



# Blanding's Turtle

(*Emydoidea blandingii*) in Ontario

## Ontario Recovery Strategy Series

Draft

2019

# 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 Environment, Conservation and Parks Species at Risk webpage at: [www.ontario.ca/speciesatrisk](http://www.ontario.ca/speciesatrisk)

## 1 **Recommended citation**

2 Ministry of the Environment, Conservation and Parks. 2019. DRAFT Recovery Strategy  
3 for the Blanding's Turtle (*Emydoidea blandingii*) in Ontario. Ontario Recovery Strategy  
4 Series. Prepared by the Ministry of the Environment, Conservation and Parks,  
5 Peterborough, Ontario. iv + 6 pp. + Appendix. Adoption of the Recovery Strategy for  
6 Blanding's Turtle (*Emydoidea blandingii*), Great Lakes / St. Lawrence population, in  
7 Canada (Environment and Climate Change Canada 2018).

8 Cover illustration: Photo by Joe Crowley

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10 ISBN [*MECP will insert prior to final publication.*]

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13 use statement of the adopted federal recovery strategy.

14 Cette publication hautement spécialisée « Recovery strategies prepared under the  
15 *Endangered Species Act, 2007* », n'est disponible qu'en anglais en vertu du Règlement  
16 411/97 qui en exempte l'application de la [Loi sur les services en français](#). Pour obtenir  
17 de l'aide en français, veuillez communiquer avec [recovery.planning@ontario.ca](mailto:recovery.planning@ontario.ca).

18

## 19 **Declaration**

20 The recovery strategy for the Blanding's Turtle (*Emydoidea blandingii*) was developed in  
21 accordance with the requirements of the *Endangered Species Act, 2007* (ESA). This  
22 recovery strategy has been prepared as advice to the Government of Ontario, other  
23 responsible jurisdictions and the many different constituencies that may be involved in  
24 recovering the species.

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

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

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

## 36 **Responsible jurisdictions**

37 Ministry of the Environment, Conservation and Parks  
38 Environment and Climate Change Canada – Canadian Wildlife Service, Ontario  
39 Parks Canada Agency  
40

## 41 **Executive summary**

42 The *Endangered Species Act, 2007* (ESA) requires the Minister of the Environment,  
43 Conservation and Parks to ensure recovery strategies are prepared for all species listed  
44 as endangered or threatened on the Species at Risk in Ontario (SARO) List. Under the  
45 ESA, a recovery strategy may incorporate all or part of an existing plan that relates to  
46 the species.

47 The Blanding's Turtle (*Emydoidea blandingii*) is listed as threatened on the SARO List.  
48 The species is listed as threatened under the federal *Species at Risk Act* (SARA).  
49 Environment and Climate Change Canada prepared the Recovery Strategy for the  
50 Blanding's Turtle (*Emydoidea blandingii*), Great Lakes / St. Lawrence population, in  
51 Canada in 2018 to meet its requirements under the SARA. This recovery strategy is  
52 hereby adopted under the ESA. With the additions indicated below, the enclosed  
53 strategy meets all of the content requirements outlined in the ESA.

54 The federal recovery strategy describes the northern extent of the species' range as  
55 occurring from Sault St. Marie east to extreme southwestern Quebec, with "isolated  
56 occurrences" north of that area. However, recent occurrence data across central and  
57 northern Ontario suggest that the species' northern range limit extends much further  
58 north than previously documented.

59 The Critical Habitat section of the federal recovery strategy provides an identification of  
60 critical habitat (as defined under the SARA). Identification of critical habitat is not a  
61 component of a recovery strategy prepared under the ESA. However, it is  
62 recommended that the approach used to identify critical habitat in the federal recovery  
63 strategy, along with any new scientific information pertaining to the Blanding's Turtle  
64 and the areas it occupies, be considered when developing a habitat regulation under  
65 the ESA.

66

67

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## 84 **1.0 Adoption of federal recovery strategy**

85 The *Endangered Species Act, 2007* (ESA) requires the Minister of the Environment,  
86 Conservation and Parks to ensure recovery strategies are prepared for all species listed  
87 as endangered or threatened on the Species at Risk in Ontario (SARO) List. Under the  
88 ESA, a recovery strategy may incorporate all or part of an existing plan that relates to  
89 the species.

