoreline development such as construction of residential and commercial buildings, parking lots, breakwater structures and marinas;
- Activities that result in vegetation trampling, soil compaction or other vegetation damage such as ATV use and trucks;
- Activities that result in the removal of native vegetation or long-term destruction of dune habitat such as raking, grooming or bulldozing of dunes;
- Activities that facilitate the introduction of new invasive species or range expansion of already established invasive species (e.g., contaminated equipment, dune disturbance, shoreline development of infrastructure modification).

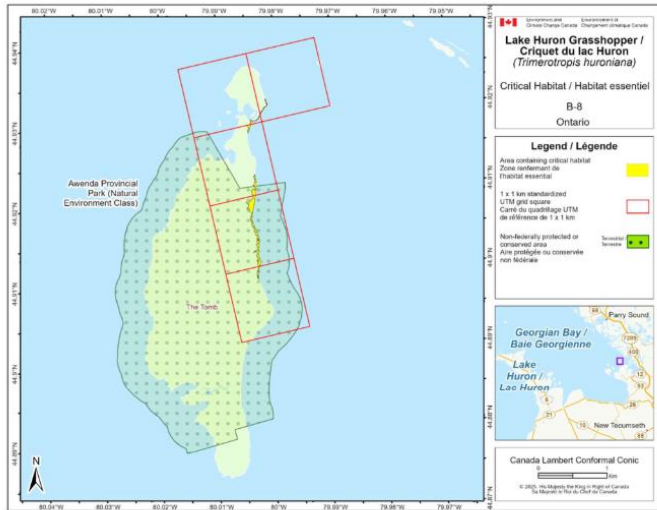
How You Can Help

- Learn more about these species, the threats to their survival and their habitat needs at www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html;
- Practice voluntary stewardship activities and best management practices;
 - Work in cooperation with Environment and Climate Change Canada, local conservation groups and authorities to conserve habitat;
 - Avoid activities that can harm the species or its habitat.
- Report sightings to conservation data centres, including:
 - The Ontario Natural Heritage Information Centre: <https://www.ontario.ca/page/natural-heritage-information-centre>;
 - iNaturalist: <https://www.inaturalist.org>.

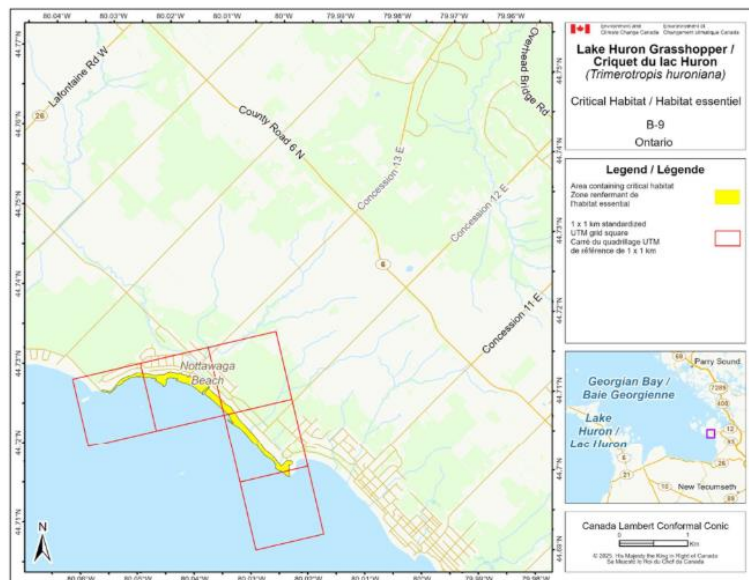


Overview of the map extents within which Critical Habitat of the Lake Huron Grasshopper is found in Ontario. The area within which draft critical habitat is found is represented by the boxes. Within this area, critical habitat only occurs where the biophysical attributes are found. For more information, and to view each map extent at a finer scale, please refer to Appendix B (Figures B-1 to B-10) of the full draft Recovery Strategy.

or more information, please contact us directly at
 Environment and Climate Change Canada (ECCC) – Canadian Wildlife Service, Ontario Region
 905 Dufferin Street, Toronto ON, M3H 5T4
 mail: SpeciesAtRisk.Ontario@ec.gc.ca
 or can also visit the following website for more information.
 Species at Risk Public Registry (<https://www.canada.ca/en/environment-climate-change/services/species-at-risk-public-registry.html>)



993 **Figure B-8.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
994 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
995 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
996 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
997 this figure is a standardized national grid system used to indicate the general geographic area
998 within which critical habitat is found. Any additional boundaries are included for landmarking
999 purposes only.
1000
1001



1002 **Figure B-9.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
1003 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
1004 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
1005 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
1006 this figure is a standardized national grid system used to indicate the general geographic area
1007 within which critical habitat is found. Any additional boundaries are included for landmarking
1008 purposes only.
1009
1010

Recovery Strategy for the
Lake Huron Grasshopper
(Trimerotropis huroniana)
in Canada



2026 (PROPOSED)

Species at Risk Act
Recovery Strategy Series
Adopted under Section 44 of SARA

Canada

Recovery Strategy for the

Lake Huron Grasshopper (*Trimerotropis huroniana*) in Canada



2026 (PROPOSED)

Species at Risk Act

Recovery Strategy Series

Adopted under Section 44 of SARA

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Canada

1 **Recommended citation:**
2

3 Environment and Climate Change Canada. 2026. Recovery Strategy for the Lake Huron
4 Grasshopper (*Trimerotropis huroniana*) in Canada [Proposed]. *Species at Risk Act*
5 Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. 3 parts,
6 34 pp. + iv + 27 pp. + 9 pp.

7
8
9 **Official version**

10 The official version of the recovery documents is the one published in PDF. All
11 hyperlinks were valid as of date of publication.

12 **Non-official version**

13 The non-official version of the recovery documents is published in HTML format and all
14 hyperlinks were valid as of date of publication.

15
16 For copies of the recovery strategy, or for additional information on species at risk,
17 including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
18 Status Reports, residence descriptions, action plans, and other related recovery
19 documents, please visit the [Species at Risk \(SAR\) Public Registry](#)¹.

20
21 Cat. No.:

22 ISBN:

23 EC

24
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26 *non-commercial purposes, with appropriate credit to the source.*

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38 351 St-Joseph boulevard

39 Gatineau Quebec K1A 0H3

40 Toll free: 1-800-668-6767

41 Email: enviroinfo@ec.gc.ca

42

¹ www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

43 **Cover illustration:** Female Lake Huron Grasshopper at Carter Bay, Central Manitoulin,
44 Ontario. Photo by Allan Harris.

45

46

47 © His Majesty the King in Right of Canada, represented by the Minister of the
48 Environment, Climate Change and Nature, 2026. All rights reserved.

49

50

51 Également disponible en français sous le titre
52 « Programme de rétablissement de la limace à manteau de la Caroline
53 (*Philomycus carolinianus*) au Canada [Proposition] »

54

55 RECOVERY STRATEGY FOR THE LAKE HURON
56 GRASSHOPPER (*Trimerotropis huroniana*) IN CANADA
57

58 2026
59

60 Under the Accord for the Protection of Species at Risk (1996), the federal, provincial,
61 and territorial governments agreed to work together on legislation, programs, and
62 policies to protect wildlife species at risk throughout Canada.
63

64 In the spirit of cooperation of the Accord, the Government of Canada adopts the
65 *Recovery Strategy for the Lake Huron Grasshopper (Trimerotropis huroniana) in*
66 *Ontario* (Part 2) and the *Lake Huron Grasshopper – Ontario Government Response*
67 *Statement*² (Part 3) under Section 44 of the *Species at Risk Act* (SARA). Environment
68 and Climate Change Canada has included a federal addition (Part 1) which completes
69 the SARA requirements for this recovery strategy.

70
71 The federal recovery strategy for the Lake Huron Grasshopper in Canada consists
72 of three parts:
73

74 Part 1 – Federal Addition to the *Recovery Strategy for Lake Huron Grasshopper*
75 (*Trimerotropis huroniana*) *in Ontario*, prepared by Environment and Climate
76 Change Canada (2025).

77 Part 2 – *Recovery Strategy for the Lake Huron Grasshopper (Trimerotropis*
78 *huroniana) in Ontario*, prepared by J. Jones for the Ontario Ministry of the
79 Environment, Conservation and Parks (2018).

80 Part 3 – *Lake Huron Grasshopper – Ontario Government Response Statement*,
81 prepared by the Ontario Ministry of the Environment, Conservation and Parks (2019).

² The Government Response Statement is the Ontario Government's policy response to the recovery strategy and summarizes the prioritized actions that the Ontario Government intends to take and support to achieve Ontario's recovery goal.

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113	and Parks (2018).	
114		
115	Part 3 – <i>Lake Huron Grasshopper – Ontario Government Response Statement</i> ,	
116	prepared by the Ontario Ministry of the Environment, Conservation and Parks (2019).	
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Part 1 – Federal Addition to the *Recovery Strategy for Lake Huron Grasshopper (Trimerotropis huroniana) in Ontario*, prepared by Environment and Climate Change Canada

138 **Preface**

139
140 The federal, provincial, and territorial government signatories under the [Accord for the](#)
141 [Protection of Species at Risk \(1996\)](#)³ agreed to establish complementary legislation and
142 programs that provide for effective protection of species at risk throughout Canada⁴.
143 Under the [Species at Risk Act \(S.C. 2002, c.29\)](#)⁵ (SARA), the federal competent
144 ministers are responsible for the preparation of recovery strategies for listed Extirpated,
145 Endangered, and Threatened species and are required to report on progress within
146 five years after the publication of the final document on the Species at Risk Public
147 Registry.

148
149 The Minister of the Environment, Climate Change and Nature is the competent minister
150 under SARA for the Lake Huron Grasshopper and has prepared the federal component
151 of this recovery strategy (Part 1), as per section 37 of SARA. To the extent possible, it
152 has been prepared in cooperation with all relevant jurisdictions, wildlife management
153 boards, Indigenous organizations and any others as per section 39(1) of SARA. SARA
154 section 44 allows the competent minister to adopt all or part of an existing plan for the
155 species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)).
156 The Ontario Ministry of the Environment, Conservation and Parks led the development
157 of the attached recovery strategy for the Lake Huron Grasshopper (Part 2) in
158 cooperation with Environment and Climate Change Canada. The Province of Ontario
159 also led the development of the attached Government Response Statement (Part 3),
160 which is the Ontario Government's policy response to its provincial recovery strategy
161 under the *Endangered Species Act, 2007* prior to its amendment on June 5, 2025, and
162 summarizes the prioritized actions that the Ontario government intends to take and
163 support. Given that this Government Response Statement was developed prior to the
164 June 5, 2025 legislative amendments, it may contain outdated references to concepts
165 from the previous legislation, such that some aspects are no longer relevant under the
166 amended *Endangered Species Act*.

167
168 Success in the recovery of this species depends on the commitment and cooperation of
169 many different constituencies that will be involved in implementing the directions set out
170 in this strategy and will not be achieved by Environment and Climate Change Canada,
171 or any other jurisdiction alone. All members of the public are invited to join in supporting
172 and implementing this strategy for the benefit of the species and society as a whole.

173
174 This recovery strategy will be followed by one or more action plans that will provide
175 information on recovery measures to be taken by Environment and Climate Change
176 Canada and other jurisdictions and/or organizations involved in the conservation of the

³ www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding.html#2

⁴ The Government of Quebec is not signatory to the Accord for the Protection of the Species at Risk (1996). However, the Government of Quebec does cooperate with the federal government in the conservation of species at risk of common interest.

⁵ <https://laws.justice.gc.ca/eng/acts/S-15.3/index.html>

177 species. Implementation of this strategy is subject to appropriations, priorities, and
178 budgetary constraints of the participating jurisdictions and organizations.

179
180 The recovery strategy sets the strategic direction to support the recovery and/or survival
181 of the species. It provides all persons in Canada with information to help take action on
182 species conservation, including identification of critical habitat to the extent possible.
183 Where available, critical habitat spatial data is found in the [Critical Habitat for Species at
184 Risk National Dataset](#)⁶.

185
186 When critical habitat is identified, either in a recovery strategy or an action plan, SARA
187 provides a legal framework that enables the protection of that critical habitat.

188
189 In the case of critical habitat identified for terrestrial species including migratory birds
190 SARA requires that critical habitat identified in a federal protected area, referred to in
191 SARA ss. 58(2), be described in the *Canada Gazette* within 90 days after the recovery
192 strategy or action plan that identified the critical habitat is included in the Public
193 Registry. The prohibition against destruction of critical habitat under subsection (ss.)
194 58(1) will apply 90 days after the description of that critical habitat is published in the
195 *Canada Gazette*.

196
197 For critical habitat located on federal lands that are not a federal protected area, as in
198 SARA ss. 58(2), the competent minister must make an order applying the ss. 58(1)
199 prohibition against destruction of critical habitat if it is not already legally protected by a
200 provision in or measure under SARA or any other Act of Parliament. If the competent
201 minister does not make the order, a statement must be included on the Species at Risk
202 Public Registry setting out how the critical habitat, or portions of it are legally protected
203 on those federal lands.

204
205 For any other part or portion of critical habitat located on non-federal, if the Minister
206 forms the opinion that any portion of critical habitat is not protected by provisions in or
207 measures under SARA or other Acts of Parliament, or the laws of the province or
208 territory, SARA requires that the Minister recommend that the Governor in Council make
209 an order to apply the ss. 61(1) prohibition against destruction of critical habitat. The
210 discretion to protect critical habitat on non-federal lands that is not otherwise protected
211 rests with the Governor in Council.

⁶ <https://open.canada.ca/data/en/dataset/47caa405-be2b-4e9e-8f53-c478ade2ca74>

212 **Acknowledgements**

213
214 This federal addition to the Ontario Recovery Strategy was written by Elisabeth Shapiro
215 and Shady Abbas, with input from Karolyne Pickett, Marie-Claude Archambault and
216 Krista Holmes (Environment and Climate Change Canada [ECCC], Canadian Wildlife
217 Service [CWS] - Ontario Region). This recovery strategy benefited from input, review,
218 and suggestions from the following individuals and organizations: Lucia Abellan and
219 Megan Harrison (ECCC, CWS - National Capital region), the Ontario Ministry of
220 Environment, Conservation and Parks and the Ontario Ministry of Natural Resources.

221
222 Acknowledgement and thanks is given to all other parties that provided advice and input
223 used to help inform the development of this recovery strategy, including various
224 Indigenous organizations and individuals, citizens, and stakeholders who provided
225 input.

226 **Additions and Modifications to the Adopted Document**

227
228 The following sections have been included to address specific requirements of the
229 federal *Species at Risk Act* (SARA) that are not addressed in the *Recovery Strategy for*
230 *the Lake Huron Grasshopper (Trimerotropis huroniana) in Ontario* (Part 2 of this
231 document, referred to henceforth as “the provincial recovery strategy”) and/or to provide
232 updated or additional information.

233
234 Environment and Climate Change Canada (ECCC) is adopting the provincial recovery
235 strategy (Part 2) with the exception of section 2.0 Recovery. In place of section 2.0,
236 ECCC has established a population and distribution objective and performance
237 indicators and is adopting the Province of Ontario’s government-led and
238 government-supported actions of the *Lake Huron Grasshopper Ontario Government*
239 *Response Statement* (Part 3) as the broad strategies and general approaches to meet
240 the population and distribution objectives.

241
242 On June 5, 2025, the Province of Ontario passed Bill 5: *Protecting Ontario by*
243 *Unleashing our Economy Act, 2025* which included amendments to the *Endangered*
244 *Species Act, 2007* (ESA) that are now in force. Given that the provincial Recovery
245 Strategy and Government Response Statement were developed prior to the June 5,
246 2025 legislative amendments, they may contain outdated references to concepts from
247 the previous legislation, such that some aspects are no longer relevant under the
248 amended ESA. Species at risk and their habitat in Ontario continue to be protected
249 under the amended ESA.

250
251 Under SARA, there are specific requirements and processes set out regarding the
252 protection of critical habitat. Therefore, statements in the provincial recovery strategy
253 referring to protection of the species’ habitat may not directly correspond to federal
254 requirements. Recovery measures dealing with the protection of habitat are adopted;
255 however, whether these measures will result in protection of critical habitat under SARA
256 will be assessed following publication of the final federal recovery strategy.

257 Recovery Feasibility Summary

258
259 Based on the following criteria⁷ that Environment and Climate Change Canada (ECCC)
260 uses to establish recovery feasibility, as described in the [Species at Risk Act Policies –](#)
261 [Policy on Recovery and Survival](#)⁸, recovery of the Lake Huron Grasshopper has been
262 deemed technically and biologically feasible.

263
264
265 **1. Survival characteristics:** Can survival characteristics⁹ be addressed to the extent
266 that the species' risk of extinction or extirpation as a result of human activity is
267 reduced?

268
269 **Yes.** In order to reduce the risk of the species' extirpation in Canada, the survival
270 characteristic redundancy¹⁰ needs to be addressed. Redundancy of the Canadian
271 population of the Lake Huron Grasshopper is compromised because of its small range
272 and the limited size of the area within which it occurs (i.e., measured by the Extent of
273 Occurrence¹¹ (EOO) and Index of Area of Occupancy¹² (IAO), respectively), the small
274 number of locations¹³ where it occurs, and a decline in habitat quality (COSEWIC 2015).
275 Redundancy, as measured by number of locations, has improved since the COSEWIC
276 status report through the confirmation of three subpopulations, which represent distinct
277 locations. The current number of locations is now 11-14, surpasses the COSEWIC
278 threshold for threatened and requires further evaluation. Despite these improvements,
279 further work is needed to address this key survival characteristic. Redundancy can
280 be addressed by completing regular habitat management at the 14 extant
281 subpopulations¹⁴, in order to arrest the decline in habitat quality. This can be achieved
282 through stewardship actions that control the spread of invasive plant species such as
283 Spotted Knapweed (*Centaurea stoebe*), White Sweet-clover (*Melilotus alba*), European
284 Common Reed (*Phragmites australis*), Scots Pine (*Pinus sylvestris*), and Glandular
285 Baby's Breath (*Gypsophila scorzonifolia*). Stewardship actions that focus on mitigating
286 the impacts of human disturbance (e.g., all-terrain vehicle use, trampling, dune
287 vegetation removal) may also help to improve dune habitat quality and availability.

⁷ Recovery is considered technically and biologically feasible if the species can meet the criteria for survival, improvement, and non-reliance on human intervention (ECCC 2021).

⁸ <https://species-registry.az.ec.gc.ca/index-en.html#/documents/1nVEtc2T2QqfyZy4Ful1F>

⁹ Survival characteristics consist of stability, resilience, redundancy, connectivity, and non-vulnerability to human-caused threats (ECCC 2022).

¹⁰ Redundancy refers to the degree to which the species is widespread (ECCC 2022).

¹¹ The Extent of Occurrence (EOO) is the area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a wildlife species (COSEWIC 2024).

¹² The Index of Area of Occupancy (IAO) is the biological measure of the occupied habitat within a wildlife species' range, determined by COSEWIC (2024).

¹³ Location refers to a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. (COSEWIC 2024)

¹⁴ A subpopulation is considered to be a geographically or otherwise distinct group in the population between which there is little demographic or genetic exchange (typically one successful migrant or gamete per year or less) (COSEWIC 2024).

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2. Independence: Is the species currently able to persist in Canada independent of deliberate human interventions, and/or will it eventually be able to achieve and maintain independence in the state where condition (1) is met (i.e., after the key survival characteristic(s) are addressed), such that it is not reliant on significant, direct, ongoing human intervention?

Yes. The species currently persists in Canada independent of direct human intervention. In order to address the key survival characteristic of redundancy mentioned above, habitat stewardship and threat mitigation must continue to be addressed. Habitat stewardship is not considered a significant, direct, ongoing human intervention (ECCC 2022). Such measures are considered indirect habitat management activities, as they do not involve direct manipulation of individuals of the species. Successful implementation of these activities will require continued cooperation amongst all levels of government, environmental non-governmental organizations, Indigenous communities, and private landowners.

3. Improvement: Can the species' condition be improved over when it was assessed as at risk?

Yes. The Lake Huron Grasshopper is naturally rare in Canada as it is endemic to rare coastal dune habitat within the Great Lakes region. The area of occupied habitat is naturally well below the threshold of threatened (IAO <2000 km²), and it is likely that this species will continue to meet the COSEWIC assessment criteria as a species at risk even in a recovered state (e.g., Special Concern). Nonetheless, the species condition can be improved by restoring habitat quality at extant subpopulations. This can be achieved by mitigating threats associated with recreation and by undertaking invasive species management with techniques well known and widely used in Canada. Such work has already reduced the incidence of dune blowouts and maintained the amount of suitable habitat on Manitoulin Island and Great Duck Island (COSEWIC 2015).