90 The Blanding's Turtle (*Emydoidea blandingii*) is listed as threatened on the SARO List.  
91 The species is listed as threatened under the federal *Species at Risk Act* (SARA).  
92 Environment and Climate Change Canada prepared the Recovery Strategy for the  
93 Blanding's Turtle (*Emydoidea blandingii*), Great Lakes / St. Lawrence population, in  
94 Canada in 2018 to meet its requirements under the SARA. This recovery strategy is  
95 hereby adopted under the ESA. With the additions indicated below, the enclosed  
96 strategy meets all of the content requirements outlined in the ESA.

### 97 **1.1 Species assessment and classification**

98 The following list is assessment and classification information for the Blanding's Turtle  
99 (*Emydoidea blandingii*). Note: The glossary provides definitions for the abbreviations  
100 and technical terms in this document.

- 101 • SARO List Classification: Threatened
- 102 • SARO List History: Threatened (2017, 2004)
- 103 • COSEWIC Assessment History: Endangered (2016), Threatened (2005)
- 104 • SARA Schedule 1: Threatened (2006)
- 105 • Conservation Status Rankings: G-rank: G4; N-rank: N3; S-rank: S3

### 106 **1.2 Distribution, abundance and population trends**

107 Recent occurrence data across central and northern Ontario suggest that the species'  
108 northern range limit extends much further north than previously documented. In recent  
109 years, Blanding's Turtles have been reported in several locations across northern  
110 Ontario, including near Timiskaming Shores, Matheson, Timmins, Sultan Road,  
111 Cochrane, Manitouwadge, and north of Jellicoe (NHIC 2019, M. Rasmussen pers.  
112 comm. 2019). Over the past decade, increased search effort has also revealed that this  
113 species is relatively abundant in some northern regions where it was previously  
114 believed to be absent or rare, as has been the case across large portions of Sudbury  
115 district (M. Rasmussen pers. comm. 2019). Blanding's Turtle population density has  
116 been shown to decrease with increasing latitude in Ontario (COSEWIC 2016) and low  
117 densities in northern Ontario, combined with limited search effort, may have resulted in  
118 significant underestimates of the species' distribution near its northern range limit.  
119 Further work is required in these areas where Blanding's Turtles have recently been

120 reported, as well as the intervening regions, to determine the full extent of the species'  
121 distribution in northern Ontario.

### 122 **1.3 Area for consideration in developing a habitat regulation**

123 Under the ESA, a recovery strategy must include a recommendation to the Minister of  
124 the Environment, Conservation and Parks on the area that should be considered in  
125 developing a habitat regulation. A habitat regulation is a legal instrument that prescribes  
126 an area that will be protected as the habitat of the species. The recommendation  
127 provided below will be one of many sources considered by the Minister, including  
128 information that may become newly available following completion of the recovery  
129 strategy, when developing the habitat regulation for this species.

130 The Critical Habitat section of the federal recovery strategy provides an identification of  
131 critical habitat (as defined under the SARA). Identification of critical habitat is not a  
132 component of a recovery strategy prepared under the ESA. However, it is  
133 recommended that the approach used to identify critical habitat in the federal recovery  
134 strategy, along with any new information pertaining to Blanding's Turtle and the areas it  
135 occupies, be considered when developing a habitat regulation under the ESA.

136

137



138 **Glossary**

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

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

145 Conservation status rank: A rank assigned to a species or ecological community that  
146 primarily conveys the degree of rarity of the species or community at the global  
147 (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank  
148 and S-rank, are not legal designations. Ranks are determined by NatureServe  
149 and, in the case of Ontario's S-rank, by Ontario's Natural Heritage Information  
150 Centre. The conservation status of a species or ecosystem is designated by a  
151 number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate  
152 geographic scale of the assessment. The numbers mean the following:

- 153 1 = critically imperilled
- 154 2 = imperilled
- 155 3 = vulnerable
- 156 4 = apparently secure
- 157 5 = secure
- 158 NR = not yet ranked

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

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

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

171 **List of abbreviations**

- 172 COSEWIC: Committee on the Status of Endangered Wildlife in Canada
- 173 COSSARO: Committee on the Status of Species at Risk in Ontario
- 174 ESA: Ontario's *Endangered Species Act, 2007*

- 175 ISBN: International Standard Book Number
- 176 MECP: Ministry of the Environment, Conservation and Parks
- 177 MNRF: Ministry of Natural Resources and Forestry
- 178 SARA: Canada's *Species at Risk Act*
- 179 SARO List: Species at Risk in Ontario List
- 180
- 181

182 **References**

183 COSEWIC. 2016. COSEWIC assessment and status report on the Blanding's Turtle  
184 *Emydoidea blandingii*, Nova Scotia population and Great Lakes/St. Lawrence  
185 population, in Canada. Committee on the Status of Endangered Wildlife in Canada.  
186 Ottawa. xix + 110 pp.

187 Natural Heritage Information Centre (NHIC). 2019. Provincially tracked species data.  
188 Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario.  
189 Accessed February 8, 2019.

190 **Personal communications**

191 Rasmussen, M. 2019. Email correspondence to J. Crowley. February 2019. Regional  
192 Terrestrial Ecosystems Science Specialist (Northeast Region), Ministry of Natural  
193 Resources and Forestry, Timmins, Ontario.

194

195 **Appendix 1. Recovery strategy for the Blanding's**  
196 **Turtle (*Emydoidea blandingii*), Great Lakes / St.**  
197 **Lawrence population, in Canada**

# Recovery Strategy for the Blanding's Turtle (*Emydoidea blandingii*), Great Lakes / St. Lawrence population, in Canada

## Blanding's Turtle



2018



Government  
of Canada

Gouvernement  
du Canada

Canada

**Recommended citation:**

Environment and Climate Change Canada. 2018. Recovery Strategy for the Blanding's Turtle (*Emydoidea blandingii*), Great Lakes / St. Lawrence population, in Canada. *Species at Risk Act Recovery Strategy Series*. Environment and Climate Change Canada, Ottawa. viii + 59 pp.

For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)<sup>1</sup>.

**Cover illustration:** © Joe Crowley

Également disponible en français sous le titre  
« Programme de rétablissement de la tortue mouchetée (*Emydoidea blandingii*),  
population des Grands Lacs et du Saint-Laurent, au Canada »

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ISBN 978-0-660-29011-9  
Catalogue no. En3-4/310-2018E-PDF

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<sup>1</sup> <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

## Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)<sup>2</sup> agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c. 29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Blanding's Turtle, Great Lakes / St. Lawrence population, and has prepared this strategy, as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Province of Ontario (Ministry of Natural Resources and Forestry) and the Province of Quebec (Ministère des Forêts, de la Faune et des Parcs), as per section 39(1) of SARA.

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 and will not be achieved by Environment and Climate Change Canada, the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Blanding's Turtle and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment and Climate Change Canada, the Parks Canada Agency, and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area<sup>3</sup> be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against

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<sup>2</sup> <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

<sup>3</sup> These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.



## Acknowledgments

This document was developed by Rachel deCatanzaro, Krista Holmes, Lee Voisin (Environment and Climate Change Canada, Canadian Wildlife Service – Ontario Region), Angela McConnell, Marie-Claude Archambault, Kari Van Allen, Barbara Slezak, Carollynne Smith, Bruna Peloso, and Louis Gagnon (formerly Environment and Climate Change Canada, Canadian Wildlife Service – Ontario Region), Gabrielle Fortin and Sylvain Giguère (Environment and Climate Change Canada, Canadian Wildlife Service – Quebec Region). Numerous other people also drafted content or had input into various versions of the present recovery strategy, including Patrick Galois (Amphibia-Nature), David Seburn (Seburn Ecological Services), and Scott Gillingwater (Upper Thames River Conservation Authority). Contributions from staff at the Ministry of Natural Resources and Forestry, Ministère des Forêts, de la Faune et des Parcs, National Capital Commission, Canadian Wildlife Service, and various universities and other organizations are also gratefully acknowledged. Further, recovery documents developed by the Équipe de rétablissement des tortues du Québec and the Ontario Multi-Species Turtles at Risk Recovery Team formed the foundation for earlier drafts of this document and are gratefully acknowledged.

Acknowledgment and thanks are given to all other parties that provided advice and input used to help inform the development of this recovery strategy, including various Indigenous organizations and individual citizens, and stakeholders who provided input and/or participated in consultation meetings.