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1. COSEWIC* Species Assessment Information

Date of Assessment: November 2015

Common Name (population): Lake Huron Grasshopper

Scientific Name: *Trimerotropis huroniana*

COSEWIC Status: Threatened

Reason for Designation: This globally rare grasshopper is endemic to the Great Lakes region of Ontario, Michigan, and Wisconsin where it is restricted to dunes along the shores of lakes Huron, Michigan, and Superior. In Canada, it is known from 11 dune sites: one location on the east shore of Lake Superior, and seven on Lake Huron at the south shore of Manitoulin Island and Great Duck Island. Formerly, it occurred at three additional sites on Lake Huron, but these subpopulations appear to have become extirpated in the 1990s, likely as a result of residential and commercial development combined with intensive recreational use which damaged much of the dune habitat. While recreational use by pedestrians and off-road vehicles continue to threaten some dunes, other sites have undergone recent improvements under dune stewardship programs. Additional threats to dune environments include invasive plants and changes in lake levels related to climate change, natural cycles, or lake level management.

Canadian Occurrence: Ontario

COSEWIC Status History: Designated Threatened in November 2015.

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* COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

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2. Species Status Information

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The Lake Huron Grasshopper (*Trimerotropis huroniana*) is listed as Threatened¹⁵ on Schedule 1 of the *Species at Risk Act* (SARA) (S.C. 2002, c.29). In Ontario, the species is listed as Threatened¹⁶ under the *Endangered Species Act, 2007* (ESA) (S.O. 2007, c. 6) and may receive species and habitat protection under the ESA.

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The global rank for the Lake Huron Grasshopper is Apparently Secure (G4). It is considered Imperiled (N2) in Canada and Imperiled (S2) in Ontario (NatureServe 2021) (see Appendix A for more information on conservation ranks).

¹⁵ A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

¹⁶ A species that lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening to lead to its extinction or extirpation.

334 In the United States, it is restricted to shoreline habitat along Lake Huron, Lake
335 Michigan, and Lake Superior. It is known from Michigan and Wisconsin where it has
336 been assessed as Imperiled/Vulnerable (S2S3) and Critically Imperiled (S1),
337 respectively. Despite this, the Lake Huron Grasshopper is not listed under the
338 United States *Endangered Species Act* (NatureServe 2021).

339
340 Based on available distribution data, it is estimated that 11% of the species global range
341 is in Canada (COSEWIC 2015).

342

343 **3. Species Information**

344

345 **3.1 Species Population and Distribution**

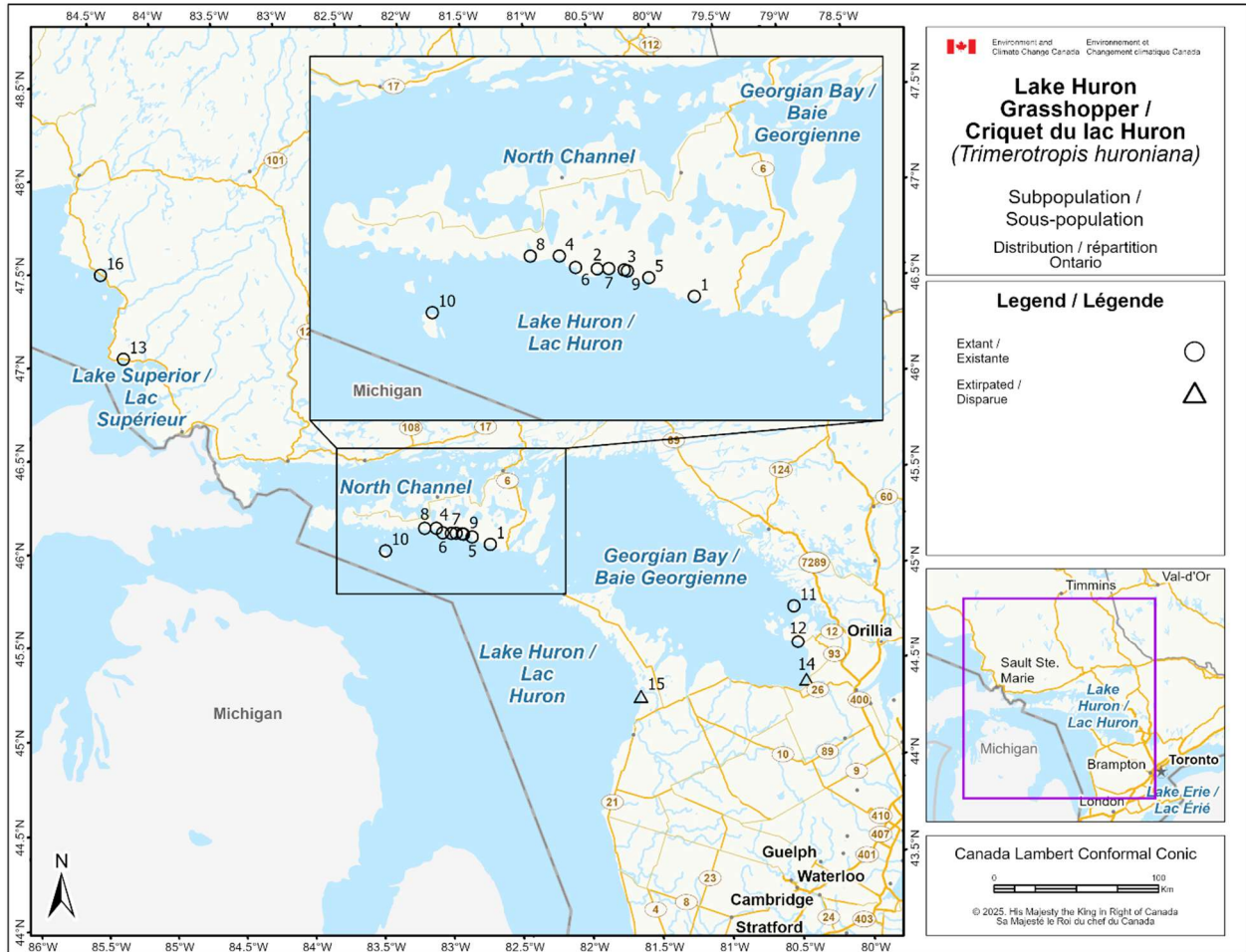
346

347 Lake Huron Grasshopper is known from coastal freshwater dune habitat on Lake Huron,
348 Lake Superior, and Georgian Bay. In Canada, the Lake Huron Grasshopper occurs as
349 14 extant subpopulations and 2 extirpated subpopulations (Figure 1, Table 1). This
350 assessment aligns with NatureServe element occurrence data standards (NatureServe
351 2002) as applied by the Natural Heritage Information Centre (NHIC) and the assessed
352 subpopulations (referred to as ‘populations’) in the provincial recovery strategy (Jones
353 2018). The 2015 COSEWIC status report does not define or delineate subpopulations
354 for the Lake Huron Grasshopper although references it to be known from 11 dune sites.
355 The subpopulation on Giants Tomb Island was considered to be extirpated by
356 COSEWIC 2015, but the species was reconfirmed there in 2017 (Jones 2018). A new
357 subpopulation was identified in 2023 at Lake Superior Provincial Park (MECP 2024).

358

359 There are at least 25 unsurveyed sites containing suitable habitat that should be
360 prioritized for Lake Huron Grasshopper surveys (Jones 2018). Addressing these
361 knowledge gaps will inform the successful implementation of recovery actions for this
362 species.

363



364
 365 **Figure 1.** Lake Huron Grasshopper distribution in Canada. Note: Each subpopulation is
 366 represented by a symbol.
 367

368 **Table 1.** Status of Lake Huron Grasshopper subpopulations in Canada assessed in
 369 this recovery strategy from COSEWIC 2015, Jones 2018, with information from the
 370 NHIC 2024.
 371

Subpopulation ID	Subpopulation Name	Region	Last Observed	Status
1	Carter Bay	Manitoulin Island	2020	Extant
2	Dominion Bay	Manitoulin Island	2020	Extant
3	Lonely Bay	Manitoulin Island	2020	Extant
4	Portage Bay	Manitoulin Island	2020	Extant
5	Providence Bay	Manitoulin Island	2021	Extant
6	Shrigley Bay	Manitoulin Island	2020	Extant
7	Square Bay	Manitoulin Island	2020	Extant
8	Taskerville	Manitoulin Island	2020	Extant
9	Deans Bay	Manitoulin Island	2020	Extant
10	Great Duck Island	Northern Lake Huron	2019	Extant
11	Giants Tomb Island	Southern Georgian Bay	2017	Extant
12	Nottawaga Bay	Southern Georgian Bay	2017	Extant
13	Pancake Bay	Southern Lake Superior	2020	Extant
14	Wasaga Beach	Southern Georgian Bay	1941	Extirpated
15	Sauble Beach	Southern Lake Huron	1901	Extirpated
16	Lake Superior Provincial Park	Southern Lake Superior	2023	Extant

372 **4. Threats**

373
374 **4.1 Threat Assessment**

375
376 The Lake Huron Grasshopper threat assessment is based on the IUCN-CMP
377 (International Union for Conservation of Nature–Conservation Measures Partnership)
378 unified threats classification system (Version 2.0) (Salafsky et al. 2008). Threats are
379 defined as the proximate activities or processes that have caused, are causing, or may
380 cause in the future the destruction, degradation, and/or impairment of the entity being
381 assessed (population, species, community, or ecosystem) in the area of interest (global,
382 national, or subnational). Limiting factors¹⁷ are not considered during this assessment
383 process.

384
385 For purposes of threat assessment, only present and future threats are considered.
386 Threat information in Table 2 was taken from the COSEWIC assessment and status
387 report for the species (COSEWIC 2015).

388
389 Historical threats, indirect or cumulative effects of the threats, or any other relevant
390 information that would help understand the nature of the threats are presented in the
391 Description of Threats section (section 4.2) and the provincial recovery strategy Part 2,
392 section 1.6.

¹⁷ Factors that may limit population growth or spread, but do not cause declines.

393 **Table 2.** Threat Assessment Table for Lake Huron Grasshopper (COSEWIC 2015).

Threat # ^a	Threat description	Impact ^b	Scope ^c	Severity ^d	Timing ^e
1	Residential & commercial development	Low	Small	Slight	High
1.1	Housing & urban areas	Low	Small	Serious-moderate	Moderate
1.2	Commercial & industrial areas	Unknown	Unknown	Serious-Moderate	Moderate
1.3	Tourism & recreation areas	Low	Small	Slight	High
6	Human intrusions & disturbance	Medium	Pervasive	Moderate	High
6.1	Recreational activities	Medium	Pervasive	Moderate	High
8	Invasive & other problematic species & genes	Medium-Low	Pervasive	Moderate-Slight	Moderate
8.1	Invasive non-native/alien species	Medium-Low	Pervasive	Moderate-Slight	Moderate
8.2	Problematic native species	Medium-Low	Large	Moderate-Slight	High
11	Climate change & severe weather	Unknown	Unknown	Unknown	High
11.1	Habitat shifting & alteration	Unknown	Unknown	Unknown	High
11.3	Temperature extremes	Unknown	Unknown	Unknown	High
11.4	Storms & flooding	Unknown	Unknown	Unknown	High

^a **Threats** are numbered using the IUCN Classification System. Only those threats that are relevant to the species are presented in this table and in Section 4.2 Description of Threats and Part 2 (*Recovery Strategy for the Lake Huron Grasshopper (Trimerotropis huroniana) in Ontario*).

^b **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

^c **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71-100%; Large = 31-70%; Restricted = 11-30%; Small = 1-10%; Negligible <1%).

^d **Severity** – Within the scope, the level of damage to the species that can reasonably be expected to be affected by the threat within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71-100%; Serious = 31-70%; Moderate = 11-30%; Slight = 1-10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

408 ^e **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [<10 years or 3 generations]) or now suspended (could come back in
409 the short term); Low = only in the future (could happen in the long term [> 10 years or 3 generations]) or now suspended (could come back in the long term);
410 Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

411 **4.2 Description of Threats**

412
413 The overall threat impact for Lake Huron Grasshopper is Medium. This overall threat
414 considers the cumulative impacts of multiple threats to the species in Canada. Threats
415 are listed in order as they appear in the Threats Classification Table (Table 2).
416

417 Lake Huron Grasshopper is presumed to be impacted by three primary threats
418 (Table 2): residential and commercial development (housing and urban areas, tourism
419 and recreation areas); human intrusions and disturbance (recreational activities); and
420 invasive and other problematic species & genes (invasive non-native/alien species, and
421 problematic native species). The impact of climate change and severe weather is an
422 additional potential threat, but given knowledge gaps, it is currently ranked as unknown.
423

424 **IUCN Threat #1. Residential & commercial development**

425
426 1.1 Housing & urban areas; 1.2 Commercial & industrial areas; 1.3 Tourism & recreation
427 areas (*Low*)
428

429 The development of shoreline habitat for residential, tourism and recreational uses
430 threatens Lake Huron Grasshopper by directly reducing suitable habitat availability. The
431 potential impact of commercial and industrial areas is unknown. Residential and
432 commercial development, tourism and recreation are considered the primary drivers in
433 the local extirpation of the species from Wasaga Beach and Sauble Beach (COSEWIC
434 2015).
435

436 Undertaking construction activities where Lake Huron Grasshopper occurs will eliminate
437 dune habitat within the project footprint. It may also disrupt the natural processes that
438 maintain suitable habitat for the species. Developments often occur outside of the
439 foredune where Lake Huron Grasshoppers are found, so the extent of direct habitat loss
440 may be limited. However, development is also associated with increased human
441 presence in dunes and ancillary structures that impact the species or its habitat. This is
442 especially true of development for tourism and recreation which not only directly affect
443 habitat but invite and facilitate further disturbance associated with recreation (see: IUCN
444 Threat #6.1 Human Intrusion & Disturbance – Recreational Activities), which may
445 increase the severity of the threat over time.
446

447 Current municipal by-laws may limit and regulate development for some sites, and there
448 are no known development projects planned or proposed. However, most sandy bays
449 on Manitoulin Island are subdivided for residential development, including Carter Bay
450 (ECCC 2024). Residential development has already taken place at many Manitoulin
451 Island dune sites, and habitats are thought to have recovered somewhat from these
452 activities (Jones 2018). While some sites where the grasshopper occurs are conserved
453 within designated parks or protected areas, others fall under municipal and/or private
454 ownership (Jones 2018). Development associated with recreation is regulated through
455 by-laws and provincial legislation.
456

457 For further information on this threat, see section 1.6 of the provincial recovery strategy:
458 ‘*Shoreline Development*’.

459

460 **IUCN Threat #6. Human intrusions & disturbance**

461

462 6.1 Recreational activities (*Medium*)

463

464 Recreational activities impact the Lake Huron Grasshopper by altering and/or removing
465 habitat used by the species for key life processes (e.g., foraging, reproduction, shelter).
466 Operation of motorized vehicles (ATVs, trucks, and heavy equipment) and pedestrian
467 traffic can lead to trampling of native dune vegetation that is used by Lake Huron
468 Grasshoppers for foraging and shelter, as well as compaction of soils, which may
469 impact egg laying. Damage to native grasses and shrubs may also lead to dune
470 blowouts and erosion (Peach 2005 as cited in COSEWIC 2015; Scholtens et al. 2005;
471 COSEWIC 2015). Ultimately, these disruptions to vegetation and soil stability can result
472 in long-term changes to dune habitat which are challenging to reverse and limit the
473 capacity of these areas to support the species. This threat is ongoing at the majority of
474 extant subpopulations.

475

476 For further information on this threat, see section 1.6 of the provincial recovery strategy:
477 ‘*Heavy Recreational Use*’.

478

479 **IUCN Threat #8. Invasive & other problematic species & genes**

480

481 8.1 Invasive non-native/alien species (*Medium-Low*)

482

483 Invasive species, such as European Common Reed, Spotted Knapweed and Glandular
484 Baby’s Breath, are a key threat to Lake Huron Grasshopper (Jones 2018). Non-native
485 plants, such as Spotted Knapweed, have the capacity to spread rapidly within open
486 dune ecosystems, stabilizing sand movement and allowing for establishment of other
487 plant species (Danielson 2019, Marshall 2021). This can affect dune species like
488 Lake Huron Grasshopper through reducing or eliminating access to exposed sand used
489 for egg-laying, open areas used for courtship and mating displays, and preferred food
490 plants (Jones 2018). Other invasive species contributing to dune stabilization include
491 European Common Reed, although, thanks to successful eradication and control
492 programming, phragmites presence on Manitoulin Island has been reduced (Jones
493 2018). In addition to dune stabilization and competition with native dune species,
494 invasive plant species, such as Glandular Baby’s Breath, are also associated with
495 decreased arthropod diversity and abundance and altered arthropod community
496 composition, including increased predator abundance (Emery and Doran 2013), which
497 could potentially increase competition for or predation on Lake Huron Grasshopper. If
498 no management actions are undertaken it is possible that this threat may increase, as
499 other invasive plant species occurring on Lake Huron shores may also be introduced to
500 these sites. For example, several invasive species known to impact dune systems in
501 Michigan include White Sweet-clover (*Melilotus albus*), Yellow Sweetclover (*Melilotus*
502 *officinalis*), Leafy Spurge (*Euphorbia esula*), Giant Knotweed (*Rheynoutria*

503 *sachalinensis*), and White Poplar (*Populus alba*) (Catling et al. 2022). The range rank
504 denotes uncertainty in the severity of this score.

505
506 For further information on this threat, see section 1.6 of the provincial recovery strategy:
507 '*Invasive Species and Problematic Native Species*'.

508 509 8.2 Problematic native species (*Medium-Low*)

510
511 An increase in competition from the Seaside Grasshopper (*Trimerotropis maritima*), a
512 native grasshopper species, may pose a significant threat to the Lake Huron
513 Grasshopper. This competition likely occurs for food or other limited resources, which
514 may further reduce the population (COSEWIC 2018). The Seaside Grasshopper, whose
515 range has expanded northward, is thought to outcompete and displace the Lake Huron
516 Grasshopper, as the two species almost never occupy the same sites despite using
517 similar dune and beach habitats (Jones 2018). At heavily disturbed sites, the Mottled
518 Sandy Grasshopper has been observed to replace the Lake Huron Grasshopper, likely
519 due to changes in vegetation that favor the Mottled Sandy Grasshopper rather than
520 through competition (Scholtens et al. 2005). Further research is needed to better
521 understand how these interactions and habitat disturbances can potentially contribute to
522 the decline of the Lake Huron Grasshopper. The range rank denotes uncertainty in the
523 severity of this score.

524
525 For further information on this threat, see section 1.6 of the provincial recovery strategy:
526 '*Invasive Species and Problematic Native Species*'.

527 528 **IUCN Threat #11. Climate change & severe weather**

529 530 11.1 Habitat shifting & alteration (*Unknown*)

531
532 Lake Huron Grasshopper has been assessed as highly vulnerable to climate change by
533 Brinker et al. (2018), suggesting that a significant decrease in abundance and/or range
534 extent within the species' Ontario range is likely by 2050. This is largely based on the
535 species' restriction to open sand dunes. Many dune species are similarly bound by
536 narrow habitat requirements, and for this reason Brinker et al. (2018) note the Great
537 Lakes coastal dunes on Manitoulin Island as an area of greatest concern within Ontario's
538 Great Lakes Basin.

539
540 The Great Lakes Basin in Ontario is expected to become drier overall, despite projected
541 increases in precipitation (Hayhoe et al. 2010, McDermid et al. 2015, Brinker et al.
542 2018). Climate change may further affect the hydrology of the Great Lakes by altering
543 water levels and water level fluctuation. Some researchers suggest that water levels will
544 fluctuate around a lower overall average (McDermid et al. 2015; Bockheim 2021),
545 whereas others argue against an overall decline in average water level (Gronewold and
546 Rood 2019; Kayastha 2021). In recent years, the Great Lakes Basin has experienced
547 high relative water level rise during water level fluctuations. Such fluctuations can cause
548 beach narrowing (Davidson-Arnott and Bauer 2021). The magnitude and rate of lake

549 level fluctuation is expected to continue to increase due to climate change (McDermid
550 et al. 2015; Theuerkauf and Braun 2021). These rapid and large shifts from low to high
551 water levels drive rapid erosion along the Great Lakes shoreline, and erosion rates may
552 increase due to climate change (Theuerkauf and Braun 2021, Bockheim 2021). Should
553 Great Lakes water levels decline, the availability of Lake Huron Grasshopper habitat
554 may increase in the short-term but may decrease over the long-term if dune vegetation
555 succession outstrips the rate of dune building processes (COSEWIC 2015). More
556 research is needed on this emerging and poorly understood threat to understand its
557 impact on Lake Huron Grasshopper.

558
559 For further information on this threat, see section 1.6 of the provincial recovery strategy:
560 '*Climate Change*'.

561 562 11.3 Temperature extremes (*Unknown*)

563
564 The impact that temperature extremes may have on Lake Huron Grasshopper is
565 unknown. Temperature in the Great Lakes Basin of Ontario is projected to increase
566 approximately 2.8-3.3°C by the 2050s (2041-2071) (Brinker et al. 2018). It is unknown if
567 the species can physiologically adapt to temperature increases, based on its historical
568 thermal niche. Dune plant species that co-occur in Lake Huron Grasshopper habitat,
569 such as Pitcher's Thistle, are known to have reduced germination at higher
570 temperatures (Gijnsman and Vitt 2020). As such, it is possible that regional temperature
571 extremes could negatively alter food and habitat availability for Lake Huron
572 Grasshopper.

573
574 For further information on this threat, see section 1.6 of the provincial recovery strategy:
575 '*Climate Change*'.