## Executive Summary

The Blanding's Turtle (*Emydoidea blandingii*), Great Lakes / St. Lawrence population is listed as Threatened on Schedule 1 of the *Species at Risk Act* (SARA). The Blanding's Turtle is semi-aquatic and uses both aquatic and terrestrial habitats. It is a medium sized turtle species with a smooth, high-domed carapace which is black to dark brown and may have yellow streaks or flecks. The most distinguishing feature of this species is its bright yellow chin and neck.

The Blanding's Turtle is found in Canada and in the United States, with a range centred around the Great Lakes, and disjunct populations occurring in New York, Massachusetts, Maine and Nova Scotia. In Canada, the species is divided into two populations: the Great Lakes / St. Lawrence population, which occurs from Ontario to southwestern Quebec, and the Nova Scotia population.

The size of the Blanding's Turtle, Great Lakes / St. Lawrence population, is roughly estimated between 25,000 and 45,000 adults. Population trend data is limited, but according to available quantitative analyses, the number of mature individuals has declined by more than 60% over the last three generations (120 years) and road mortality alone will reduce the number of mature individuals by 50% over the next three generations.

The main threats to this turtle are road and railway networks, exotic and invasive species (European Common Reed), residential and commercial development, human-subsidized predators, illegal collection, and changes to natural systems due to water management and dredging. Other threats identified include agriculture, forestry and recreational activities. The Blanding's Turtle is highly vulnerable to any increases in mortality rates in adults or older juveniles since the species has delayed sexual maturity and a low reproductive rate.

There are unknowns regarding the feasibility of recovery of the Blanding's Turtle, Great Lakes / St. Lawrence population. Despite this, and in keeping with the precautionary principle, this recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

The long-term (~ 50 years) population and distribution objectives are to increase abundance and to maintain, and if possible increase, the area of occupancy of the Blanding's Turtle, Great Lakes / St. Lawrence population in Canada, and to ensure the viability of Blanding's Turtle local populations where they occur in Canada. The medium-term (~10-15 years) population and distribution objective is to maintain the presence of known Blanding's Turtle local populations where they occur in Canada. The broad strategies to be taken to address the threats to the survival and recovery of the species are presented in Section 6.2 (Strategic Direction for Recovery).

Critical habitat for the Blanding's Turtle is partially identified in this document. Critical habitat identification is based on two criteria: habitat occupancy and habitat suitability. A schedule of studies needed to complete the identification of critical habitat is included, along with examples of activities likely to destroy critical habitat.

One or more action plans will be completed for the Blanding's Turtle and posted in the Species at Risk Public Registry by December 2023.

## Recovery Feasibility Summary

Based on the following four criteria that Environment and Climate Change Canada uses to establish recovery feasibility, there are unknowns regarding the feasibility of recovery of the Blanding's Turtle, Great Lakes / St. Lawrence population. In keeping with the precautionary principle, this recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be technically and biologically feasible. This recovery strategy attempts to address the unknowns surrounding the feasibility of recovery.

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

Yes. There are individuals capable of reproduction remaining across the species' range. The Great Lakes / St. Lawrence population occurs around the Great Lakes in southern Ontario and extends northwest towards the Chippewa River and east into the southwestern most portion of Quebec (COSEWIC 2005). The population is roughly estimated at between 25,000 and 45,000 adults within this range (COSEWIC 2016). There is however, evidence that the number of mature individuals is declining and road mortality alone will reduce the number of mature individuals by 50% over the next three generations (COSEWIC 2016).

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

Yes. Although many of the habitats used by the Blanding's Turtle have been lost and/or degraded as a result of industrial, urban and agricultural development, as well as water management, sufficient suitable habitat remains available within the Canadian range or could be made available through management and restoration to support the species. Management and restoration techniques could be used to increase the amount of suitable habitat available for the species and increase connectivity between suitable habitat patches.

3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.

Unknown. The primary threats to the species are road and railway networks, exotic and invasive species (European Common Reed), residential and commercial development, human-subsidized predators, illegal collection, and changes to natural systems due to water management and dredging. Targeted habitat protection through land acquisition, regulations, zoning and landscape planning, along with stewardship techniques, have been used successfully in certain local populations (see section 6.1). A number of best management practices have been designed and implemented and others are likely to be developed and tested within a reasonable timeframe, and subsequently implemented to allow vulnerable local populations to recover from certain threats,

such as water management, dredging, agriculture, forestry and human-subsidized predators. Methods to mitigate threats to the species in some sectors, such as the use of predator-exclusion cages to reduce nest predation and ecopassages (with associated fencing), to reduce road mortality have been successfully implemented (see section 6.1). Outreach and educational materials have been developed and will continue to be an integral part of the strategic direction for the recovery of this species. However, it is unknown whether all of the threats can be avoided or mitigated sufficiently to achieve the population and distribution objectives for the Blanding's Turtle, Great Lakes / St. Lawrence population, in Canada. It is uncertain whether the adverse impacts from the active road network can be sufficiently mitigated to support the recovery of certain local populations, particularly in southern Ontario, where the road network is very dense. Moreover, measures have been developed to mitigate the invasion of the species' habitat by the European Common Reed. However, unless such measures are implemented broadly and collaboratively, it is unclear whether the adverse effects of large-scale habitat invasion of Blanding's Turtle habitat by the European Common Reed can be avoided or sufficiently mitigated.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

Yes. Recovery techniques, such as habitat conservation through land acquisition, regulations, zoning, and landscape planning, along with stewardship techniques, have been used successfully in some populations (Seburn and Seburn 2000). Some best management practices have been developed (e.g. road ecopassages with fencing), and it is likely that others could be developed and tested in a reasonable time frame and implemented to help conserve vulnerable populations from habitat loss and degradation and loss of individuals. Public awareness and educational materials have been developed and will continue to be an integral part of the recovery of this species.

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## 1. COSEWIC\* Species Assessment Information

**Date of Assessment:** November 2016

**Common Name (population):**

Blanding's Turtle (Great Lakes / St. Lawrence population)

**Scientific Name:** *Emydoidea blandingii*

**COSEWIC Status:** Endangered

Reason for Designation: This population, although widespread, is declining because of several observed, inferred, and projected threats. The most serious threats include: road and rail mortality; illegal collection for the pet, food and traditional medicine trades; habitat loss due to invasive European Common Reed; development and wetland alterations; and, increasing numbers of predators. Quantitative analyses estimate that the total number of mature individuals in this population has declined >60% over the last three generations (due to large-scale wetland drainage after European arrival) and will decline 50% over the next three generations because of road mortality alone.

**Canadian Occurrence:** Ontario, Quebec

**COSEWIC Status History:** Designated Threatened in May 2005. Status re-examined and designated Endangered in November 2016.

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

## 2. Species Status Information

Only the Blanding's Turtle, Great Lakes / St. Lawrence population, is considered in this recovery strategy; a separate recovery strategy has been prepared for the Nova Scotia population. Approximately 20% of the global range of this species is found in Ontario and Quebec (COSEWIC 2016).

In Canada, the Blanding's Turtle, Great Lakes / St. Lawrence population, is listed as Threatened<sup>4</sup> in Schedule 1 of the *Species at Risk Act* (SARA) since 2005; however, the species was recently re-assessed as Endangered by COSEWIC (2016). In Ontario, the

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<sup>4</sup> Threatened (SARA): A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

species has been listed since 2008 as Threatened<sup>5</sup> under the *Endangered Species Act, 2007* (S.O. 2007, c. 6) (ESA 2007), which provides for species and general habitat protection. The Blanding's Turtle is also designated as a Specially Protected Reptile under the Ontario *Fish and Wildlife Conservation Act*. In Quebec, it has been listed as Threatened<sup>6</sup> under the *Act Respecting Threatened or Vulnerable Species* (ARTVS) (CQLR, c. E-12.01) since 2009. The Blanding's Turtle is listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which controls the trade of this species (and allows trade of a listed species only if an export permit is granted). In 2010, the International Union for Conservation of Nature (IUCN) evaluated the status of the Blanding's Turtle as Endangered<sup>7</sup> (IUCN 2018). Another status evaluation was provided by NatureServe in 2016: the global status of the Blanding's Turtle is Apparently Secure<sup>8</sup> (G4) (NatureServe 2018). It is Nationally Vulnerable<sup>9</sup> (N3) in Canada and Nationally Apparently Secure (N4) in the United States. The species is considered Critically Imperiled<sup>10</sup> (S1) in Quebec and Vulnerable (S3) in Ontario.