576 577 11.4 Storms & flooding (*Unknown*)

578
579 Drought and flood intensity in the Great Lakes Basin are both expected to increase
580 (McDermid et al. 2015, Brinker et al. 2018), presenting a potential stress to Lake Huron
581 Grasshopper and the dune systems it depends on.

582
583 Climate change and severe weather also have the potential to affect the Great Lakes
584 dunes through extratropical cyclones and other weather events (Hansen et al. 2020).

585
586 For further information on this threat, see section 1.6 of the provincial recovery strategy:
587 '*Climate Change*'.

588 589 **5. Population and Distribution Objectives**

590
591 Under SARA, a population and distribution objective for the species must be established
592 for listed Endangered, Threatened and Extirpated species when recovery is deemed
593 feasible. Consistent with the actions and goal for the recovery of the species provided in
594 the provincial recovery strategy (Part 2) and that of the provincial government stated in

595 the Government Response Statement (Part 3), Environment and Climate Change
596 Canada's population and distribution objective for the Lake Huron Grasshopper in
597 Canada is to recover the species by:

- 598
- 599 • Maintaining or increasing the current distribution in Canada by improving habitat
600 quality and addressing threats at extant subpopulations.
- 601

602 Lake Huron Grasshopper was assessed as Threatened by COSEWIC due to its small
603 distribution (i.e., Extent of Occurrence (EOO) and Index of Area of Occupancy (IAO)), a
604 continuing decline in habitat quality, and because it occurred at fewer than 10 locations,
605 compromising the survival characteristic of *redundancy*.

606

607 Currently available information suggests that this species has always been rare within
608 its limited range in Canada. The EOO and IAO are small and unlikely to ever surpass
609 the thresholds for Threatened status. Given this, in the context of the population and
610 distribution objective, maintaining or increasing distribution will be defined as the
611 number of subpopulations and the area of habitat supporting each subpopulation. The
612 primary approach to address redundancy is therefore to improve habitat quality and
613 address key threats at extant subpopulations. This is best accomplished by addressing
614 the threats posed by human disturbance and invasive plant species and undertaking
615 habitat enhancement activities.

616

617 At the time of the COSEWIC assessment, the species was identified to occur at
618 8-11 locations on the basis of the most serious plausible threat being off-road vehicle
619 use. Since 2017, three additional subpopulations were confirmed as extant bringing the
620 total number of locations up to 11-14, likely surpassing the COSEWIC threshold of
621 ≤ 10 locations. Undertaking surveys at 25 unsurveyed sites containing suitable habitat
622 could further increase the number of locations in Canada.

623

624 Quantitative targets for the number of individuals at subpopulations cannot be set at this
625 time due to current data gaps. As a result, it is not possible to measure abundance
626 trends or to complete a minimum subpopulation viability analysis. However, in a
627 recovered state, the assessment of Lake Huron Grasshopper could improve to Special
628 Concern.

629

630 This federal population and distribution objective is consistent with the goals and actions
631 set out in the province of Ontario's recovery strategy (see Part 2) and Government
632 Response Statement for this species (see Part 3) developed under the provincial
633 *Endangered Species Act, 2007*. Protection and recovery efforts will be focused on
634 supporting the persistence of this species in Canada.

635

636 **6. Broad Strategies and General Approaches to Meet** 637 **Objectives**

638
639 The government-led and government-supported actions from the *Lake Huron*
640 *Grasshopper - Ontario Government Response Statement* (Part 3) are adopted as the
641 broad strategies and general approaches to meet the population and distribution
642 objective. ECCC is not adopting the approaches identified in section 2 of the *Recovery*
643 *Strategy for the Lake Huron Grasshopper* (*Trimerotropis huroniana*) in Ontario (Part 2).
644

645 **7. Critical Habitat**

646
647 Section 41(1)(c) of SARA requires that recovery strategies include an identification of
648 the species' critical habitat, to the extent possible, as well as examples of activities that
649 are likely to result in its destruction. Under section 2(1) of SARA, critical habitat is "the
650 habitat that is necessary for the survival or recovery of a listed wildlife species and that
651 is identified as the species' critical habitat in the recovery strategy or in an action plan
652 for the species".
653

654 Identification of critical habitat is not a component of provincial recovery strategies
655 under the Province of Ontario's *Endangered Species Act* (ESA). Under the ESA, when a
656 species becomes listed as endangered or threatened on the Species at Risk in Ontario
657 List, it automatically receives general habitat protection. Lake Huron Grasshopper
658 currently receives general habitat protection under the ESA. In some cases, a habitat
659 regulation may be developed that replaces the general habitat protection. A habitat
660 regulation is a legal instrument that prescribes an area that will be protected¹⁸ as the
661 habitat of the species by the Province of Ontario. A habitat regulation has not been
662 developed for the Lake Huron Grasshopper; however, the provincial recovery strategy
663 includes a recommendation on the area that should be considered in developing a
664 habitat regulation for the species (see Part 2, section 2.4).
665

666 Critical habitat for Lake Huron Grasshopper is considered sufficient to achieve the
667 species' population and distribution objective (section 5), therefore no schedule of
668 studies has been developed. If new or additional information becomes available,
669 refinements to current critical habitat, or additional critical habitat may be identified in an
670 amendment to this recovery strategy or an action plan. For more information on critical
671 habitat identification, contact Environment and Climate Change Canada – Canadian
672 Wildlife Service at RecoveryPlanning-Planificationduretablissement@ec.gc.ca.
673

¹⁸ Under the federal *Species at Risk Act* (SARA), there are specific requirements and processes set out regarding the protection of critical habitat. Protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

674 **7.1 Identification of the Species' Critical Habitat**

675
676 Critical habitat for the Lake Huron Grasshopper in Canada is identified as the extent of
677 biophysical attributes (see section 7.1.2) wherever they occur within areas described in
678 section 7.1.1, below. The area containing critical habitat for the Lake Huron
679 Grasshopper is presented in Figures B-1 to B-11, in Appendix B. The UTM grid shown
680 on these figures is part of a standardized grid system that indicates the general
681 geographic areas containing critical habitat, which can be used for land use planning
682 and/or environmental assessment purposes.

683 684 **7.1.1 Area Containing Critical Habitat**

685
686 In Canada, the presence and persistence of the Lake Huron Grasshopper depends on
687 an area greater than that occupied by individuals of this species. This species requires
688 landscapes of suitable habitat¹⁹ that function to promote life cycle processes related to
689 population dynamics (e.g., reproduction or dispersal). The presence and composition of
690 biophysical attributes²⁰ used by the species in these landscapes may vary over space
691 and time, but the function that they provide must be maintained to support biological
692 processes related to the Lake Huron Grasshopper habitat and biological needs.

693
694 The area containing critical habitat for Lake Huron Grasshopper is:

- 695
696 • The extent of suitable habitat where Lake Huron Grasshoppers are found at
697 extant subpopulations

698 699 **7.1.2 Biophysical Attributes of Critical Habitat**

700
701 Within the areas described under section 7.1.1., critical habitat is identified where the
702 following biophysical attributes occur; typically characterized as follows:

- 703
704 • Patchy to continuous meadow vegetation cover with tree or shrub cover $\leq 25\%$,
705 with scattered grasses, sedges, and rushes, which supports visibility for courtship
706 behaviours and provides shelter;
- 707 • Loose, sandy soil, with little or no buildup of decaying plants or other organic
708 matter, so it can still be shaped and moved by wind or water that shifts the sand
709 (e.g., wind, wave-wash, ice movement and changes to lake levels) and not
710 become colonized by non-native vegetation or trees. This maintains availability of
711 preferred food plants (e.g. American Beachgrass, Great Lakes Sandreed, and

¹⁹ For Lake Huron Grasshopper, suitable habitat is an area with an Ecological Land Classification at the community series level of: Open Sand Dune (SDO) (Lee et al. 1998), as delineated from imagery from the extant subpopulations and Element Occurrences (EOs) data provided by the Natural Heritage Information Centre (NHIC; November 2022).

²⁰ Biophysical attributes are those environmental and vegetation characteristics (biotic and abiotic factors) describing the suitable habitat that provide individuals of the species the necessary conditions (e.g. soil and moisture, light penetration, species composition and species interactions) to carry out essential life processes and behaviours.

712 Field Wormwood) and other native dune grasses and exposed sand to support
713 egg-laying.

714
715 These biophysical attributes are characterized by the Ecological Land Classification
716 vegetation type for Little Bluestem – Long-leaved Reed Grass – Great Lakes Wheat
717 Grass Dune Grassland (SDO1-2; Lee et al. 1998) as described in habitat needs of the
718 species (COSEWIC 2015). Jones 2018 also identifies the vegetation type of American
719 Dune Grass – Beach Pea – Sand Cherry Dune Grassland (SDO1-3; NHIC 2021). The
720 open, actively moving sand portions of freshwater coastal sand dunes are rare in
721 Ontario, as they are narrow linear features restricted to localized areas along major
722 shorelines. Dune habitats are maintained by dynamic forces such as wind, wave-wash,
723 ice movement, and changes in lake levels (Albert 2000; Maun 2009) that move sand.
724 These forces maintain open sand conditions and prevent trees from becoming
725 established for the long term (Dech et al. 2005; Maun 2009; Bakowsky and Henson
726 2014). Extreme conditions of wind, heat, light, drought and other climatic factors also
727 prevent many common plant species from becoming established. In the absence of
728 these dynamic forces to maintain the suitable habitat and vegetation communities, more
729 plant growth occurs, and sand may become too vegetated for the Lake Huron
730 Grasshopper.

731

732 **7.2 Activities Likely to Result in Destruction of Critical Habitat**

733

734 Understanding what constitutes destruction of critical habitat is necessary for the
735 protection and management of critical habitat. Destruction is determined on a
736 case-by-case basis. Destruction would result if part of the critical habitat was degraded,
737 either permanently or temporarily, such that it would not serve its function when needed
738 by the species. Destruction may result from a single activity or multiple activities at one
739 point in time or from the cumulative effects of one or more activities over time. It should
740 be noted that not all activities that occur in or near critical habitat are likely to cause its
741 destruction. Some activities that result in a short-term disturbance of critical habitat,
742 without affecting individuals or residence, may improve the future quality of critical
743 habitat, if managed appropriately. Some disturbance may be beneficial to the Lake
744 Huron Grasshopper given its association with dynamic shoreline dune habitat. It is
745 possible for ecosystem management activities which support dynamic dune processes
746 and prevent succession (e.g., invasive species management) to be conducted in a
747 manner that promotes habitat conditions, without damaging or destroying critical habitat.

748

749 Activities described in Table 3 are examples of those likely to cause destruction of
750 critical habitat for the species; however, destructive activities are not necessarily limited
751 to those listed.

752

753 **Table 3.** Activities Likely to Result in the Destruction of Critical Habitat.

Description of Activity	Description of effect in relation to function loss	Details of effect
Shoreline development, including but not limited to the construction of breakwater structures, marinas, and shoreline hardening.	Modification to shorelines can change the dynamic forces that move sand, which can result in sand stabilization and the establishment of competing vegetation, or shoreline erosion. This can result in loss of suitable habitat required to support all life functions for Lake Huron Grasshopper.	<p>This activity is likely to result in the destruction of critical habitat if it occurred within the bounds of critical habitat or outside the bounds of critical habitat, provided that the activity caused erosion or sedimentation to occur in beach or sand dune areas within the critical habitat.</p> <p>IUCN-CMP Threat 1.1 Housing & urban areas; 1.2 Commercial & industrial areas; 1.3 Tourism & recreation areas</p>
Activities that result in vegetation trampling, soil compaction or other vegetation damage including the operation of motorized vehicles (e.g., use of ATVs, trucks, heavy equipment).	Trampling of native dune vegetation and compaction of soils can alter or damage dune habitat to the extent that it may no longer contain the suitable habitat required to support foraging, shelter and reproduction (egg-laying) for the Lake Huron Grasshopper.	<p>When this activity occurs within critical habitat, the effects may be direct and/or cumulative. This activity would likely result in the destruction of critical habitat if it occurred within the bounds of critical habitat.</p> <p>This activity could cause destruction at all times of year.</p> <p>IUCN-CMP Threat 6.1 Recreational activities</p>
Activities that result in the removal of native vegetation or long-term destruction of dune habitat, rendering the area unsuitable for Lake Huron Grasshopper. Examples include, but are not limited to the raking, grooming, or bulldozing of dunes, and associated removal of native vegetation. For clarity, the removal of non-native, invasive vegetation according to Best Management Practices is not considered as an activity likely to destroy critical habitat.	These activities may trample, compact, cover or remove vegetation, debris or beach substrate, resulting in changes to natural dune dynamics and open meadow vegetation cover and loss of suitable habitat required to support all life functions for Lake Huron Grasshopper.	<p>This activity would likely result in the destruction of critical habitat if it occurred within the bounds of critical habitat at any time of year. When this activity occurs within critical habitat at any time of year, the effects may be direct and/or cumulative. Some vegetation management (e.g., reduction or removal of encroaching or non-native vegetation) that maintains or increases habitat suitability may not constitute destruction and should be evaluated on a case-by-case basis. Such management activities must consider the needs of Lake Huron Grasshopper.</p> <p>IUCN-CMP Threat 7.3 Other Ecosystem Modifications</p>

<p>Activities that facilitate the introduction of new invasive plant species or range expansion of already established invasive species (e.g., introduction of non-native plant seeds, shoreline development, or infrastructure modification that may use contaminated equipment or disturb dunes) in or near Lake Huron Grasshopper critical habitat. Potential threatening species may include European Common Reed and Spotted Knapweed.</p>	<p>If new invasive alien plant species are introduced, or ranges of existing invasive species are expanded, they could displace preferred food plants of Lake Huron Grasshopper (affecting foraging), or increase overall vegetation cover >25%, impacting courtship (reproduction).</p>	<p>When this activity occurs within critical habitat at any time of year, the effects may be direct and/or cumulative. It is likely to result in the destruction of critical habitat.</p> <p>IUCN-CMP Threat 8.1 Invasive non-native/alien plant species</p>
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8. Measuring Progress

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The performance indicators presented below provide a way to define and measure progress towards achieving the population and distribution objectives. Every ten years, success of recovery strategy implementation will be measured against the following performance indicators:

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- All 14 extant subpopulations of Lake Huron Grasshopper in Canada remain extant and habitat quality improvements and/or additional subpopulation discoveries, or re-discoveries have resulted in increases to the number of extant subpopulations and/or the area of supporting habitat.

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9. Statement on Action Plans

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One or more action plans will be completed and posted on the Species at Risk Public Registry for Lake Huron Grasshopper within ten years of the posting of the final recovery strategy.

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773

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913 **Appendix A: Conservation Ranks of the Lake Huron**
914 **Grasshopper (*Trimerotropis huroniana*) in Canada and the**
915 **United States**

916
917 **Table A-1.** Conservation Ranks of Lake Huron Grasshopper from NatureServe Explorer
918 2024.

Lake Huron Grasshopper (<i>Trimerotropis huroniana</i>)				
Global (G) Rank	National (N) Rank (Canada)	Sub-national (S) Rank (Canada)	National (N) Rank (United States)	Sub-national (S) Rank (United States)
G4	N2	Ontario (S2)	N2N3	Michigan (S2S3); Wisconsin (S1)

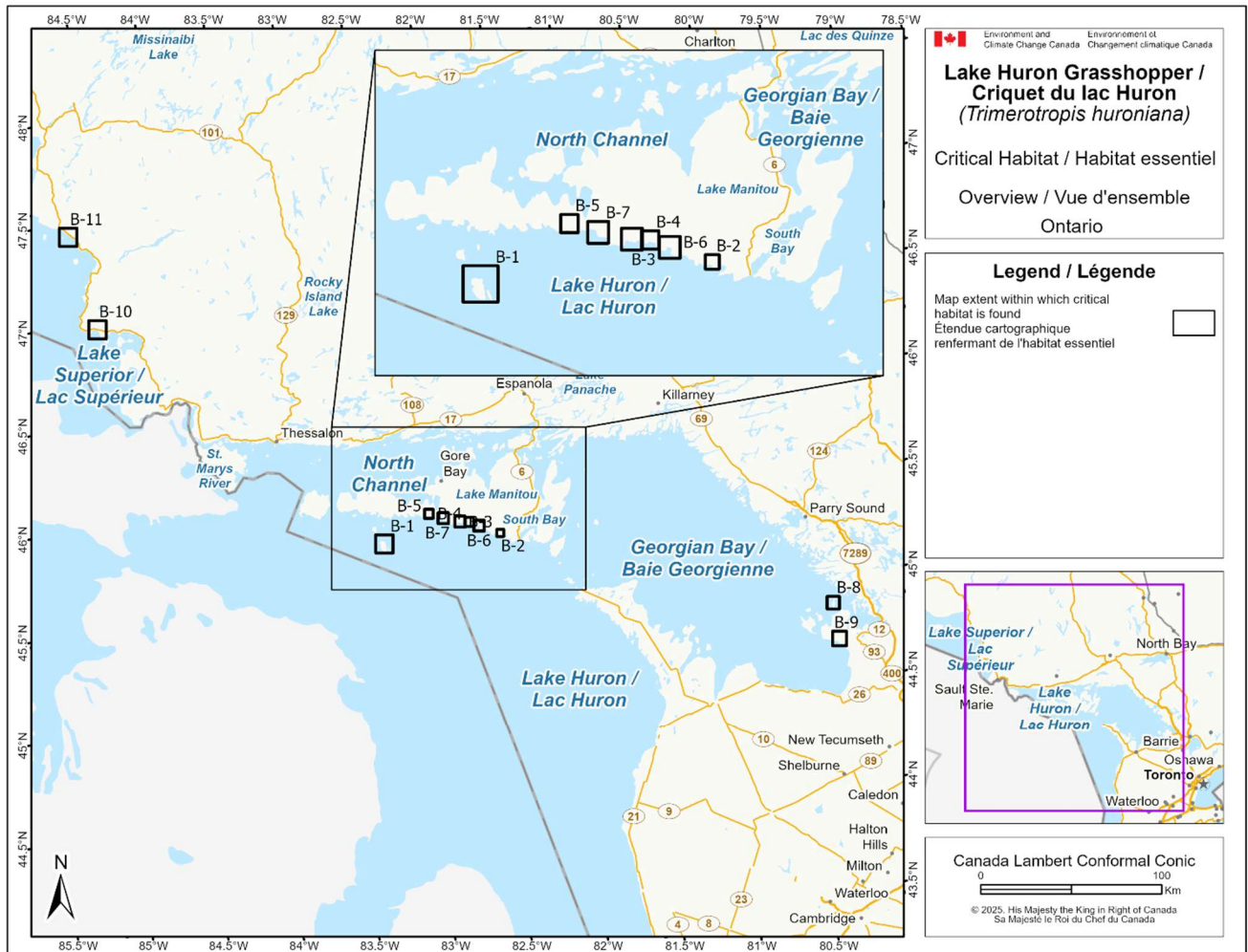
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920
921 **Table A-2.** Definitions of Global (G), National (N), and Subnational (S) Conservation
922 Status Ranks (Master et al. 2012).