### 3. Species Information

#### 3.1 Species Description

The Blanding's Turtle is a medium-sized freshwater turtle (adult carapace length 13–27 cm) with a smooth high-domed carapace (upper shell), generally black to dark brown in colour, with yellow or tan streaks and/or flecking (Ernst and Lovich 2009; COSEWIC 2016). The plastron (lower shell) is yellowish with black markings at the back outer edge of each scute (plates on the shell/plastron) (Ernst and Lovich 2009), and have a functional hinge between the pectoral and abdominal scutes (COSEWIC 2016). There is sexual dimorphism<sup>11</sup> in the plastron and tail: males have a slightly concave plastron and a larger tail with the vent extending beyond the edge of the carapace, while females have a fairly flat plastron and a narrower tail with the vent anterior to the edge of the carapace. The chin and throat are a distinctive bright yellow. In males, the upper beak tends to be dark, whereas in females, it is streaked with yellow (Ernst and Lovich

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<sup>5</sup> Threatened (ESA): A species that lives in the wild in Ontario, is not endangered [facing imminent extinction or extirpation], but is likely to become endangered if steps are not taken to address factors threatening to lead to its extinction or extirpation.

<sup>6</sup> Threatened (ARTVS): any species whose disappearance is anticipated.

<sup>7</sup> Endangered (IUCN): considered to be facing a very high risk of extinction in the wild.

<sup>8</sup> Apparently Secure (NatureServe): At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences.

<sup>9</sup> Vulnerable (NatureServe): Vulnerable in the jurisdiction due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

<sup>10</sup> Critically Imperiled (NatureServe): critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction.

<sup>11</sup> Sexual dimorphism: the condition in which the males and females in a species are morphologically different (Carr 1952).



2009; COSEWIC 2016). Hatchlings differ in colouration from adults and typically have a plain brown-grey carapace, a creamy yellow chin and throat, and a non-functioning hinge. In young Blanding's Turtles, the plastron is characterized by a central greyish spot and yellow outer edge, and the tail extends further past the carapace than in adults (COSEWIC 2016).

The species has been known to live over 83 years (Reference removed). In the northern portions of its global range, the Blanding's Turtle can take up to 25 years to reach sexual maturity, which makes it one of the latest maturing turtle species in Canada (References removed).

### **3.2 Species Population and Distribution**

The range of the Blanding's Turtle (Figure 1) extends from central Ontario and southwestern Quebec in the north, west to Minnesota and Nebraska and south to central Illinois to New York State in the east, with disjunct populations occurring in southeastern New York, eastern New England (Massachusetts to southern Maine), and Nova Scotia (Ernst and Lovich 2009; NatureServe 2018).

The Blanding's Turtle, Great Lakes / St. Lawrence population, occurs from around the Great Lakes in southern Ontario northwest to Sault Ste. Marie and east to extreme southwestern Quebec (COSEWIC 2016). Some isolated records have been identified as far north as 48.48° in latitude (Crowley pers. comm. 2014). Isolated observations have been recorded in Bruce County (Ontario) in recent years however, a local population has not yet been confirmed in this region (Crowley pers. comm. 2014). In Quebec, the bulk of the observations are concentrated in the Outaouais region, with a few other observations in the Montérégie, Abitibi, and Capitale-Nationale regions (Reference removed).

Data on the abundance of various local Great Lakes and St. Lawrence populations are incomplete, which makes it difficult to make an accurate estimate. However, the population has been roughly estimated at between 25,000 and 45,000 adults (COSEWIC 2016). Data on population trends is also limited, but it is estimated that it has declined by more than 60% over the last three generations owing to habitat loss and fragmentation within its range in southern Ontario and southwestern Quebec (COSEWIC 2016). According to the COSEWIC status report (2016), the population size is projected to continue to decline by 40% in the next 80 years (i.e., two generations) and by 50% in the next 117 years (just under three generations) due to unsustainable rates of road mortality in many parts of Ontario. Local populations are also expected to decline. Annual nest survival rates as low as 0% have been observed at certain sites in Ontario, which limits the population's capacity to stabilize in the presence of other sources of mortality (COSEWIC 2016).