Rank	Definition
GNR; NNR; SNR	Unranked: State/province conservation status not yet assessed
SNA	Not applicable: A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities.
G1; N1; S1	Critically Imperiled: At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
G2; N2; S2	Imperiled: At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
G3; N3; S3	Vulnerable: At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
G4; N4; S4	Apparently Secure: At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5; N5; S5	Secure: At very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats

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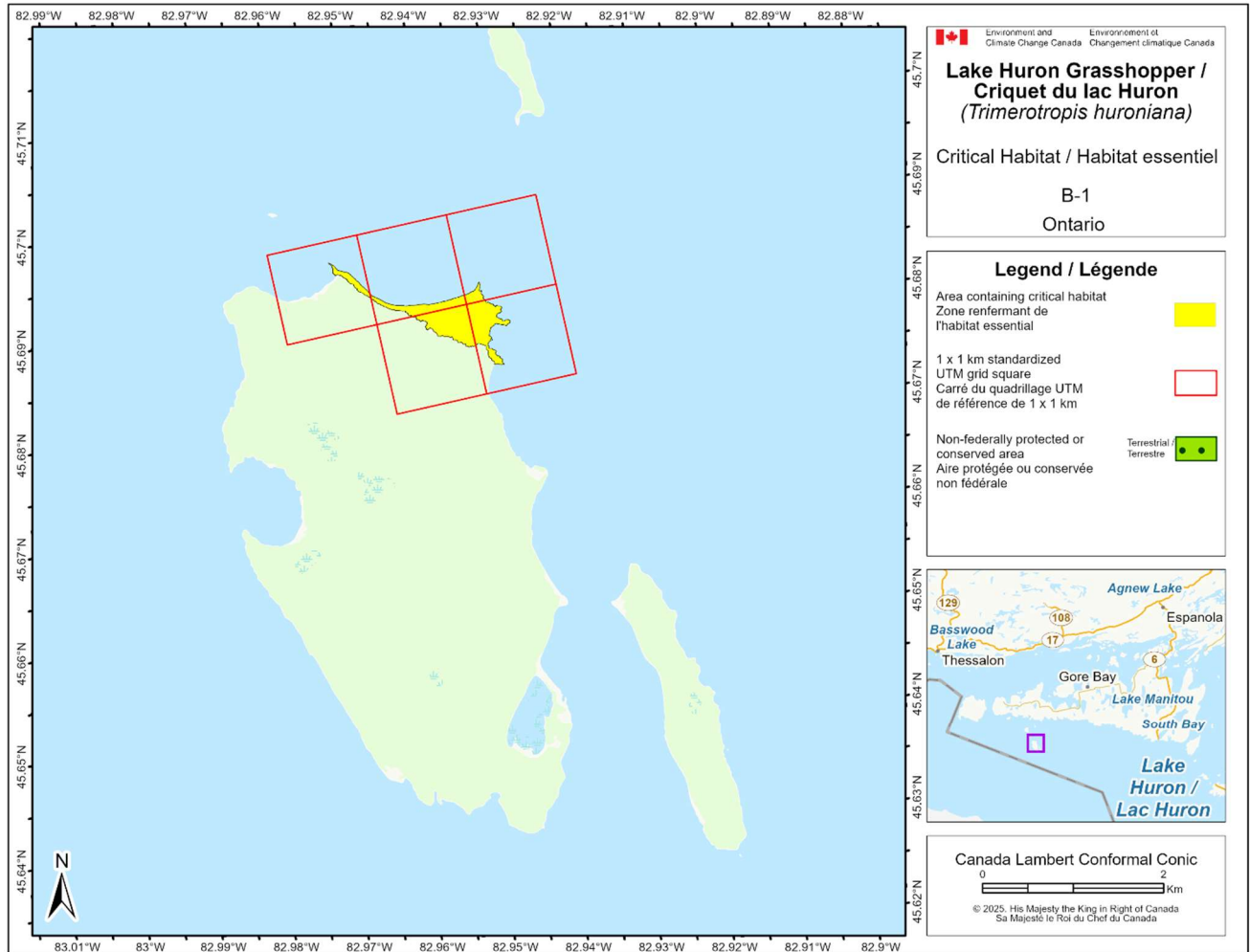
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Appendix B: Critical Habitat Maps for the Lake Huron Grasshopper in Canada

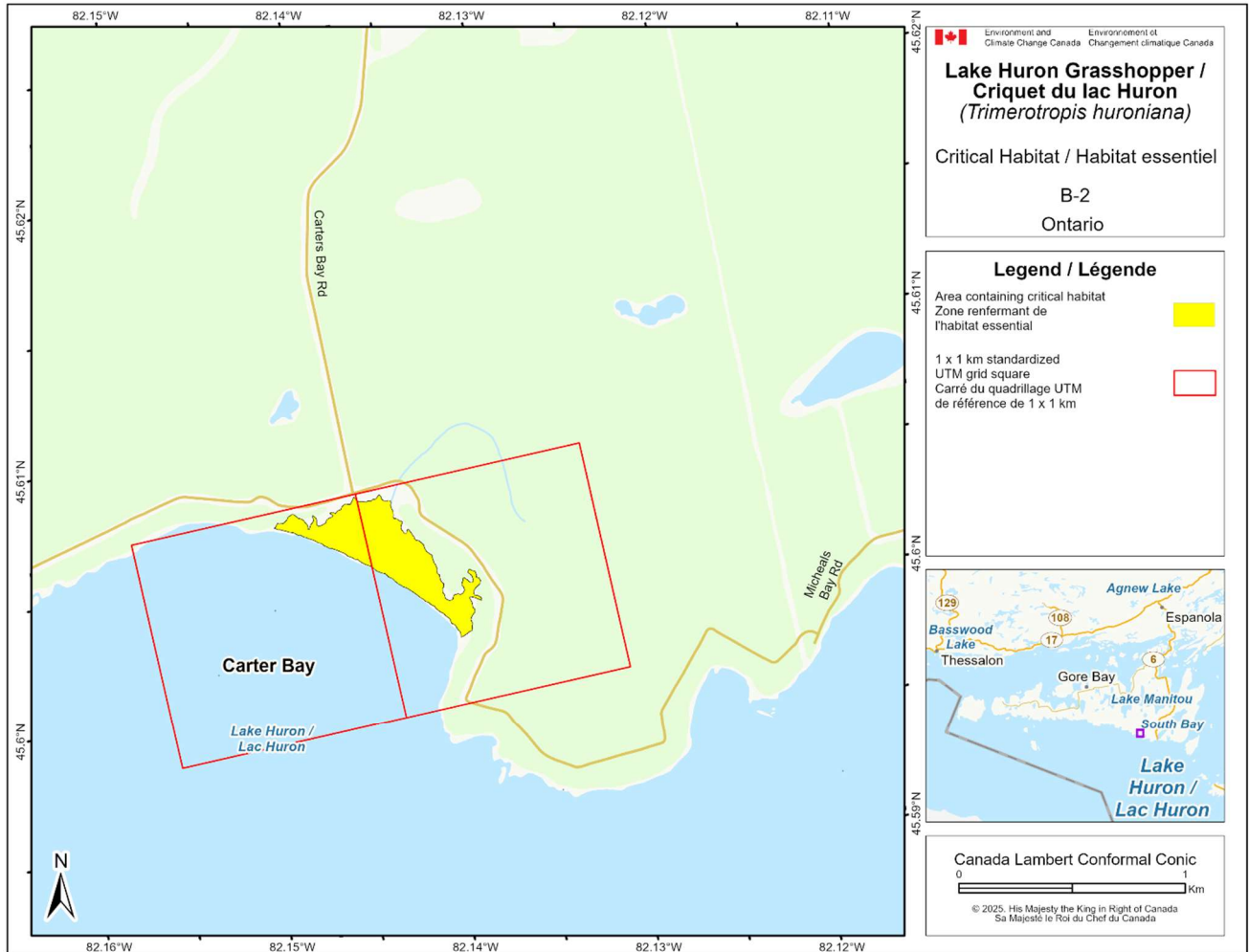


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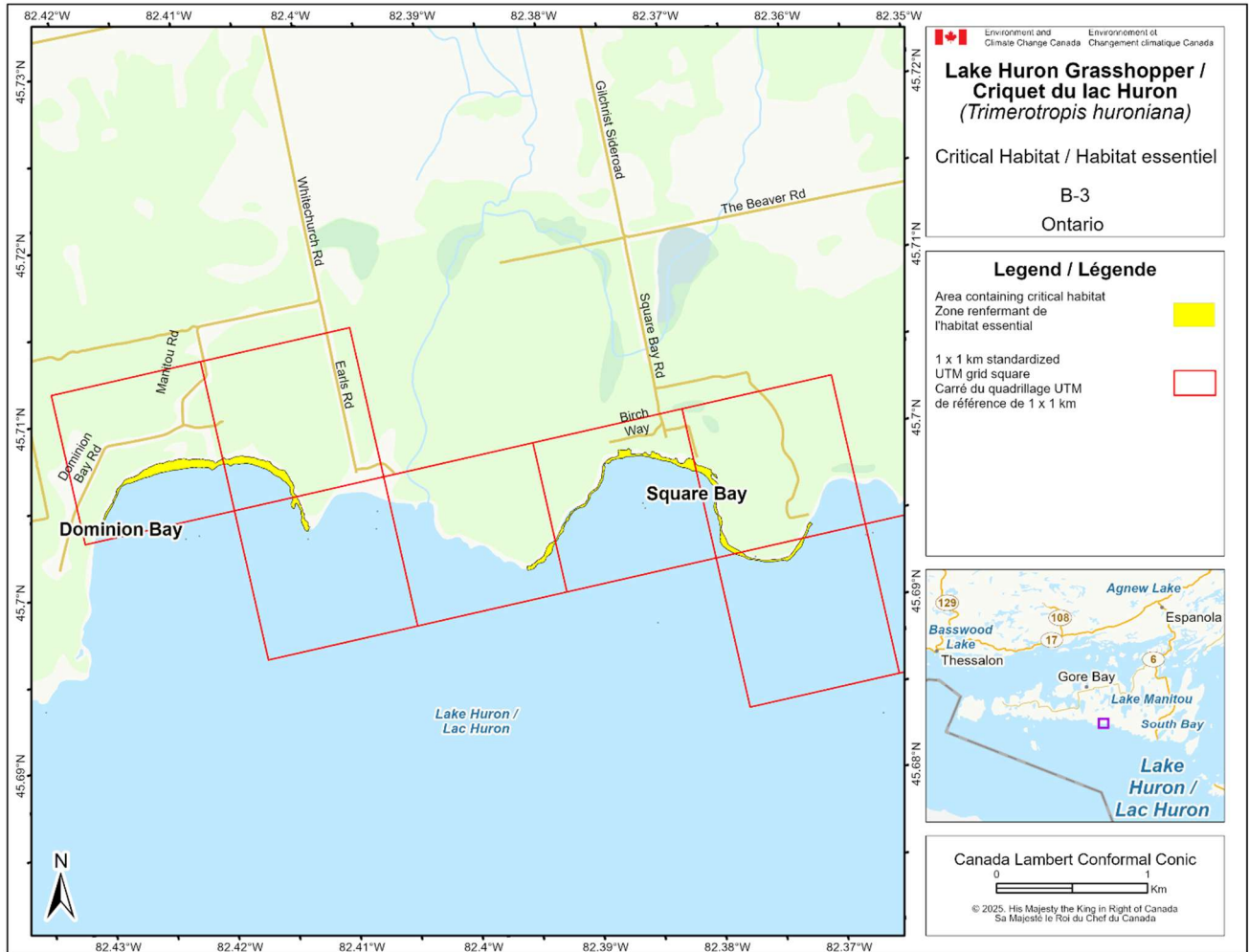
Figure B. The Lake Huron Grasshopper in Canada. Overview (Ontario). Map extent for critical habitat for the Lake Huron Grasshopper in Ontario as depicted in Figures B-1 to B-11.



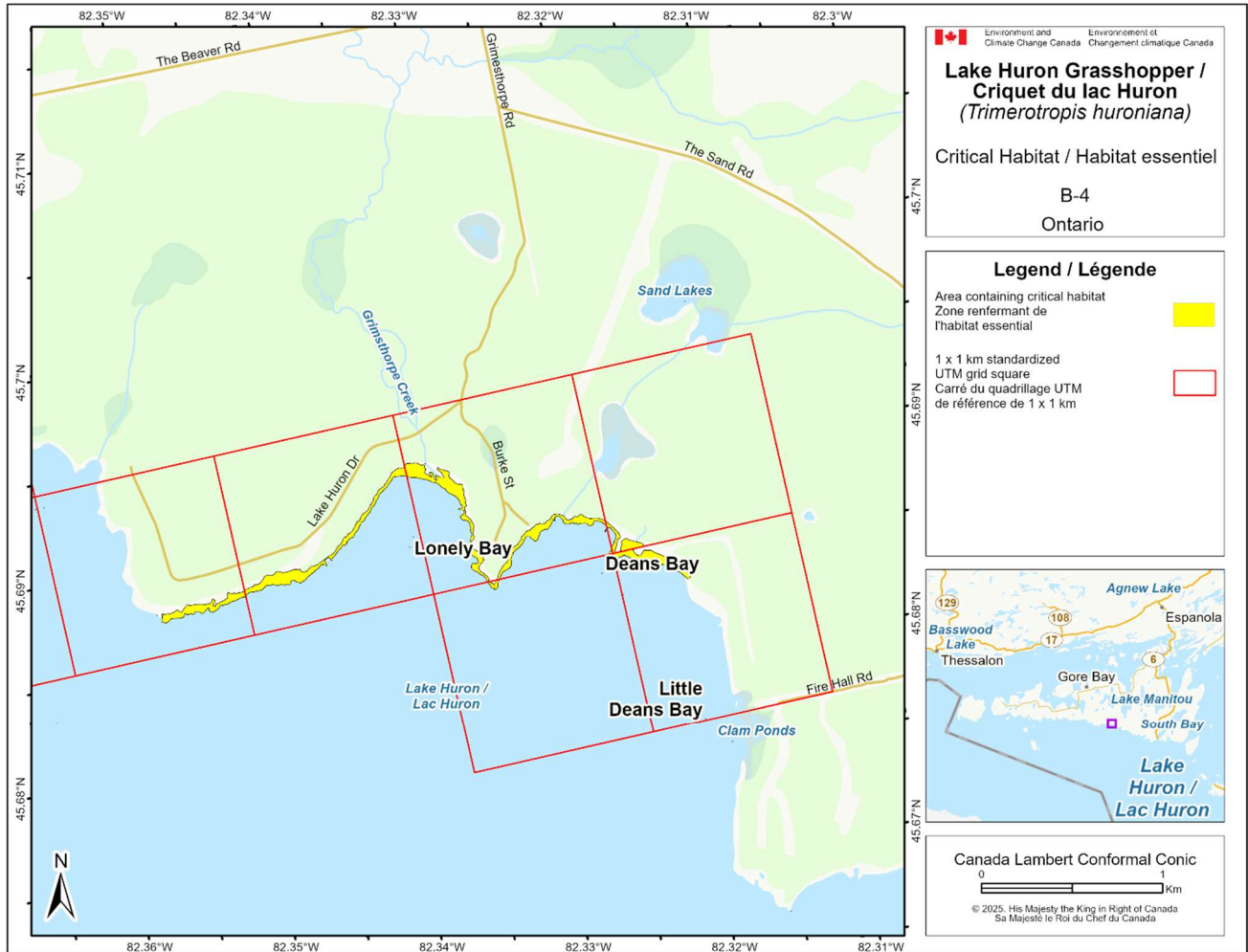
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 932 **Figure B-1.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
 933 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
 934 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
 935 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
 936 this figure is a standardized national grid system used to indicate the general geographic area
 937 within which critical habitat is found. Any additional boundaries are included for landmarking
 938 purposes only.
 939



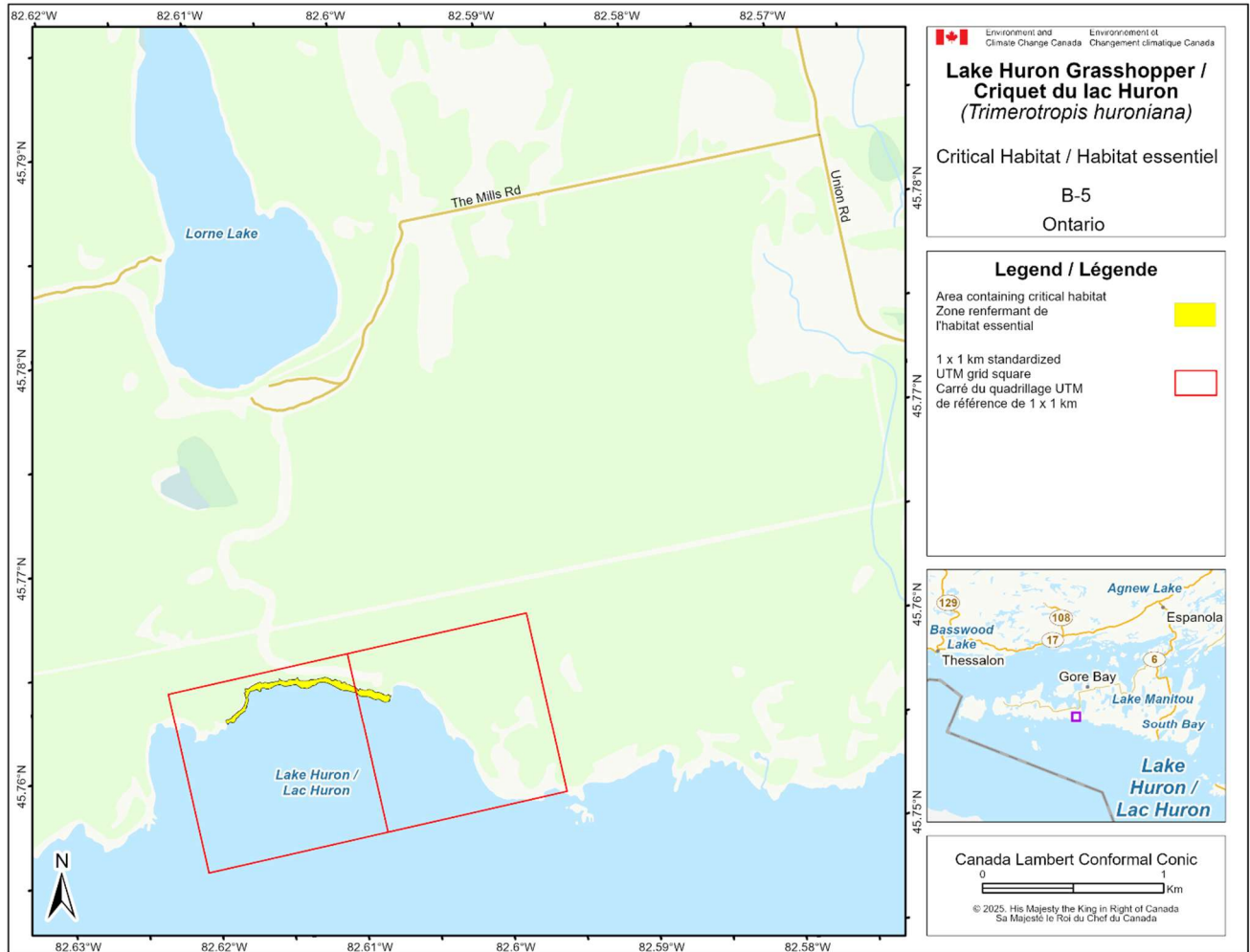
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 941 **Figure B-2.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
 942 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
 943 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
 944 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
 945 this figure is a standardized national grid system used to indicate the general geographic area
 946 within which critical habitat is found. Any additional boundaries are included for landmarking
 947 purposes only.
 948