**Figure 1. North American Range of the Blanding's Turtle (adapted from Ministère des Forêts, de la Faune et des Parcs 2010).** This map represents the general range of the species, and does not depict detailed information on the presence and absence of observations within the range. Please refer to the text for further details on the distribution of the species in Ontario and Quebec.

The extent of occurrence<sup>12</sup> of the Blanding's Turtle, Great Lakes/St. Lawrence population, is over 400 000 km<sup>2</sup>, if isolated sightings are included. However, almost the entire population occurs within an area of 222 000 km<sup>2</sup> (COSEWIC 2016). On the basis of the latest survey results (i.e., no sightings at previously occupied sites), the area of

<sup>12</sup> Extent of occurrence: the area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a wildlife species (COSEWIC 2010).

occupancy,<sup>13</sup> estimated at over 9 900 km<sup>2</sup>, is considered to be in decline. As of 2014, provincial Conservation Data Centres hold a total of 7157 Blanding's Turtle records (2013 in Ontario, 5144 in Quebec), which are distributed among 248 element occurrences<sup>14</sup> (CDPNQ 2014; NHIC 2014). In Ontario, there are a total of 213 element occurrences (139 extant, 74 historic), while there are 35 in Quebec (29 extant, 6 historic). In Ontario, increased survey efforts have resulted in the collection of over 6000 observation records available from NHIC, which have not yet been formally assessed using NatureServe methodologies. These new observations will likely result in the establishment of new element occurrences and/or modifications to existing element occurrences.

### 3.3 Needs of the Blanding's Turtle, Great Lakes / St. Lawrence Population

#### *General Habitat Needs*

The Blanding's Turtle is a semi-aquatic species<sup>15</sup>. Although it spends most of its time in aquatic habitats, it has seasonal movement patterns which allow it to meet different biological or behavioural needs, including use of terrestrial habitats during the active season (Reference removed). Habitat use varies as a function of the different activities undertaken by individuals to complete their life cycle. Blanding's Turtles use aquatic habitats for overwintering, mating, foraging, thermoregulation, summer inactivity, and movement. They often favour relatively eutrophic<sup>16</sup> environments, with shallow water (less than 2 m deep, often less than 50 cm), soft highly organic substrates, and abundant submergent,<sup>17</sup> floating, and emergent vegetation (References removed; Ernst and Lovich 2009; Gillingwater, pers. comm. 2016). They can occur in a variety of wetland habitats (e.g., marshes, ponds, swamps, bogs, fens, coastal wetlands) (References removed), slow flowing rivers and creeks, pools, lakes, bays, sloughs, marshy meadows, and artificial channels (Reference removed). Blanding's Turtles have been shown to select all wetland types over lotic environments and have also shown a preference for ponds and marshes when available (References removed). In Quebec, Blanding's Turtles mainly occupy wetlands which are maintained by a complex of beaver dams (Reference removed). While large permanent wetlands can support a larger number of individuals, small and/or temporary wetlands (e.g. vernal pools) are also important habitat features (Reference removed; Grgurovic and Sievert 2005). Weather conditions can affect the availability of aquatic habitats through changes in

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<sup>13</sup> Area of occupancy: the area within the "extent of occurrence" that is occupied by a taxon, excluding cases of vagrancy (COSEWIC 2009).

<sup>14</sup> Element occurrence: an area of land and/or water in which a species or natural community is, or was, present (NatureServe 2018).

<sup>15</sup> Semi-aquatic turtles spend significant amounts of time outside of the aquatic environment, using terrestrial habitats not only for nesting but also to meet other biological needs.

<sup>16</sup> Eutrophic: waters characterized as rich in mineral and organic nutrients that support a dense growth of algae and other organisms, the decay of which reduces the dissolved oxygen content of the water.

<sup>17</sup> Some sites used by Blanding's Turtles in Ontario are characterized by sandy substrates and abundant aquatic vegetation (Gillingwater, pers. comm. 2016).

water levels. For example, (Reference removed) showed shortened usage of vernal pools in springs in which they dried out early.