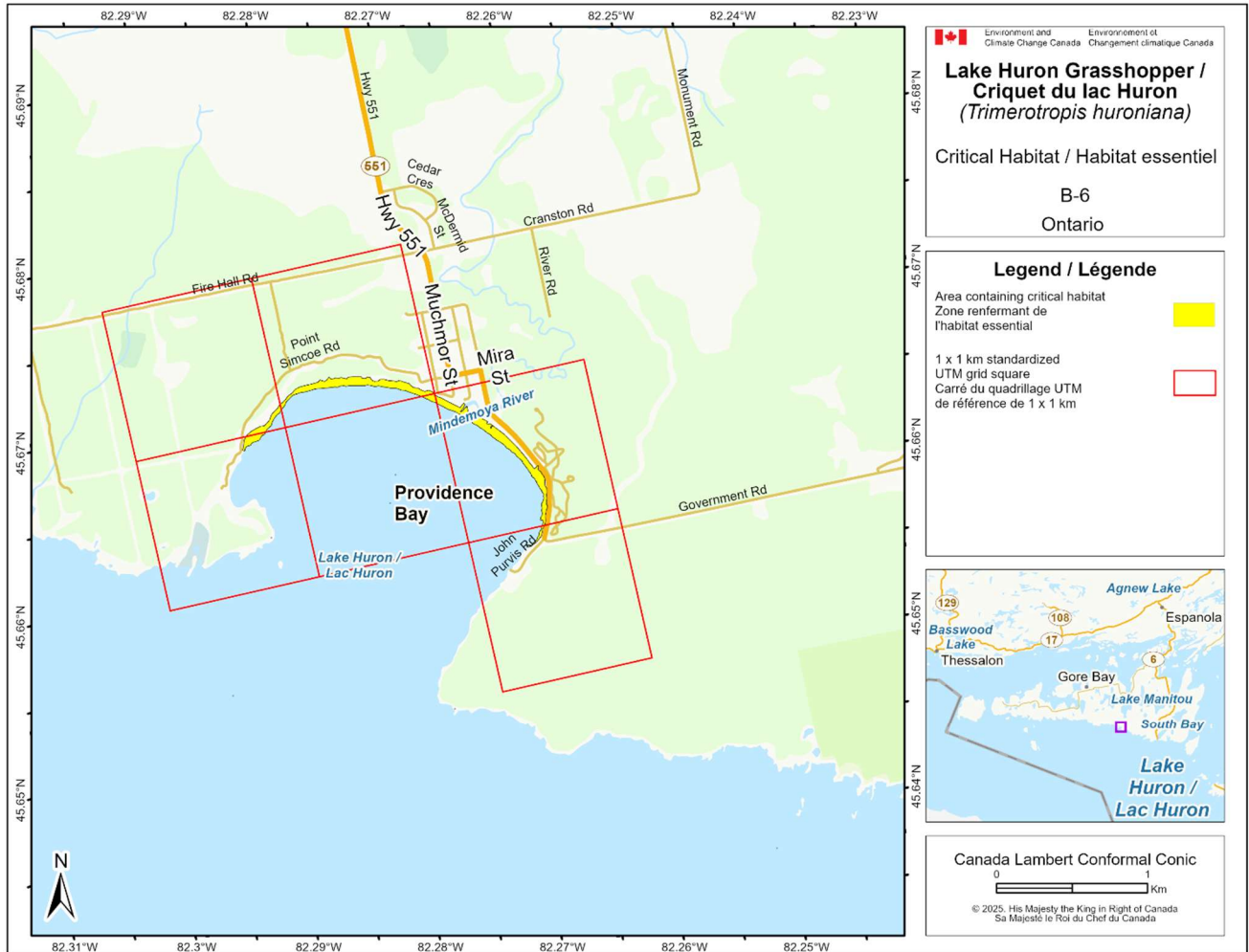
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 950 **Figure B-3.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
 951 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
 952 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
 953 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
 954 this figure is a standardized national grid system used to indicate the general geographic area
 955 within which critical habitat is found. Any additional boundaries are included for landmarking
 956 purposes only.
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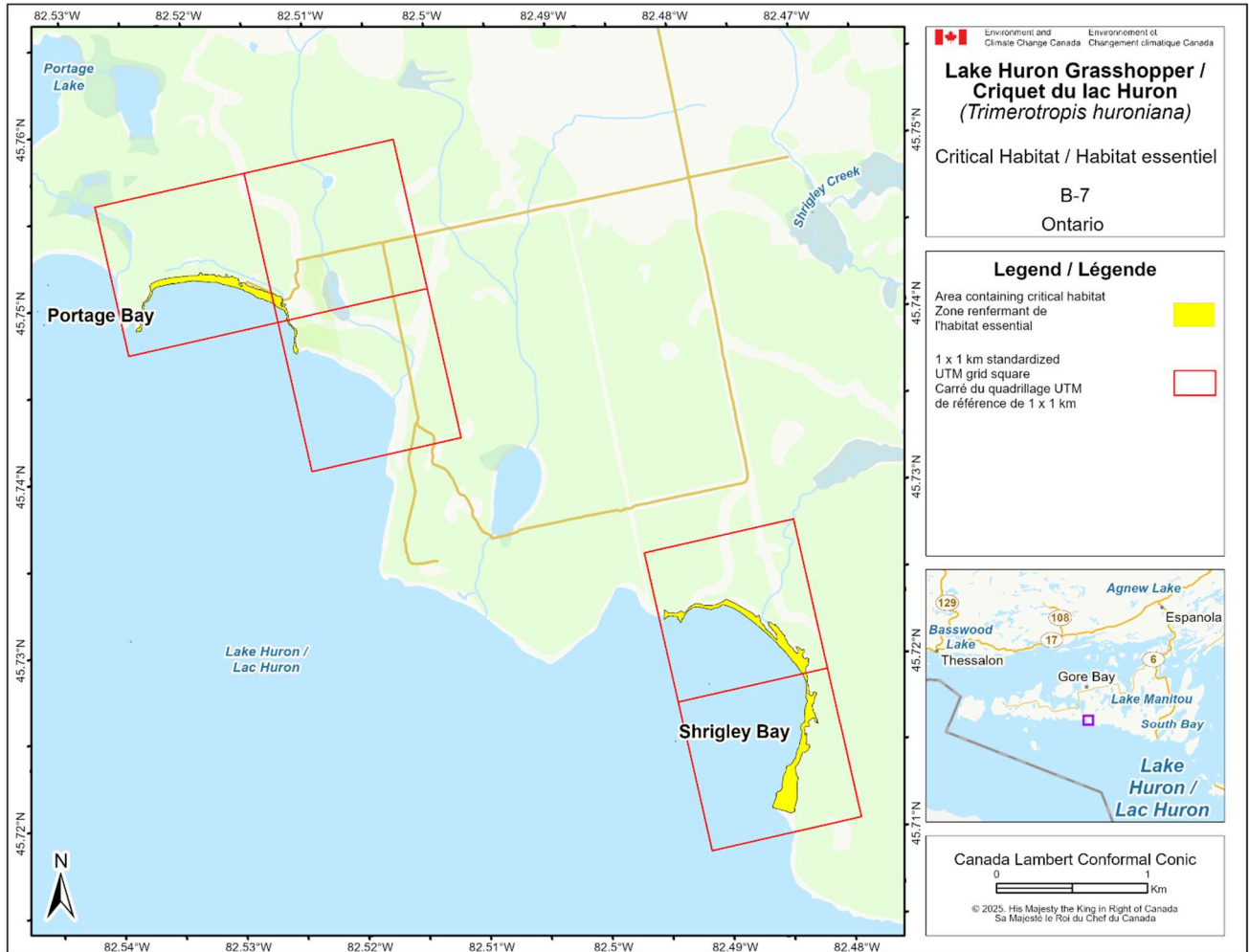
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 959 **Figure B-4.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
 960 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
 961 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
 962 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
 963 this figure is a standardized national grid system used to indicate the general geographic area
 964 within which critical habitat is found. Any additional boundaries are included for landmarking
 965 purposes only.
 966



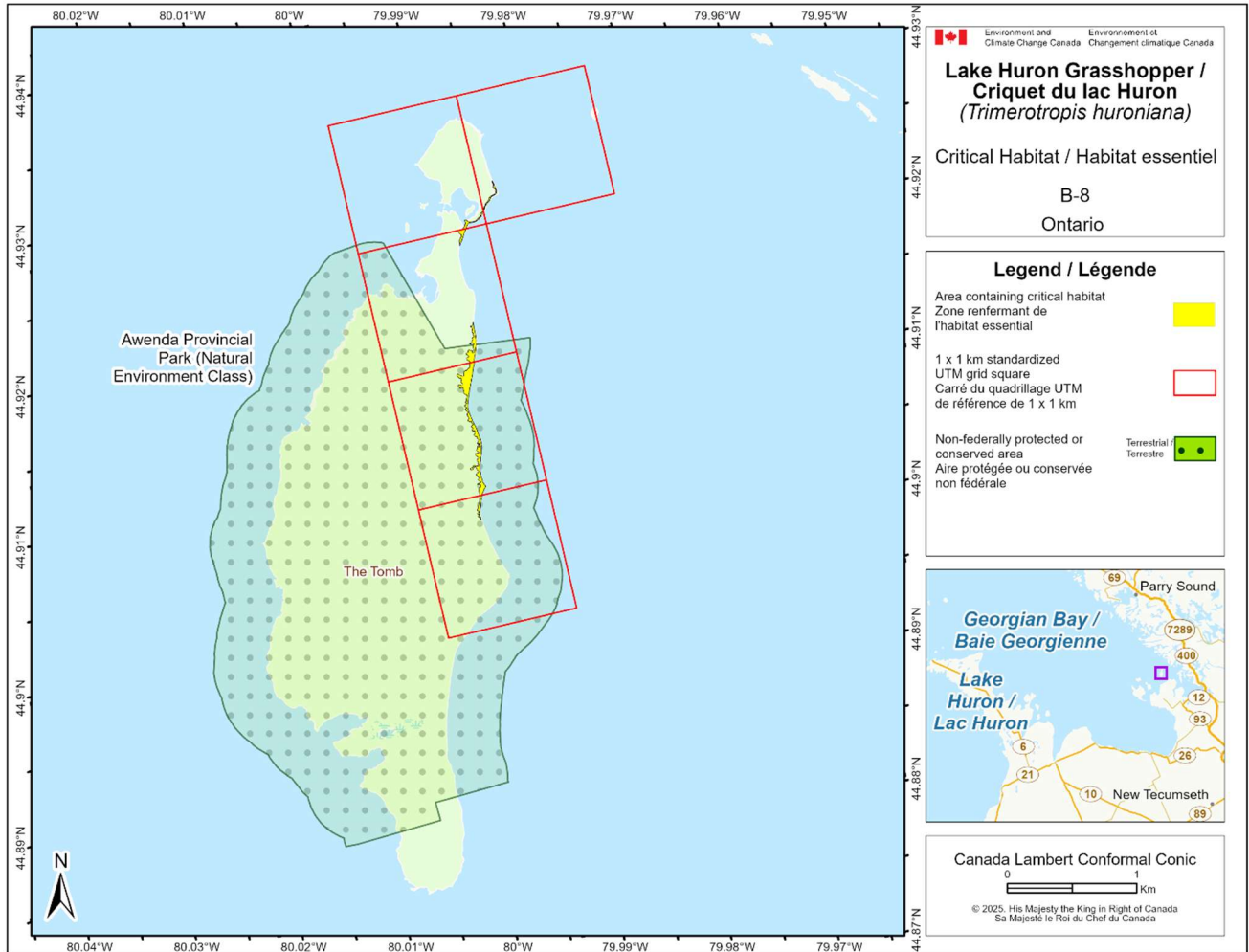
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 968 **Figure B-5.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
 969 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
 970 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
 971 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
 972 this figure is a standardized national grid system used to indicate the general geographic area
 973 within which critical habitat is found. Any additional boundaries are included for landmarking
 974 purposes only.
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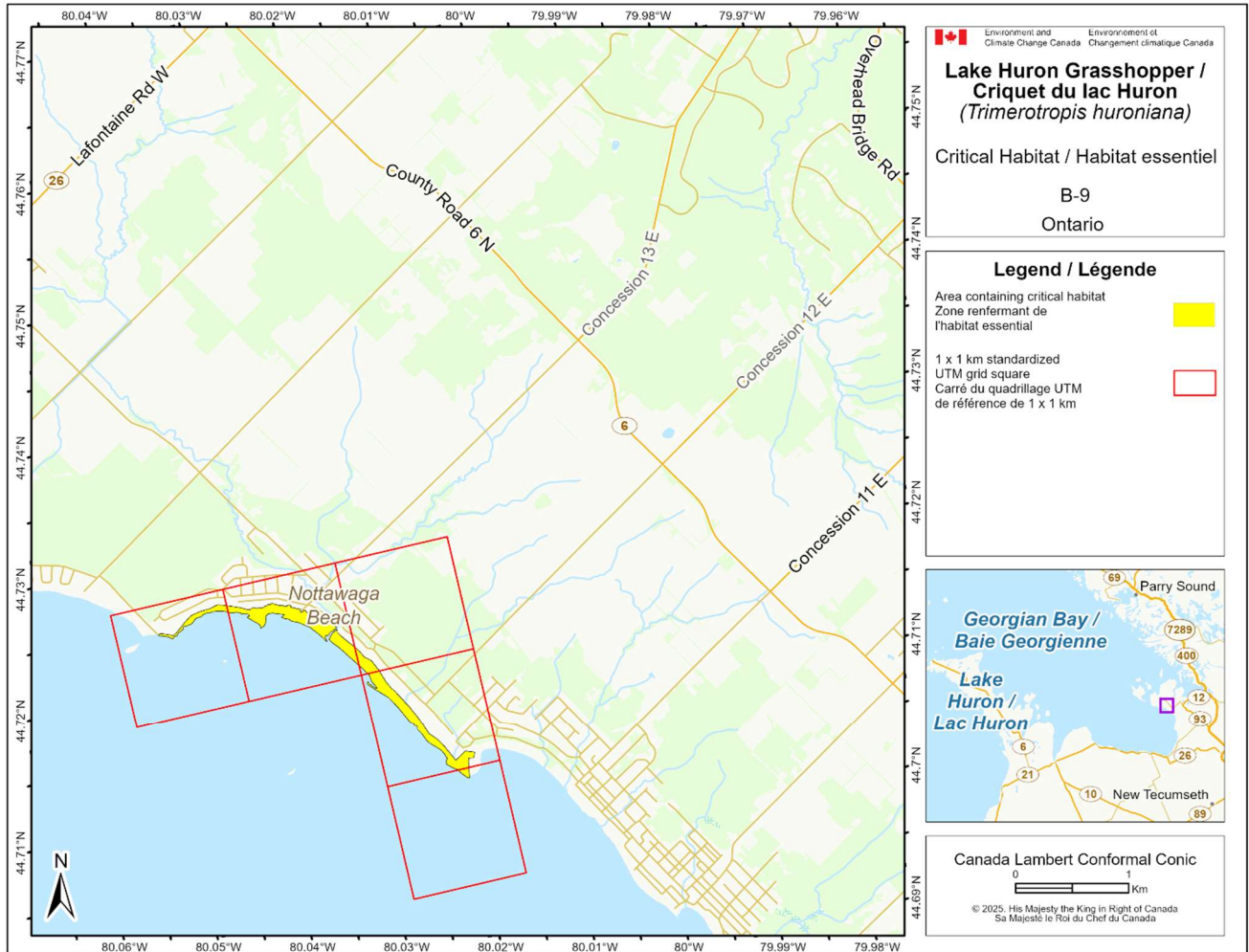
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 977 **Figure B-6.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
 978 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
 979 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
 980 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
 981 this figure is a standardized national grid system used to indicate the general geographic area
 982 within which critical habitat is found.
 983



984
 985 **Figure B-7.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
 986 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
 987 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
 988 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
 989 this figure is a standardized national grid system used to indicate the general geographic area
 990 within which critical habitat is found. Any additional boundaries are included for landmarking
 991 purposes only.
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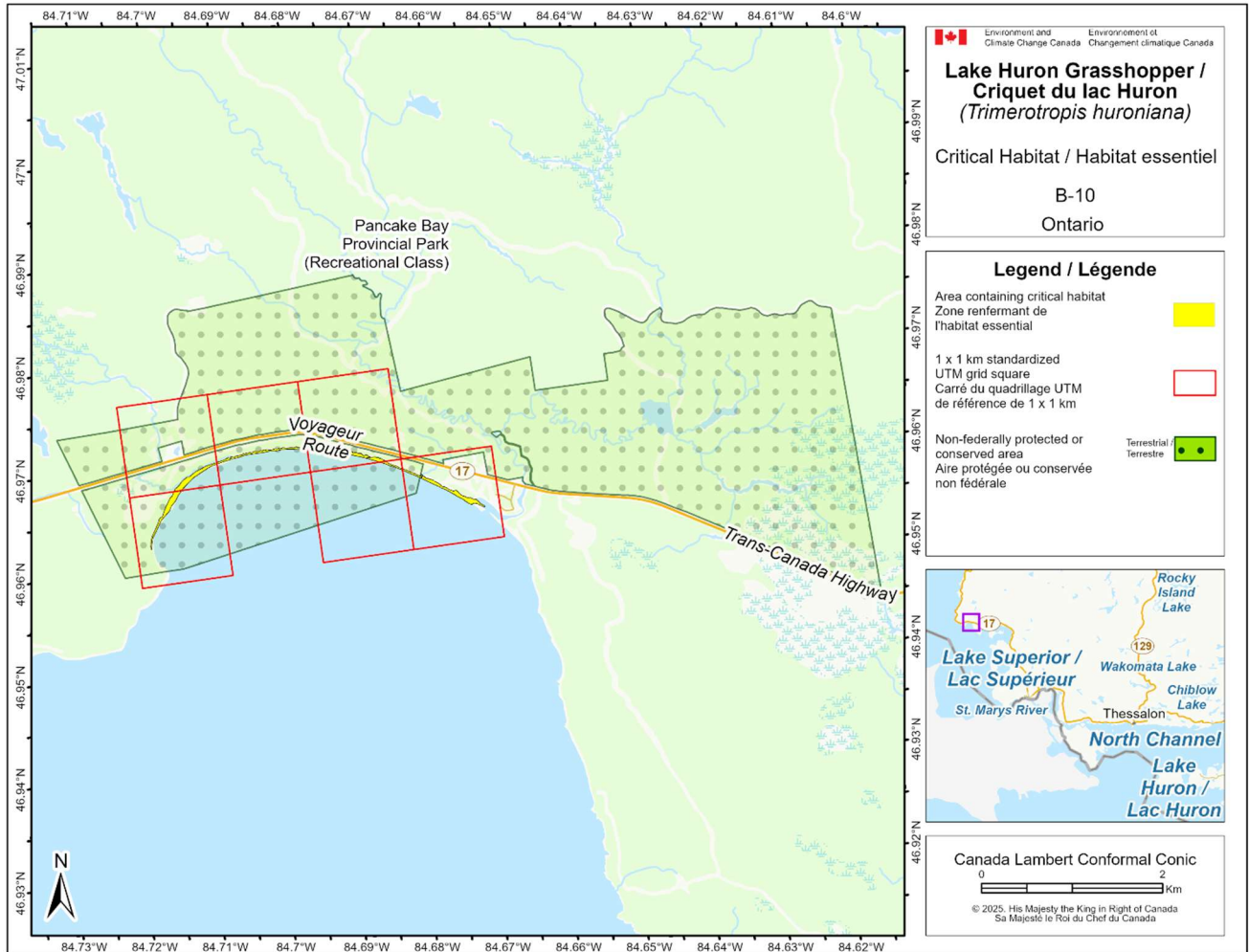


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 994 **Figure B-8.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
 995 critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by
 996 the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes
 997 described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on
 998 this figure is a standardized national grid system used to indicate the general geographic area
 999 within which critical habitat is found. Any additional boundaries are included for landmarking
 1000 purposes only.
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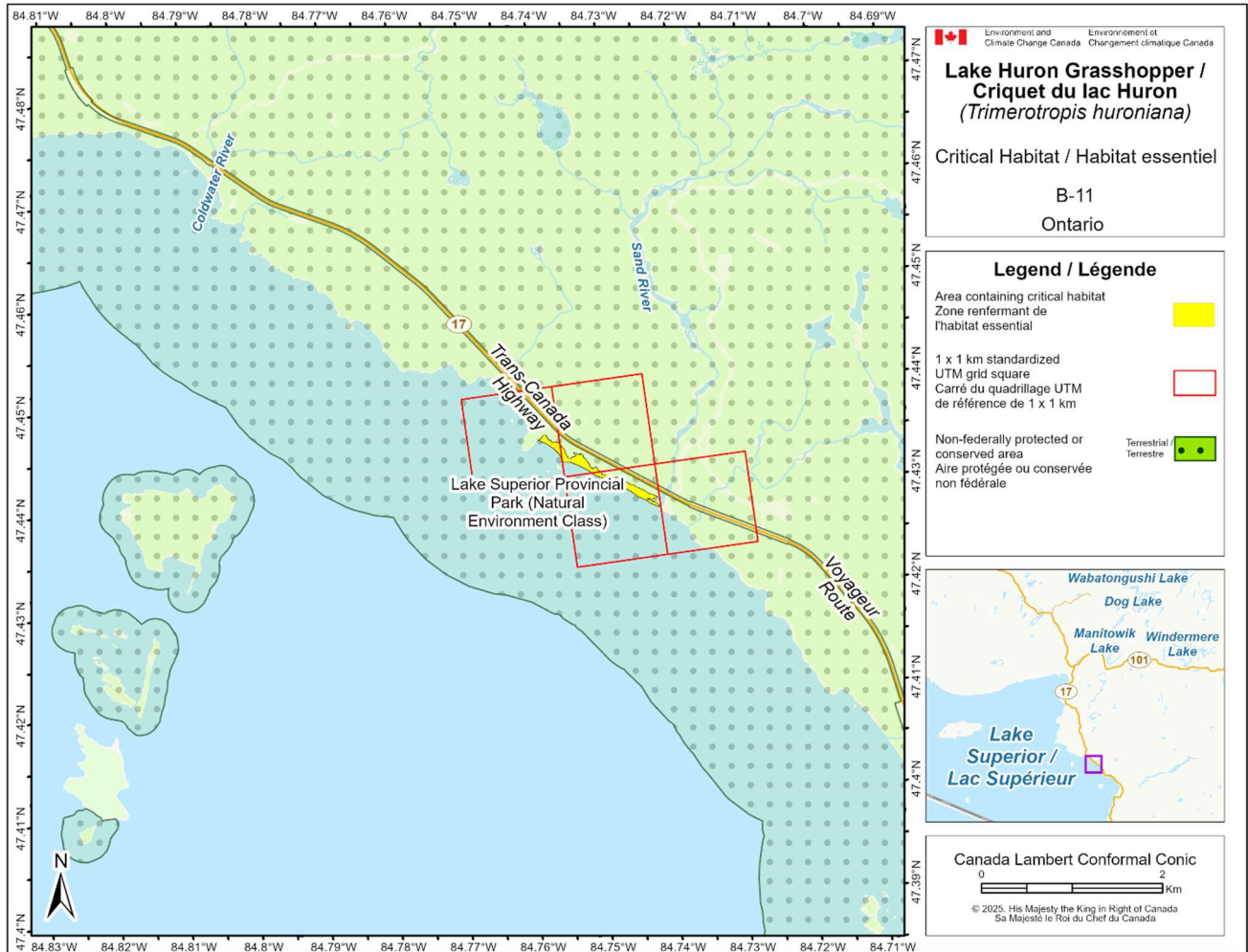


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Figure B-9. Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found. Any additional boundaries are included for landmarking purposes only.



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 1012 **Figure B-10.** Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing
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Figure B-11. Critical Habitat for the Lake Huron Grasshopper in Canada – The area containing critical habitat for the Lake Huron Grasshopper, as described in section 7.1.1, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.2 are found. The 1 km × 1 km UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found. Any additional boundaries are included for landmarking purposes only.

**Part 2 – *Recovery Strategy for the Lake Huron Grasshopper*
(*Trimerotropis huroniana*) in Ontario, prepared by
Judith Jones for the Ontario Ministry of the Environment,
Conservation and Parks**



Lake Huron Grasshopper

(*Trimerotropis huronia*) in Ontario

Ontario Recovery Strategy Series

2018

About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the *Endangered Species Act 2007* (ESA) and the Accord for the Protection of Species at Risk in Canada.

What is recovery?

Recovery of species at risk is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

Under the ESA a recovery strategy provides the best available scientific knowledge on what is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of the Environment, Conservation and Parks Species at Risk webpage at: www.ontario.ca/speciesatrisk

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Declaration

The recovery strategy for the Lake Huron Grasshopper was developed in accordance with the requirements of the *Endangered Species Act, 2007* (ESA). This recovery strategy has been prepared as advice to the Government of Ontario, other responsible jurisdictions and the many different constituencies that may be involved in recovering the species.

The recovery strategy does not necessarily represent the views of all of the individuals who provided advice or contributed to its preparation, or the official positions of the organizations with which the individuals are associated.

The recommended goals, objectives and recovery approaches identified in the strategy are based on the best available knowledge and are subject to revision as new information becomes available. Implementation of this strategy is subject to appropriations, priorities and budgetary constraints of the participating jurisdictions and organizations.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy.

Responsible jurisdictions

Ministry of the Environment, Conservation and Parks
Environment and Climate Change Canada – Canadian Wildlife Service, Ontario
Parks Canada Agency

Executive summary

The Lake Huron Grasshopper (*Trimerotropis huroniana*) is Threatened in Ontario. It is a mottled silver-grey insect with a broad dark band through the hind wing. It may be distinguished from the Seaside Grasshopper (*T. maritima*), also found on dunes, by a wide black blotch and narrow band on the inside of the hind leg. The Lake Huron Grasshopper is found only on dunes on the northern Great Lakes. In Canada it occurs only in Ontario on Manitoulin Island, Great Duck Island, north of Sault Ste. Marie, and on eastern Georgian Bay, at a total of 13 locations. The species is extirpated from Southampton and Wasaga Beach where it occurred historically. There are many dune sites not yet surveyed.

Suitable habitat for the Lake Huron Grasshopper consists of open sand sparsely vegetated with native dune plants. Dunes are dynamic habitats that change due to wind, wave-wash, ice-scour, changes in lake levels, and other factors. They are subjected to extremes of temperature, light, drought, etc., so the Lake Huron Grasshopper is likely adapted to survive a great range of conditions. The Lake Huron Grasshopper feeds primarily on native dune plants, especially native dune grasses and Field Wormwood (*Artemisia campestris*). Adults may be able to fly several kilometres. The Lake Huron Grasshopper is almost never found at the same sites as the Seaside Grasshopper, but the reasons for this are not known.

Shoreline development, heavy recreational usage including all-terrain vehicle use, invasive species, intentional removal of vegetation, and potentially climate change, are threats to the Lake Huron Grasshopper and its habitat. Natural limitations include a lack of suitable dune habitat, predation by native and non-native species, and the natural dynamic factors which maintain the habitat but occasionally also wipe out grasshoppers. Knowledge gaps include whether the Lake Huron Grasshopper is present at unsurveyed dune sites; the size of populations and whether they are stable, increasing or decreasing; and details on the biological requirements of the species that may affect its survival.

The recommended recovery goal is to maintain or increase the current number of populations and to maintain or increase the current range of the species for the next ten years. The recommended objectives are to: protect the species and its habitat with on-the-ground actions to reduce threats; assist municipalities and planning authorities in protecting the Lake Huron Grasshopper and its habitat; increase awareness about the Lake Huron Grasshopper and its habitat; and fill knowledge gaps related to species distribution, abundance and biology. A number of approaches to achieve these objectives and address threats are given in the text.

The specific habitat required by the Lake Huron Grasshopper is found within dune systems which change over time and which are subject to changes in lake levels. It is suggested that the area to be considered for a habitat regulation have tree and shrub cover $\leq 25\%$; contain vegetation of either Little Blue-stem-Long-leaved Reed Grass – Great Lake Wheatgrass (SDO1-2) or American Dune Grass – Beach Pea – Sand Cherry Dune Grassland (SDO1-3); have native dune grasses or wormwood present;

have been occupied by the Lake Huron Grasshopper in the last 15 years; and include a 15 m area adjacent to the dunes to include natural vegetation involved in maintaining dune dynamics. A further explanation of these characteristics with rationale is provided in this document.

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1.0 Background information

1.1 Species assessment and classification

Table 1. Species assessment and classification of the Lake Huron Grasshopper (*Trimerotropis huroniana*). The glossary on page 21 gives definitions for abbreviations and technical terms used in the table below and in the rest of this document.

Assessment	Status
SARO list classification	Threatened
SARO list history	Added to Schedule 3, June 2, 2017.
COSEWIC assessment history	Threatened (2015)
SARA schedule 1	Threatened (2017)
Conservation status rankings	GRANK: G2G3 NRANK: N2 SRANK: S2

1.2 Species description and biology

The Lake Huron Grasshopper, like all grasshoppers, has large back legs which are used for jumping, a flat-sided head with large eyes, and forewings (tegmina) which close over the hind wings and body when at rest (Milne and Milne 1980). The Lake Huron Grasshopper is a mottled silver-grey to brownish colour and from 24 to 40 mm in size (Figure 1). Occasionally some individuals may be more orange. The forewings are clear with random speckles and bands while the hind wings are clear or yellowish with a broad, dark band through the middle (COSEWIC 2015) (Figure 2a).

The Lake Huron Grasshopper may be distinguished from the very similar Seaside Grasshopper (*T. maritima*) by the two black bands on the inside of the upper hind leg (femur)—a broad one which covers almost half the femur and a second narrower one (Walker 1902; Bland 2003) (Figure 2b). The Seaside Grasshopper has only narrow black bands (Marshall 2003; Bland 2003). To see the inside of the back legs, it may be necessary to catch an individual (Marshall 2003), which is not advised.

The Lake Huron Grasshopper was formerly known as the Lake Huron Locust (Rabe 1999; Scholtens et al. 2005). However, locusts form swarms of large numbers of individuals, and swarm behavior is not known in this species (COSEWIC 2015).



Figure 1. The Lake Huron Grasshopper (Photo: Allan Harris)



Figure 2. a. Hind wing of the Lake Huron Grasshopper showing dark band. b. Inside of the back leg showing large dark blotch and narrow stripe (Photos: Robert Foster)

Species biology

The Lake Huron Grasshopper overwinters as an egg. Nymphs hatch in late spring and develop through five stages (instars). Adults may be found by mid-July and may survive until hard frosts in the fall (Rabe 1999). Mating occurs in late summer or early fall. The specifics of reproduction for the Lake Huron Grasshopper are not known, but the biology is thought to be similar to the closely-related Pallid-winged Grasshopper (*T.*

pallidipennis) (Otte 1970) which lays eggs in sandy soil. Since the Lake Huron Grasshopper is a species of dunes and beaches, presumably it lays eggs in its habitat and the eggs overwinter in the sand. Each female produces several egg clusters for a single generation (Milne and Milne 1980).

The Lake Huron Grasshopper feeds primarily on native dune plants and secondarily on dried plant debris and dead insects (Bland 2003; Scholtens et al. 2005). Preferred food plants include American Beachgrass (*Ammophila breiligulata*; also known as Marram Grass or American Dune Grass), Great Lakes Sandreed (*Sporobolus rigidus*; also known as Long-leaved Reed Grass), Field Wormwood (*Artemisia campestris*), and Sanddune Wildrye (*Elymus lanceolatus* ssp. *psammophilus*; also known as Great Lakes Wheatgrass) although most non-woody plants may be eaten including Pitcher's thistle (*Cirsium pitcheri*) (Rabe 1999), a threatened species in Ontario which usually occurs with the Lake Huron Grasshopper.

Courtship among Lake Huron Grasshoppers involves complex communication and attraction behaviours which may include flight displays of hovering or flashing of wings, sounds such as crackling (crepitation) and rubbing the femur on the forewings (stridulation), and male-male aggressive displays with shaking and tipping of their femurs (Otte 1970). These behaviours usually occur on sunny days with temperatures above 25°C (Rabe 1999).

The Lake Huron Grasshopper does not migrate, yet it is found on islands in Lake Huron and Lake Michigan (Rabe 1999; COSEWIC 2015)—some as much as 15 km from other land—suggesting that adults may be able to fly several kilometres over open water (COSEWIC 2015). As well, the Lake Huron Grasshopper has been observed to return to at least one site after an absence (Providence Bay in COSEWIC 2015), so presumably adults have the ability to move between sites when required. Within the habitat, on calm sunny days individuals may be found on sparsely vegetated sand, in evenly spread out territories of about 1 m². On windy or overcast days, the grasshoppers shelter together in areas of heavy dune grass (Rabe 1999).

The Seaside Grasshopper is found in the same types of dune and beach habitats as the Lake Huron Grasshopper. It is a much more common and widely occurring species, yet the two species almost never occur together (Walker 1902; Hubbell 1929; Marshall 2003; Scholtens et al. 2005; COSEWIC 2015). It is unknown why the two species generally do not occur together. It may be due to competition between the two for food, space, or other resources (Hubbell 1929; Otte 1970; COSEWIC 2015), to requirements for certain environmental conditions which may change, to different tolerances for disturbance which may increase or decrease, or to some other factor.

It has been speculated that the Seaside Grasshopper may be replacing the Lake Huron Grasshopper because some sites occupied in the 1990s by the Lake Huron Grasshopper no longer have that species present but were occupied by the Seaside Grasshopper in 2002 (Marshall 2003). On the other hand, in 2015 only the Lake Huron Grasshopper was present at two Manitoulin Island sites (COSEWIC 2015) where the Seaside Grasshopper had been present in 2002 (Marshall 2003). Thus there may be

some situations in which one species is better able to survive than the other. Many other species of grasshoppers are also present on beaches and dunes where the Lake Huron Grasshopper is present (see COSEWIC 2015) and may also compete with the species and reduce its presence.

The Lake Huron Grasshopper lives in dune and beach habitats which experience extremes of temperature, light, moisture level, wind, and shifting substrate (Albert 2000; Maun 2009), so presumably the species must be adapted to survive a wide range of environmental conditions and must have a broad tolerance to many factors. See Section 1.4: Habitat Needs.

1.3 Distribution, abundance and population trends

The global distribution of the Lake Huron Grasshopper is shown in Figure 3 below. The species is found on the shores of Lakes Huron, Michigan and Superior, in Ontario, Michigan, and Wisconsin (Ballard 1989; Scholtens et al. 2005; COSEWIC 2015). In Canada, the Lake Huron Grasshopper occurs only in Ontario. Its current range encompasses 13 populations, with 10 on Lake Huron along the south shore of Manitoulin Island and on Great Duck Island, two on Georgian Bay, and one on southern Lake Superior at Pancake Bay (Figure 4). A list of all localities where the species occurs is provided in Appendix A. There are still many dune sites on Lake Huron and Georgian Bay that have not been surveyed (Appendix A). The Lake Huron Grasshopper appears to be extirpated from Wasaga Beach and Southampton where it was reported historically.

COSEWIC (2015) listed eight populations at 11 sites, lumping Deans Bay, Lonely Bay, and Square Bay together. However, there is justification for treating all as separate populations. Lonely Bay and Square Bay are more than 1 km from each other, and all three sites are separated along the shore by stretches of unsuitable rocky or marshy habitat (Jones pers. obs.) or in a straight line distance by forested habitat. With the addition of two populations discovered in 2017, a total of 13 populations are considered extant.

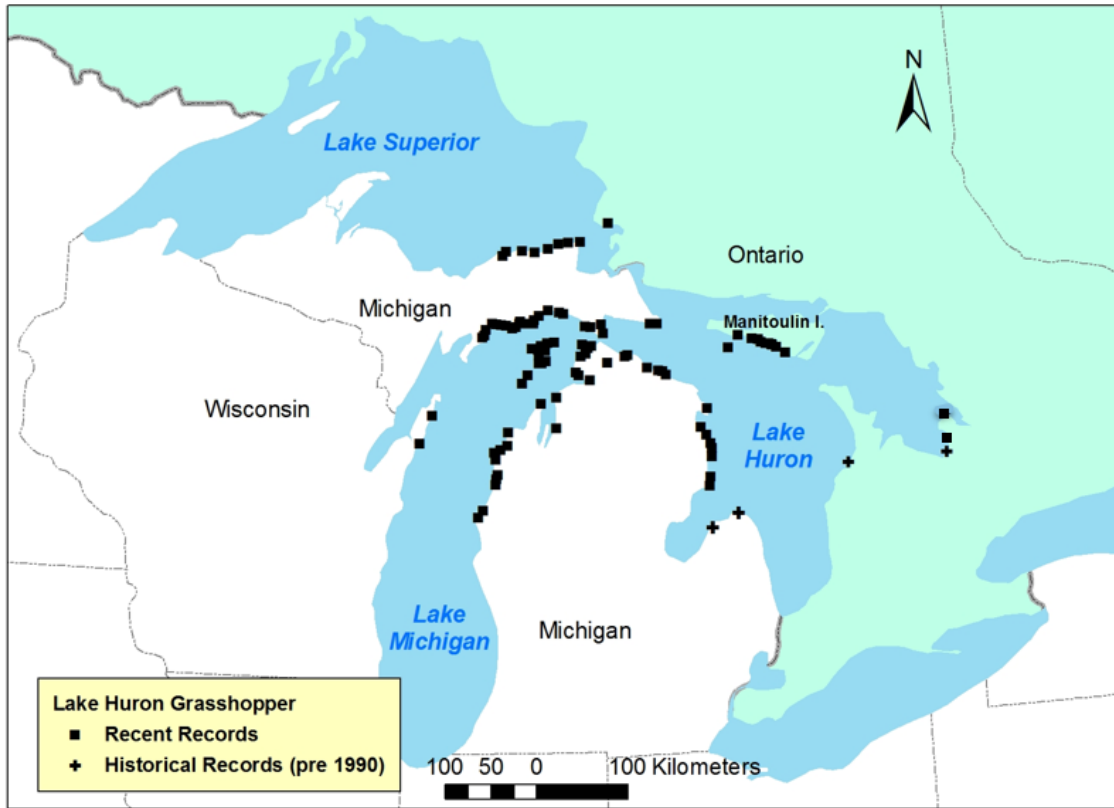


Figure 3. Global range of Lake Huron Grasshopper. Black squares indicate extant populations (observations within the last 20 years) (COSEWIC 2015; NHICa 2018).

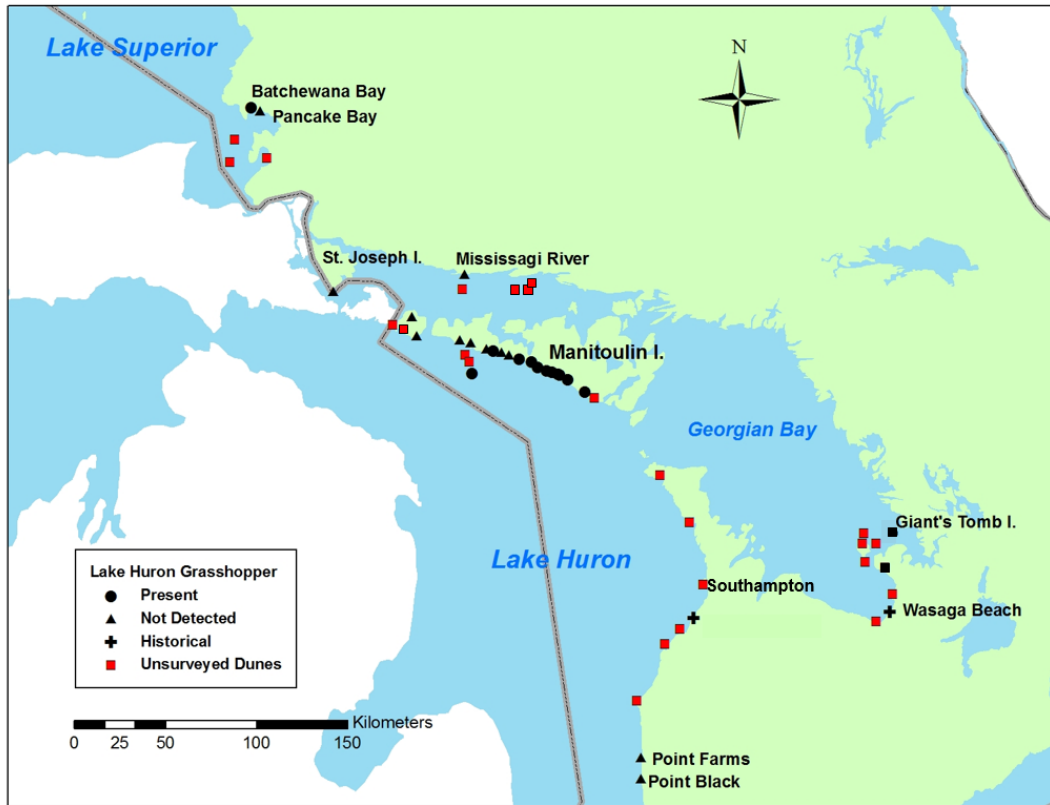


Figure 4. Current distribution of the Lake Huron Grasshopper in Ontario. Black circles indicate extant populations based on surveys in 2014 and 2017 (COSEWIC 2015; NHIC 2018a).

The species was first described from Southampton, Ontario (Walker 1902) and was present historically at Wasaga Beach but it is no longer present at these two sites (Marshall 2003; COSEWIC 2015). A historical population reported from Sauble Beach (COSEWIC 2015) is an error. The report authors did not know there were dunes at Southampton and so presumed the Southampton record must have come from Sauble Beach (Harris pers. comm. 2018). In fact, the Chantry Dunes at Southampton still contain intact dune vegetation (Jones 2002; Jones pers. obs. 2016) and are a completely separate dune system from that of Sauble Beach, which is more than 15 km away.

It is possible the distribution of the Lake Huron Grasshopper may be influenced in some way by the Seaside Grasshopper. Historically, Walker (1902) noted that the two species did not co-occur, and Hubble (1929) found that the Lake Huron Grasshopper replaced the Seaside Grasshopper at northern sites in Michigan. Between the 1940s and the 1960s the boundary between the two species on the western side of Lake Huron apparently moved northward by about 80 km although it moved southward on Lake Michigan in the same time period (Otte 1970). Collections of both species on Manitoulin Island in 2002-2003 (COSEWIC 2015) show the two species have been present at the same site but in different years, and that the two species were actually

present together once at one site.

There is no information about population abundance or trends for the Lake Huron Grasshoppers. However, fluctuations in population size are probably natural for dune species due to the changing nature of the habitat (see 1.4 Habitat needs). Fluctuations in population sizes may be tied to changing lake levels which periodically submerge portions of the habitat (Scholtens et al. 2005; Jones unpublished data 2000-2017). The dune species Pitcher's Thistle also exhibits fluctuations in population size probably as a result of natural dune dynamics (Parks Canada Agency unpublished data 2004-2017; Nantel et al. in prep).

1.4 Habitat needs

Lake Huron Grasshopper occurs only on dunes and beaches that have nearly bare sand and sparse vegetation of scattered grasses and herbaceous plants with little or no duff (Otte 1970, COSEWIC 2015) (Figure 5). Sparse conditions are found mainly on the foredune (the area closest to the lake after the wet, wave-wash zone) but may also be found further back (towards the forest) if disturbance has removed vegetation and opened the sand. Thus, the Lake Huron Grasshopper mainly occupies the foredune but is occasionally found further back from the water in sparser spots (Harris pers. comm. 2018).



Figure 5. Habitat of the Lake Huron Grasshopper showing patches of sparse vegetation on the foredune (Photo: Judith Jones).

On Lake Huron, the vegetation community that contains suitable habitat is classified as Little Bluestem – Long-leaved Reed Grass – Great Lakes Wheat Grass Dune Grassland

SDO1-2 (Lee et al. 1998). On Lake Superior (Great Lakes - St. Lawrence region), it may be classified as American Dune Grass – Beach Pea – Sand Cherry Dune Grassland SDO1-3 (NHIC 2018b; Bakowsky pers. comm. 2018) or less specifically as Active Eolian Sand G006X (Banton et al. 2009; Webster et al. 2015) although total vegetation cover is usually greater than 25% (Jones personal observations 2017; Bakowsky pers. comm. 2018). In both regions, these dune vegetation types are of conservation concern and considered imperiled in Ontario or S2 (NHIC 2018b).

Dune habitats are dynamic and are subject to forces that move sand, such as wind, wave-wash, ice movement, and changes in lake levels (Albert 2000; Maun 2009). These forces maintain open sand conditions and prevent the long-term growth of most tree species (Dech et al. 2005; Maun 2009). In the absence of dynamic forces, more plant growth occurs and sand may become too vegetated for the Lake Huron Grasshopper.

As well, water levels in the Great Lakes naturally fluctuate in cycles of approximately 30 years with 120 to 160 year extremes (Quinn and Sellinger 2006; Wilcox et al. 2007). At high levels, lake water submerges large portions of beach, but when the water recedes again, newly exposed bare sand becomes suitable habitat (Scholtens et al. 2005; Jones unpublished data 2000-2017).

The presence of preferred food plants, such as American Beachgrass, Great Lakes Sandreed, and especially Field Wormwood, may be required for habitat suitability for the Lake Huron Grasshopper (COSEWIC 2015). Although the Lake Huron Grasshopper has been found to eat most dune plant species (Rabe 1999), studies in Michigan have found the Lake Huron Grasshopper is more likely to be found where Wormwood and other native species are present and less likely to be found where some invasive species are present (Marshall and Storer 2007).

The sparse microhabitat occupied by the Lake Huron Grasshopper in Ontario ranges in size from 1.2 ha to 30 ha and in width from approximately 3 m to 400 m (COSEWIC 2015). Interestingly, the shape of the dunes or beaches used by the species varies greatly. Some systems may be long and narrow, such as the 10 ha Pancake Bay site which is more than 4 km in length but only ~70 m at the widest. Others are shorter and wider, such as the 8 ha Shrigley Bay site which is 1 km in length and 130 m at the widest or the 19 ha Carter Bay site, which is 1 km in length and 260 m wide at the widest (Jones unpublished data 2018). Scholtens et al. (2005) working in Michigan also found that the size of the dune system (length, width or both) was not correlated with the presence or absence of the Lake Huron Grasshopper. Thus, it seems that size is not necessarily a factor in habitat suitability.

Sites occupied in 2015 were observed to have lower levels of human disturbance and more intact dune flora than sites where the Lake Huron Grasshopper has been extirpated (COSEWIC 2015). On the other hand, Scholtens et al. (2005) found that Lake Huron Grasshopper presence on Michigan dunes was reduced only at high levels of anthropogenic disturbance or great presence of invasive species, so it is possible that the species tolerates moderate levels of disturbance. As well, dune habitats may

recover from some types of disturbance if activities causing disturbance are restricted (COSEWIC 2010). Also, if dunes become highly vegetated because natural disturbance is low, light human disturbance (such as light foot traffic) is sometimes the only force creating sparse conditions (Jones unpublished data 2000-2017) and thus could be somewhat beneficial. In general, however, higher quality habitat has natural disturbance dynamics rather than disturbance from human activities.

1.5 Limiting factors

Suitable habitat for the Lake Huron Grasshopper is naturally limited. It is estimated that only 1800 ha of freshwater coastal dunes exist in Canada, with 492 ha on Lake Huron, 100 ha on Lake Superior, and the remaining 1,208 ha on Lakes Erie and Ontario (where the Lake Huron Grasshopper does not occur) (Bakowsky and Henson 2014). Dunes with suitable vegetation are imperiled in Ontario (NHIC 2018b).

Natural predation may limit the Lake Huron Grasshopper. There are many species that prey on grasshoppers including mammals such as Northern Raccoon (*Procyon lotor*), Red Fox (*Vulpes vulpes*); birds including American Kestrel (*Falco sparverius*), Common Grackle (*Quiscalus quiscula*), and probably most gulls; American Toad (*Anaxyrus americanus*); and arthropods such as robber flies and spiders (COSEWIC 2015). The larvae of some types of insects including some species of blister beetle (Coleoptera: *Meloidae*) and bee flies (Diptera: *Bombyliidae*) eat grasshopper eggs (COSEWIC 2015).

In addition, natural dune dynamics may limit the Lake Huron Grasshopper. In times of high natural disturbance (high lake levels, years with more frequent winter storms, etc.) areas of dune habitat may be periodically wiped out or drastically changed (Jones personal observations 2016-2017), which may reduce the presence of the grasshopper (Scholtens et al. 2005). There may also be periods in which natural disturbance is low (low lake levels, fewer winter storms, less wind, etc.), in which dune vegetation may increase in density, again creating unsuitable conditions. Presumably, species that live on dunes must be adapted to survive natural change cycles since these dynamics also create suitable habitat. However, population sizes and even presence/absence may be affected by these natural limitations.

1.6 Threats to survival and recovery

Factors that alter or degrade dune or beach habitats are threats to the Lake Huron Grasshopper. These include shoreline development, heavy recreational usage including inappropriate all terrain vehicle (ATV) use and trampling, invasive species, and intentional removal of all vegetation. Climate change may also be a potential threat.

Shoreline Development

Development of shorelines with the construction of homes, cottages, and other buildings may alter or destroy backdune habitats and lead to increased recreational usage. Construction of structures on dunes such as residences, driveways, breakwaters or retaining walls, may interfere with the natural movement of sand and change dune dynamics. A high density of homes, cottages, and retail operations probably caused the extirpation of the Lake Huron Grasshopper from historical sites at Wasaga Beach and Southampton (COSEWIC 2015). However, on many Manitoulin Island dune sites cottage development has already taken place and habitats have recovered to their current status (Jones pers. obs. 2000-2017), and three populations are in or adjacent to protected areas where shoreline activities are managed (Pancake Bay; parts of Taskerville on western Manitoulin Island; Giant's Tomb Island). In addition, landowner presence may reduce damaging behavior, compared to beaches perceived to be "uninhabited", because landowners tend to be vigilant of what occurs in front of their properties and usually discourage excessive use by non-residents (Jones pers. obs. 2000-2017). Still, the potential for future cottage development remains at some sites, which may have damaging effects on the habitat.

Heavy Recreational Usage

Heavy use of beaches and dunes for recreation may result in trampling and damage of dune vegetation. Recreation may result in heavy foot traffic, or may involve clearing vegetation for volleyball courts, fire pits, and boat storage. In addition, off-trail use of ATV may damage large areas of vegetation, cause erosion, and introduce invasive species. Off-trail ATV use is a widespread occurrence on Manitoulin Island dunes (COSEWIC 2015; Parks Canada unpublished data 2004-2017). Light recreational activities (occurring only infrequently and by few people, such as a small amount of foot traffic over the dunes or an occasional picnic) may not be harmful as the Lake Huron Grasshopper is tolerant of moderate disturbance, but heavy usage, especially by ATVs, may reduce the presence of the Lake Huron Grasshopper (Scholtens et al. 2005).

Invasive Species and Problematic Native Species

Invasive plant species grow quickly and spread rapidly, densely covering and stabilizing the sand. This eventually eliminates native plants including those needed by the Lake Huron Grasshopper for food and shelter. When non-dune species become established, it may lead to different insects being present. For example, sites with Spotted Knapweed (*Centaurea stoebe* ssp. *micranthos*) were found to have greater numbers of ants and beetles (Marshall et al. 2008), some of which may compete with the Lake Huron Grasshopper or prey on its larvae (COSEWIC 2015). Invasive species in the habitat of the Lake Huron Grasshopper include White Sweet-clover (*Melilotus alba*), European Common Reed (*Phragmites australis* ssp. *australis*), Scots Pine (*Pinus sylvestris*), Glandular Baby's Breath (*Gypsophila scorozonerifolia*), and Spotted Knapweed (Jones unpublished data 2000-2017). Invasive species are most likely to

occur at sites with a high degree of public access or ATV use (COSEWIC 2015; Jones pers. obs. 2011-2017).

An increase in competing native grasshopper species may lead to a reduction or loss of local populations of the Lake Huron Grasshopper. Scholtens et al. (2005) observed that the Mottled Sand Grasshopper (*Spharagemon collare*) displaced the Lake Huron Grasshopper at sites where heavy disturbance had occurred. They speculated that changes in the vegetation resulting from the disturbance favoured the Mottled Sand Grasshopper over the Lake Huron Grasshopper. The Seaside Grasshopper may also out-compete and displace the Lake Huron Grasshopper. As yet it is unknown what types of conditions favour the Lake Huron Grasshopper over its competitors.

At low lake levels when natural disturbance from wave-wash and ice buildup is low, native woody vegetation may grow quickly and reduce the size of the suitable habitat. During the period of years when this occurs, it is possible that populations of the Lake Huron Grasshopper may be reduced in abundance or increased in density within a smaller area. How Lake Huron Grasshopper populations respond to natural lake and vegetation cycles is unknown. COSEWIC (2015) noted there was some evidence that woody vegetation was growing in at a faster rate than new dunes were developing. However, those observations were made at only one point in time during a low water year within the 30-year lake level cycle. At the time of this writing in 2018, water levels in Lake Huron had risen again, inundating beaches and removing vegetation, so likely the dune-building dynamics remain intact at most sites. Still, in the presence of other threats, it is unknown whether Lake Huron Grasshopper populations remain able to rebound from natural disturbance cycles.

Intentional Removal of Vegetation

Landowners adjacent to beachfront property sometimes remove all vegetation from parts of the dunes, desiring a beach with only bare sand and no plant matter (Jones unpublished data 2000-2017). This removes habitat for the Lake Huron Grasshopper as well as all other dune species that were present. It also allows wind to move greater quantities of sand, often resulting in unwanted build up on walkways, streets, lawns, and elsewhere. Some municipalities on Manitoulin Island have by-laws prohibiting alteration of beaches without permission, but enforcement can be difficult. Large machinery is often a vector for invasive species (Halloran et al. 2013) as dirt or mud stuck in tracks and pinch points can harbor seeds or plant fragments. Thus, the use of machinery to remove vegetation may be especially harmful.

Climate Change

A study in Michigan (Lee et al. 2011) found the Lake Huron Grasshopper to be moderately vulnerable to the effects of climate change and predicted a decrease in its geographic range as a result. Many potential changes such as late spring frosts, unusually cool and wet growing seasons or increased temperature (leading to lower

lake levels) may all have effects on the species (COSEWIC 2015). So far, no direct threats to the Lake Huron Grasshopper from climate change have been documented, so the impacts of climate change are unknown.

1.7 Knowledge gaps

Many dune sites on Lake Huron have not been surveyed for the Lake Huron Grasshopper, so the full distribution and abundance of the species is unknown. A list of sites with potentially suitable habitat that have not been surveyed is presented in Appendix A.

The sizes of Lake Huron Grasshopper populations are not known, so it is unknown whether populations are stable, increasing, or declining, and if so at what rate. In addition, how the populations respond to lake level cycles is unknown, including whether the species undergoes periodic episodes of low abundance or whether there are periods in which density increases in smaller habitat areas.

Additional information on the biological requirements of the Lake Huron Grasshopper is needed to ensure the species and its required habitat parameters are adequately protected. Biological knowledge gaps include (but are not limited to) the egg-laying process, the effects of predators, and the mechanisms that prevent the species from co-occurring with the Seaside Grasshopper and other species, and habitat conditions that may favour competing species over the Lake Huron Grasshopper (COSEWIC 2015).

1.8 Recovery actions completed or underway

2004-2011 Lake Huron Grasshopper co-occurs with Pitcher's Thistle. The Pitcher's Thistle - Dune Grasslands Recovery Team has overseen many recovery initiatives to benefit dune habitats, including installation of signage, preparation of outreach materials, and implementation of monitoring of all dunes on Manitoulin Island and southern Lake Huron (Parks Canada Agency 2011; Jones unpublished data 2000-2017; Parks Canada Agency unpublished data 2004-2017).

2017 The Township of Central Manitoulin has received a permit to do work on the Providence Bay beach that will lead to an overall benefit for Pitcher's Thistle and the dune habitat. Beneficial actions include removal of large patches of non-dune shrub species, invasive species, and ground thatch to increase available open sand. This should also improve habitat for the Lake Huron Grasshopper.

2017 Pancake Bay Provincial Park has put information about the Lake Huron Grasshopper in the park's visitor information tabloid (Morris, pers. comm. 2018).

2016-on-going The Manitoulin Phragmites Project is reducing the presence of invasive European Common Reed (*Phragmites australis australis*) across Manitoulin and Cockburn Islands. The Project has already brought Phragmites under control at all Manitoulin sites where the invasive was in the habitat of the Lake Huron Grasshopper.

An annual Beach Action Day to remove invasive species from the Providence Bay beach with the public has also been hosted.

2.0 Recovery

2.1 Recommended recovery goal

The recommended recovery goal for the Lake Huron Grasshopper is to maintain or increase the current number of populations at 13 or more, and maintain or increase the current range of the species by maintaining and protecting habitat and reducing other threats.

There is no information on abundance for any population of Lake Huron Grasshopper, therefore abundance cannot be used at present to measure the success of recovery. The number of populations is known and can be tracked, and may be used to measure recovery results. Lake levels also rise and fall, causing habitat size and species abundance to change periodically. Therefore, the recommended goal of maintaining populations and current range is a reasonable way to ensure the Lake Huron Grasshopper is able to survive and recover.

2.2 Recommended protection and recovery objectives

Table 2. Recommended protection and recovery objectives.

Number	Protection or recovery objective
1	Protect the species and its habitat with on-the-ground actions to reduce threats.
2	Assist municipalities and planning authorities in protecting the Lake Huron Grasshopper and its habitat.
3	Increase awareness about the Lake Huron Grasshopper and its rare habitat.
4	Fill knowledge gaps related to species distribution, abundance and biology.

2.3 Recommended approaches to recovery

Table 3. Recommended approaches to recovery of the Lake Huron Grasshopper in Ontario.

Objective 1: Protect the species and its habitat with on-the-ground actions to reduce threats.

Relative priority	Relative timeframe	Recovery theme	Approach to recovery	Threats or knowledge gaps addressed
Critical	Ongoing	Management, Stewardship	<p>1.1 Reduce off-trail ATV use and trampling from foot traffic.</p> <ul style="list-style-type: none"> • Designate trails, install signage, place barriers. • Assist landowners and municipalities with on-the-ground actions. 	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational use. • Invasive species. • Problematic native species.
Critical	Ongoing	Management, Stewardship	<p>1.2 Remove or control invasive species in the habitat of the Lake Huron Grasshopper.</p> <ul style="list-style-type: none"> • Follow species-specific best management practices for control. • Assist landowners and municipalities with on-the-ground actions. • Explain and encourage the use of the clean equipment protocol for any vehicle that must enter the beach. 	<p>Threats:</p> <ul style="list-style-type: none"> • Invasive species.
Critical	Ongoing	Protection, Communication	<p>1.3 Reduce or stop the removal of native dune vegetation.</p> <ul style="list-style-type: none"> • Work with by-law and conservation officers to identify sites where increased compliance may be needed. • Provide positive information to landowners and beach users which suggest balanced alternatives. 	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational use • Intentional removal of vegetation

Objective 2: Assist municipalities and planning authorities in protecting the Lake Huron Grasshopper and its habitat.

Relative priority	Relative timeframe	Recovery theme	Approach to recovery	Threats or knowledge gaps addressed
Critical	Short-term	Communication	<p>2.1 Ensure municipalities and planning authorities are aware of the Lake Huron Grasshopper and its protection under Ontario's <i>Endangered Species Act 2007</i>.</p> <ul style="list-style-type: none"> • Provide occurrence data and information on threats. 	<p>Threats:</p> <ul style="list-style-type: none"> • Shoreline development. • Heavy recreational usage. • Invasive species. • Intentional removal of vegetation.
Necessary	On-going	Communication, Education and Outreach	<p>2.2 Ensure municipalities and planning authorities have a basic understanding of dune habitats and their dynamics.</p> <ul style="list-style-type: none"> • Discuss dune habitats with planners and other municipal staff or officials. • Provide educational materials about dunes for municipal use which can be given to the public if needed during the planning process. 	<p>Threats:</p> <ul style="list-style-type: none"> • Shoreline development. • Heavy recreational usage. • Invasive species. • Intentional removal of vegetation.
Beneficial	Long-term	Policy, Communication	<p>2.3 Encourage by-laws that prohibit alteration of beaches.</p> <ul style="list-style-type: none"> • Discuss such by-laws with municipalities. • Create an example by-law that can be used as a starting point. 	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational usage. • Intentional removal of vegetation.

Objective 3: Increase awareness about the Lake Huron Grasshopper and its rare habitat.

Relative priority	Relative timeframe	Recovery theme	Approach to recovery	Threats or knowledge gaps addressed
Critical	On-going	Education and Outreach	<p>3.1 Create educational materials to engage the public in protecting the Lake Huron Grasshopper.</p> <ul style="list-style-type: none"> • Provide materials to nature centres, tourist operations, libraries, and other public sites. • Use different types of media including video and sound in addition to print. 	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational usage. • Invasive species. • Intentional removal of vegetation.
Necessary	On-going	Education and Outreach; Stewardship	<p>3.2 Host events where the public can assist with stewardship and habitat improvement</p> <ul style="list-style-type: none"> • Show participants information about the Lake Huron Grasshopper and dune habitats. • Enlist the public's help, show participants they can make a difference, and create a sense of team work. • Events may involve actions in 1.1, such as removal of invasive species, installation of signs, etc. 	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational usage. • Invasive species. • Intentional removal of vegetation.
Necessary	On-going	Education and Outreach; Stewardship	<p>3.3 Encourage landowners to steward their dunes and to feel pride in ownership of a natural area.</p> <ul style="list-style-type: none"> • Assist landowners with actions on their properties. • Give recognition such as books, caps, etc. for good stewardship. 	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational usage. • Invasive species. • Intentional removal of vegetation.
Beneficial	On-going	Communication	<p>3.4 Provide information on financial incentives to landowners for protection of dune habitat, such as Conservation Land Tax Incentive Program (CLTIP). Habitat Stewardship Program (HSP) etc.</p>	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational usage. • Invasive species. • Intentional removal of vegetation.

Recovery Strategy for the Lake Huron Grasshopper in Ontario

Relative priority	Relative timeframe	Recovery theme	Approach to recovery	Threats or knowledge gaps addressed
Beneficial	On-going	Education and Outreach	<p>3.5 Partner with schools to do outreach with younger people.</p> <ul style="list-style-type: none"> • Discuss the Lake Huron Grasshopper, dune habitats, and species-at-risk. • Work to improve perceptions about insects in general. 	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational usage. • Intentional removal of vegetation.
Beneficial	Long-term	Communication, Stewardship	<p>3.6 Create partnerships with local groups.</p> <ul style="list-style-type: none"> • Enlist help with stewardship, habitat improvement, and outreach activities. 	<p>Threats:</p> <ul style="list-style-type: none"> • Heavy recreational usage. • Invasive species. • Intentional removal of vegetation.

Objective 4: Fill knowledge gaps related to species distribution, abundance and biology.

Relative priority	Relative timeframe	Recovery theme	Approach to recovery	Threats or knowledge gaps addressed
Critical	Short-term	Inventory	<p>4.1 Survey additional dune sites for the Lake Huron Grasshopper.</p> <ul style="list-style-type: none"> • Search during appropriate timing and weather conditions. 	<p>Knowledge gaps:</p> <ul style="list-style-type: none"> • Distribution and abundance of Lake Huron Grasshopper.
Necessary	Long-term	Monitoring and assessment	<p>4.2 Determine relative abundance and population trends for the Lake Huron Grasshopper.</p> <ul style="list-style-type: none"> • Develop and implement a monitoring program to track abundance and threats to habitat so that risk can be better assessed and response to impacts can occur quickly. • Use monitoring data to track population trends and level of risk faced by the Lake Huron Grasshopper. • Use data to determine whether encroaching vegetation is a threat in periods of low lake level. 	<p>Knowledge gaps:</p> <ul style="list-style-type: none"> • Abundance and trends in Lake Huron Grasshopper populations. • Problematic native species.

Recovery Strategy for the Lake Huron Grasshopper in Ontario

Relative priority	Relative timeframe	Recovery theme	Approach to recovery	Threats or knowledge gaps addressed
Beneficial	Long-term	Research	<p>4.3 Investigate the biology of the Lake Huron Grasshopper.</p> <ul style="list-style-type: none"> • Study interactions with other species, especially Seaside Grasshopper. • Study microhabitat requirements and determine conditions that may favour the Lake Huron Grasshopper over competing species. • Study behaviours such as egg-laying, feeding, etc. 	<p>Knowledge gaps:</p> <ul style="list-style-type: none"> • Biological factors that affect habitat requirements, distribution, and abundance. • Problematic native species.
Beneficial	Long-term	Research	<p>4.4 Based on information from 4.3, study the potential effects of climate change on the Lake Huron Grasshopper, for example:</p> <ul style="list-style-type: none"> • whether higher temperatures favour other species over the Lake Huron Grasshopper; • Whether shorter winters may change phenology such as timing of egg-laying; and • Whether altered climate may affect microhabitat suitability. 	<p>Knowledge Gaps</p> <ul style="list-style-type: none"> • Whether climate change is a threat to the Lake Huron Grasshopper.

Narrative to support approaches to recovery

Working with municipalities will be important for recovery. On most Manitoulin Island shorelines, the land below the historical high water mark is a right-of-way owned by the municipality (Land Information Ontario 2018). This includes most of the area occupied by the Lake Huron Grasshopper. The back dune (inland) part of wider beaches or dunes is usually privately owned. The municipal part of the beach is used by the adjacent landowners and sometimes by visitors from elsewhere if there is access. Helping municipalities find ways to manage and monitor their beaches may be useful.

Some municipalities have by-laws about what activities may occur on the beach and prohibit modification of the beach without permission. It may be helpful for municipalities that do not yet have these by-laws to see sample wording to find out what such by-laws may entail.

Preventing the introduction of invasive species is probably more efficient than trying to remove them once established. Invasive species are often brought in on vehicles, so outreach and education to encourage cleaning vehicles is essential to stop the spread. ATV riders should be encouraged to spray down or dry-brush their machines before leaving home, and larger equipment operators should be encouraged to follow Ontario's Clean Equipment Protocol for Industry (Halloran et al. 2013).

Outreach and education are the primary strategies to help the Lake Huron Grasshopper. Misconceptions about beaches, insects in general, and appropriate use of public property may lead people to damage the habitat or harm the species. Good, clear information about the value of natural dune vegetation in preventing sand erosion, about grasshoppers as part of the web of life, and about harm from off-trail ATV use may help reduce unintended damage as well as intentional removal of vegetation.

2.4 Performance measures

Recovery of the Lake Huron Grasshopper will be successful if 13 or more populations of the Lake Huron Grasshopper are extant in Ontario

- after 30 years or full cycle of lake levels is completed, with levels returning to the current high level of 2018.

2.5 Area for consideration in developing a habitat regulation

Under the ESA, a recovery strategy must include a recommendation to the Minister of the Environment, Conservation and Parks on the area that should be considered in developing a habitat regulation. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species. The recommendation provided below by the author will be one of many sources considered by the Minister when developing the habitat regulation for this species.

The Lake Huron Grasshopper is highly restricted to sparse areas of dune and beach habitats, yet it is difficult to constrain the exact area needed by the species within an overall dune system. Dunes and beaches change due to dynamic factors, so within the dunes, the location and size of the sparse patches needed by the species may also change. As well, areas that may be unsuitable for the Lake Huron Grasshopper can become suitable, as for example if disturbance opens sand in a very densely vegetated area. In addition, when lake levels rise and the foredune is submerged, the mid-dune may become the primary habitat for the species although this area may not always be occupied. Finally, open conditions may be found further from the lake in larger dune systems, so distance from the lake is not a defining characteristic for required habitat.

Therefore, it is suggested that habitat with all three of these criteria be regulated:

- Sites occupied by the Lake Huron Grasshopper in the last 15 years regardless of visible presence in any single year;
- Vegetation types of:
 - Little Blue-stem-Long-leaved Reed Grass-Great Lake Wheatgrass Dune Grassland (SDO1-2) or
 - American Dune Grass – Beach Pea – Sand Cherry Dune Grassland (SDO1-3) or
 - Active Eolian Sand G006X;Or
 - Tree and shrub cover less than or equal to 25%, following parameters for dune grasslands (Lee et al. 1998); and native dune grasses or wormwood present;
- An area of 15 metres of natural vegetation of any type adjacent to this area to include the trees and shrubs that may be involved in maintaining dune dynamics.

It is recommended that habitat, even if thought to be unoccupied, remain regulated for a period of at least 15 years. There are several reasons for this. First, it may take a number of years to determine presence/absence; at some times of year surveys may not locate individuals although the species is present. Also, the Lake Huron Grasshopper presumably has the ability to move between sites when required (COSEWIC 2015) such as when habitat conditions are not favourable, and it has been documented occasionally to return to sites after a period of absence. It is possible that the species may be periodically present when conditions permit, but conditions may vary over several years. Finally, habitat suitability may increase or decrease depending on lake levels and other factors. If a complete lake level cycle takes 30 years, then 15 years should encompass a range of levels including those that confer suitable habitat.

An area of 15 m adjacent to dunes was determined on the ground by the Pitcher's Thistle – Dune Grasslands Recovery Team to be involved in the maintenance of habitat for Pitcher's Thistle. In Ontario, this 15 m area is part of regulated habitat for Pitcher's Thistle (OMNRF 2015), and the federal critical habitat identification for that species

(Parks Canada Agency 2011) also includes it. Pitcher's Thistle occurs at almost all sites occupied by the Lake Huron Grasshopper, so it is assumed that the need to protect the factors that drive the overall dune dynamics would be the same for both species although the two may not always occur in the same parts of the dunes.

Glossary

Backdune: Within the dune complex, the area further from the water closer to the trees; the area that is not the foredune (see below).

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee established under section 14 of the Species at Risk Act that is responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community that conveys its degree of rarity at the global (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. Global and National ranks are determined by NatureServe. Subnational S-ranks are determined for Ontario by the Natural Heritage Information Centre. The conservation status of a species or ecosystem is ranked from 1 to 5, preceded by the letter G, N or S which shows the geographic scale of the assessment. The numbers mean the following:

- 1 = critically imperilled
- 2 = imperilled
- 3 = vulnerable
- 4 = apparently secure
- 5 = secure
- NR = not yet ranked

Crepitation: A crackling, snapping, or buzzing sound made in flight by expanding or contracting the hind wings.

Duff: The layer of dried, dead plant debris that builds up on the surface of the ground.

***Endangered Species Act, 2007* (ESA):** The provincial legislation that provides protection to species at risk in Ontario.

Extirpation: When a species has been completely eliminated from a defined area; a localized extinction.

Femur: The long, upper segment of a grasshopper's hind leg.

Foredune: Within the dune complex, the area closest to the water that consists of dry sand not being regularly swept with waves.

Instars: Phases in the development of an insect or other invertebrate animal.

Natural succession: The natural progression of the vegetation as it increases from a sparse cover of herbaceous plants, to a denser cover, to an increase in shrubs

and woody seedlings, to a growth of trees, and ultimately to a forest. Some types of open (non-forest) ecosystems require natural disturbance events such as fires or wind storms to prevent natural succession and the growth of trees.

Nymph: A juvenile stage of a developing grasshopper.

Protonum—see *Thorax*

Species at Risk Act (SARA): The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk. Schedules 2 and 3 contain lists of species that at the time the Act came into force needed to be reassessed. After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the *Endangered Species Act, 2007* that provides the official status classification of species at risk in Ontario. This list was first published in 2004 as a policy and became a regulation in 2008.

Stridulation: Sound produced by rubbing one part of the body against another. Includes the familiar noise made by crickets. Band-winged Grasshoppers stridulate by rubbing the femur against the front wing (Bland 2003).

Tegmina (plural; singular tegmen): The front wing(s) of grasshoppers and the order Orthoptera (includes crickets, katydids, and others).

Thorax: The middle section of the insect body between the head and the abdomen.

Vegetation community: Recurring groups of plants found together on specific types of substrates and moisture requirements; examples may include Dry-Fresh Mineral Sugar Maple Forest or Willow Organic Thicket Swamp.

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Appendix A

Table 4. List of sites where the Lake Huron Grasshopper currently occurs (COSEWIC 2015), with ownership information. Most recent observation for all sites is 2014.

Site Name	Region	Private Ownership	Municipal Ownership*	Other Ownership
Nottawaga Beach	Georgian Bay; Simcoe County	Multiple owners	Tiny Township	
Giant's Tomb Island	Georgian Bay; Simcoe County	Multiple Owners	Tiny Township	Ontario Parks
Carter Bay	Manitoulin Island	Two owners	Central Manitoulin	
Providence Bay	Manitoulin Island	Multiple owners	Central Manitoulin	
Dean's Bay	Manitoulin Island	Multiple owners	Central Manitoulin	
Lonely Bay	Manitoulin Island	Multiple owners	Central Manitoulin	
Square Bay	Manitoulin Island	Multiple owners	Central Manitoulin	
Dominion Bay	Manitoulin Island	Multiple owners	Central Manitoulin	
Shrigley Bay	Manitoulin Island	Multiple owners	Burpee-Mills	
Portage Bay	Manitoulin Island	Multiple owners	Burpee-Mills	
Taskerville	Manitoulin Island	One owner	Burpee-Mills	Nature Conservancy Canada
Desert Point, Great Duck Is.	Northern Lake Huron	One owner	Northeastern Manitoulin and Islands	
Pancake Bay	Southern Lake Superior			Ontario Parks

*In the Manitoulin District, below the historical high water line, most shorelines are owned by the municipality. Above that line, the dunes may be in private ownership.

Table 5. List of some dune sites with suitable habitat (Jones 2001-2003, 2006; Bakowsky and Henson 2014) suggested for future surveys for the Lake Huron Grasshopper.

Site Name	Region
Big Sand Bay, Christian Island**	Georgian Bay
Little Sand Bay, Christian Island**	Georgian Bay
West Sand Bay, Christian Island	Georgian Bay
Hope Island	Georgian Bay
Beckwith Island	Georgian Bay
Cawaja Beach	Georgian Bay
Dorcas Bay	Bruce Peninsula
Black Creek Provincial Park	Bruce Peninsula
Oliphant	Bruce Peninsula
Chantry Dunes, Southampton	Bruce County
Inverhuron Provincial Park	Bruce County
Lurgen Beach	Bruce County
Timber Bay	Manitoulin Island

Recovery Strategy for the Lake Huron Grasshopper in Ontario

Site Name	Region
Hyndman Bay	Cockburn Island
Wagosh Bay	Cockburn Island
Western Duck Island	Northern Lake Huron
Horseshoe Bay, Great Duck Island	Northern Lake Huron
John Island	North Channel, Lake Huron
Aird Island	North Channel, Lake Huron
Klotz Island	North Channel, Lake Huron
Mississagi Island	North Channel, Lake Huron
North Sandy Island	Lake Superior
Ile Parisienne	Lake Superior
Goulais Bay	Lake Superior
Oiseau Bay*	Lake Superior

* Not shown on map in Figure 4. ** Proximal sites depicted by a single symbol.

**Part 3 – *Lake Huron Grasshopper* – Ontario Government
Response Statement, prepared by the Ontario Ministry of
the Environment, Conservation and Parks**

Lake Huron Grasshopper

Ontario Government Response Statement



Photo: Allan Harris

Protecting and Recovering Species at Risk in Ontario

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

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

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

The Recovery Strategy for the Lake Huron Grasshopper (*Trimerotropis huroniana*) in Ontario was completed on December 7, 2018.

Lake Huron Grasshopper is a mottled silver-grey to brownish insect with speckles and banding on its front wings that help it to blend in with its sandy habitat. Like all grasshoppers, the Lake Huron Grasshopper has large back legs which are used for jumping. In Canada, the Lake Huron Grasshopper occurs only in Ontario on dunes along the shorelines of the northern Great Lakes.

Protecting and Recovering Lake Huron Grasshopper

Lake Huron Grasshopper is listed as a threatened species under the ESA, which protects both the insect and its habitat. The ESA prohibits harm or harassment of the species and damage or destruction of its habitat without authorization. Such authorization would require that conditions established by the Ontario government be met.

Globally, Lake Huron Grasshopper is restricted to the Great Lakes region of Ontario, Wisconsin, and Michigan. In Canada, it occurs only in Ontario at a total of 13 locations on the shores of Lake Superior and Lake Huron. The species formerly occurred at Wasaga Beach in Georgian Bay and Southampton along Lake Huron but has been declared extirpated from these sites. All known extant Canadian subpopulations, except for Giant's Tomb Island, were discovered since 2002. Although approximately 76 percent of dune complexes within the range of the species in Ontario have been surveyed, there are still a number of un-surveyed dune sites where the species may occur. The 13 extant subpopulations in Ontario occur on municipally-owned shorelines, conservation lands, provincial parks and privately-owned land.

Suitable habitat for the Lake Huron Grasshopper consists of open sand sparsely vegetated with native dune plants. Dunes are dynamic habitats that change due to wind, wave-wash, ice-scour, changes in lake levels, and other factors, and the Lake Huron Grasshopper has likely adapted to survive a great range of conditions. Preferred habitat for the Lake Huron Grasshopper is the foredune, a low ridge closest to the lake with open bare sand and scattered grasses. The species likely feeds primarily on native dune plants of which American Beachgrass (*Ammophila breiligulata*), Long-leaved Reed Grass (*Sporobolus rigidus*) and Field Wormwood (*Artemisia campestris*) appear to be the preferred food sources of both nymphs and adults.

Mating occurs in late summer, following which the females lay clusters of eggs which overwinter in the sand. Each female produces several egg clusters. The nymphs hatch in late spring and develop through five stages (instars) before maturing into adults. Adults may be found by mid-July and may survive until hard frosts in the fall.

Knowledge gaps include whether Lake Huron Grasshopper is present at un-surveyed dune sites; the abundance (size) of the populations at extant sites; additional information on the species' biology such as the egg-laying process and effects of predators; and habitat requirements, including the conditions that may favour competing species over the Lake Huron Grasshopper.

It is possible the distribution of Lake Huron Grasshopper is influenced by other native grasshoppers such as the Seaside Grasshopper (*Trimerotropis maritima*) and Mottled Sand Grasshopper (*Spharagemon collare*). Seaside Grasshopper and Lake Huron Grasshopper occupy similar habitat but rarely occur together, suggesting that the two species may compete for food or other limiting resources. Mottled Sand Grasshoppers seem to increase when dunes are disturbed by recreational activities. These disturbances may cause changes in dune vegetation allowing Mottled Sand Grasshopper to invade and displace the Lake Huron Grasshopper.

Threats to the species and its habitat include shoreline development, heavy recreational usage including all-terrain vehicle (ATV) use, invasive species, intentional removal of vegetation and potentially climate change. Historically, residential and commercial development and intensive recreational use destroyed or damaged much of the available dune habitat. These factors are likely what led to the extirpation of the species at Wasaga Beach and Southampton. Recreational use of dunes by pedestrians and off-road vehicle continues to threaten some areas by damaging vegetation, causing erosion and introducing invasive species. Invasive plants, especially Phragmites (European Common Reed) (*Phragmites australis* ssp. *australis*) and Spotted Knapweed (*Centaurea stoebe* ssp. *Micranthos*) can replace preferred food plants and alter dune processes. Changes in lake levels related to climate change, natural cycles, or lake level management have the potential to alter the amount of dune habitat.

The abundance of Lake Huron Grasshopper populations is not known and has not been tracked, so it is unknown whether populations are currently stable, increasing or declining, and if so at what rates. In addition, there is uncertainty regarding the distribution and number of populations of the species in Ontario as some potential areas have not been surveyed. As such, one of the first steps towards achieving the recovery goal will be to perform surveys and confirm the species' presence to determine a better understanding of baseline information to track abundance and distribution over time. Focusing survey efforts on under-sampled areas with suitable habitat and implementing an ongoing monitoring program at confirmed sites will help determine whether progress is being made towards recovery. Heavy recreational use, intentional removal of native vegetation and invasive species continue to threaten Lake Huron Grasshopper, and therefore priority recovery actions will focus on reducing these threats and further loss or degradation of habitat. Increasing levels of engagement and awareness will help reduce unintended damage or destruction of habitat and will be a primary strategy to help protect and recover the Lake Huron Grasshopper.

Government's Recovery Goal

The government's goal for the recovery of Lake Huron Grasshopper is to maintain existing populations within the species' distribution in Ontario, and where feasible, enable natural increases in abundance by improving habitat and reducing threats.

Actions

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

Government-led Actions

To help protect and recover Lake Huron Grasshopper, the government will directly undertake the following actions:

- Continue to implement the *Ontario Invasive Species Strategic Plan (2012)* to address the invasive species (e.g. Phragmites) that threaten Lake Huron Grasshopper.
- Continue to implement *Ontario's Invasive Species Act* to control the spread of invasive species (i.e., Phragmites) that threaten Lake Huron Grasshopper by restricting the importation, deposition, release, breeding/growing, buying, selling, leasing or trading of Phragmites.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Lake Huron Grasshopper data to the Ontario's central repository through the citizen science project that they receive data from (i.e., iNaturalist.ca) and directly through the Natural Heritage Information Centre.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Continue to protect Lake Huron Grasshopper and its habitat through the ESA.
- Support conservation, agency, municipal and industry partners, and Indigenous communities and organizations to undertake activities to protect and recover Lake Huron Grasshopper. Support will be provided where appropriate through funding, agreements, permits (including conditions) and/or advisory services.

- Encourage collaboration, and establish and communicate annual priority actions for government support in order to reduce duplication of efforts.
- Conduct a review of progress toward the protection and recovery of Lake Huron Grasshopper within five years of the publication of this document.

Government-supported Actions

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

Focus Area: Research and Monitoring

Objective: Increase knowledge of Lake Huron Grasshopper distribution, abundance, habitat, and threats in Ontario.

While many of the dune complexes within or adjacent to known occurrences of Lake Huron Grasshopper have been surveyed, there remains additional work to confirm the full distribution of the species in Ontario. Surveying for the presence/absence of Lake Huron Grasshopper at extant locations, as well as under and un-surveyed areas with suitable habitat, will help determine where recovery efforts are best focused. Implementation of a standardized monitoring program will aid in understanding the status of the species, the effectiveness of recovery efforts, and will help to determine whether additional management actions may be required. Knowledge gaps also exist around the species’ ecology and biology including specific habitat requirements, interactions with other species and egg-laying and feeding behaviours. Information on these biological and ecological requirements are needed to support continued protection and management of the species and its habitat. Increasing our understanding of potential emerging threats, such as climate change will support effective mitigation if needed in the future. Potential changes such as late spring frosts, unusually cool and wet growing seasons, increased dune vegetation succession, drought or increased temperature (leading to lower lake levels) may all have effects on the species.

Actions:

1. **(High)** Develop and implement a standardized survey protocol (i.e., presence/absence) prioritizing surveys at historical sites and under or un-surveyed areas with suitable habitat.

2. **(High)** Develop a standardized long-term monitoring protocol and monitoring schedule to be implemented at subpopulations throughout the species' range. Monitoring activities could include assessment of:
 - species presence/absence;
 - relative abundance, viability and population trends;
 - site-specific threats;
 - trends in habitat condition and use; and,
 - changes in proportional abundance of Lake Huron Grasshopper and other competing native grasshoppers such as the Seaside or Mottled Sand Grasshoppers.
3. Investigate the severity and extent of known and suspected threats to the species and its habitat and where necessary and feasible investigate the effectiveness of mitigation measures to address these threats.
4. Investigate the biology and ecology of the Lake Huron Grasshopper, such as:
 - interactions with other species, especially other grasshopper species such as the Seaside Grasshopper. For example, types of habitat conditions which favour other competing grasshoppers over the Lake Huron Grasshopper;
 - microhabitat requirements;
 - affects of changing lake levels on Lake Huron Grasshopper; and,
 - behaviours such as egg-laying and feeding.

Focus Area: Habitat and Threat Management

Objective: Maintain or improve habitat and reduce threats to Lake Huron Grasshopper and its dune habitat in Ontario.

Habitat alteration poses a significant threat to the Lake Huron Grasshopper. This includes shoreline development, heavy recreational usage and intentional removal of vegetation. Exposure to wind and wave is essential to maintain erosion and deposition of sand and to prevent forest succession. Activities which restrict these natural processes from happening threaten the habitat and thus the survival of Lake Huron Grasshopper. Collectively working to implement best management practices and effective mitigation options will support habitat management and restoration for this species. Invasive plant species can displace preferred food plants for the Lake Huron Grasshopper or alter dune processes, and dunes with the greatest risk of this threat tend to be those with a high degree of public access. Cooperative efforts to prevent the introduction of invasive species and manage habitat for suitability over the long-term will greatly assist in reducing this threat.

Actions:

5. **(High)** Collaborate with local organizations and initiatives to minimize threats to the species and its habitat, including trampling and dune vegetation removal, such as:
 - reducing off-trail ATV use and trampling from foot traffic by designating trails, installing signage or placing barriers; and,
 - providing positive information and suggested alternatives to landowners and beach users to reduce or eliminate the removal of native dune vegetation.
6. Remove or control invasive species in the habitat of Lake Huron Grasshopper. Actions may include:
 - developing and implementing best management practices for invasive species control;
 - supporting landowners and municipalities with on-the-ground invasive species control actions; and,
 - encouraging the use of invasive species prevention protocols such as the [Clean Equipment Protocol](#).
7. Collaborate with local groups and land managers to identify candidate areas for habitat enhancement and/or restoration, prioritizing currently occupied habitat. This may involve identifying site-specific restoration needs and goals, developing restoration plans, and evaluating the species' response to habitat restoration practices and techniques.

Focus Area: Outreach and Awareness

Objective: Increase public awareness of the species, its habitat requirements and ways to minimize threats.

Lake Huron Grasshopper is found on both private and public lands used for a number of recreational and urban uses. As a result, the involvement of multiple groups and organizations will be necessary to implement recovery actions and promote awareness of the species and its threats. Raising awareness amongst the public, municipalities, local land owners and organizations of Lake Huron Grasshopper, as well as how to reduce threats to the species and how to enhance its habitat will help promote and encourage protection of the species and its habitat in Ontario. By increasing local awareness, individuals will become more knowledgeable about the types of activities that may inadvertently impact the species.

Actions:

8. **(High)** Promote local stewardship and awareness of the Lake Huron Grasshopper and its habitat which may include:
 - developing social marketing strategies to help influence public perceptions and behaviours. For example, increasing awareness of how landowners can benefit from protecting and restoring dune habitat;
 - producing stewardship publications to highlight success stories and engage the public in dune conservation and provide these materials to nature centres, tourist operations, libraries, and other public sites;
 - hosting events where the public can assist with stewardship and habitat improvement;
 - supporting landowners to steward their dunes;
 - providing educational materials about dunes for municipal and public use during the planning process; and,
 - partnering with schools to conduct outreach.

Implementing Actions

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

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

Reviewing Progress

The ESA requires the Ontario government to conduct a review of progress towards protecting and recovering a species no later than the time specified in the species' government response statement, or not later than five years after the government response statement is published if no time is specified. The review will help identify if adjustments are needed to achieve the protection and recovery of Lake Huron Grasshopper.

Acknowledgement

We would like to thank all those who participated in the development of the Recovery Strategy for the Lake Huron Grasshopper (*Trimerotropis huronia*) in Ontario for their dedication to protecting and recovering species at risk.

For additional information:

Visit the species at risk website at ontario.ca/speciesatrisk

Contact the Ministry of the Environment, Conservation and Parks

1-800-565-4923

TTY 1-855-515-2759

www.ontario.ca/environment