Terrestrial habitat is important for many activities of the Blanding's Turtle during the active season, including nesting, thermoregulation, summer inactivity, and movement. Upland forest is an important habitat feature for the Blanding's Turtle, and has been shown to be a strong predictor of its presence in a landscape (Reference removed). Other natural terrestrial habitat used by Blanding's Turtles includes shoreline areas such as sand bars, beaches, rocky outcrops, forest clearings, and meadows (Reference removed; Joyal et al. 2001; Beaudry et al. 2010). Blanding's Turtles can also use or move through human-altered habitats, generally open areas, such as agricultural fields, road shoulders, and quarries.

Blanding's Turtle adults and hatchlings have been shown to use similar habitat. An important difference is that hatchlings make more extensive use of open terrestrial habitat in the fall, from emergence until overwintering (Reference removed).

### *Overwintering*

To protect themselves from freezing, Blanding's Turtles overwinter in underwater sites from approximately October to April (References removed). Overwintering sites are generally located within permanent wetlands (e.g., bogs, fens, marshes) and other habitats with unfrozen shallow water (Joyal et al. 2001; References removed). This species may also overwinter within temporary wetlands adjacent to more permanent water bodies (Reference removed), graminoid<sup>18</sup> shallow marsh areas of larger wetlands (Gillingwater unpublished data 2013), non-vegetated vernal pools (References removed), roadside ditches or small excavated areas with standing water (Joyal et al. 2001; Reference removed), and road-side borrow pits (Reference removed). Individuals choose sites that are cold, thermally stable, and provide 7 to 50 cm of free water, along with a soft organic substrate in which they partially bury (Reference removed). Based on its micro-environment while overwintering, the Blanding's Turtle is believed to be anoxia-tolerant, i.e. it can survive at low concentrations of dissolved oxygen (Ultsch 2006; Reference removed). Preliminary data (Reference removed) also indicate that hatchlings could overwinter on land; however this requires further investigation. This species may overwinter in groups (sometimes with other species) or alone (References removed), and fidelity<sup>19</sup> to overwintering areas was observed, which suggests that availability of optimal overwintering sites might be limiting (References removed).

### *Mating*

Blanding's Turtles generally mate prior to and right after overwintering, more precisely from the end of April to early May, and from the end of August to the end of October (Reference removed; Newton and Herman 2009; Équipe de rétablissement des tortues du Québec unpublished data 2012). Mating activity mainly occurs when turtles are

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<sup>18</sup> Graminoid: A family of grasses and similar plants such as sedges and rushes.

<sup>19</sup> Fidelity: loyalty to a specific area, where individuals will return to year after year.

aggregated in the vicinity of their overwintering site (Reference removed). They have also been observed mating during overwintering (Newton and Herman 2009). Breeding behaviour takes place in shallow or deep water, and has been observed in permanent and ephemeral wetlands (Grgurovic and Sievert 2005). In Quebec, six individuals have been observed mating more than once before and/or after overwintering, with one or multiple partners (Équipe de rétablissement des tortues du Québec unpublished data 2012). The observed mating behaviour indicates that polyandry<sup>20</sup> and sperm storage might be part of the reproductive strategy of the Blanding's Turtle in Canada, as described for local populations in the United States (References removed).

### *Nesting*

In Ontario and Quebec, nesting activity in the Blanding's Turtle has been observed from the last week of May to the second week of July, with peak activity throughout June (Trute pers. comm. in COSEWIC 2005; Équipe de rétablissement des tortues du Québec unpublished data 2012; Gillingwater, pers. comm. 2016). This species typically nests in relatively open areas such as beaches, shorelines, meadows, rocky outcrops, and forest clearings, as well as in a variety of human-altered sites such as gardens, power line rights-of-way, fields, gravel roads, and road shoulders, sand/gravel quarries, railway rights-of-way, cycling paths, hiking trails, and all-terrain vehicle (ATV) trails (References removed; Kiviat 1997; Joyal et al. 2001; Beaudry et al. 2010; Dowling et al. 2010; Gillingwater 2013). Nesting in open areas raises the mean incubation temperature in the nest cavity, which increases the likelihood of a successful nest (COSEWIC 2016). Females often show high fidelity to the same general nesting areas (75% in Quebec) (References removed). In Quebec, females rely heavily on human-altered sites as they provide adequate nesting substrate, and 90% of nests were found at those sites during a telemetry survey (Reference removed). However, this preference for disturbed sites could be an ecological trap, as they are associated with lower nesting success and higher mortality rates in females (Reference removed; COSEWIC 2016).

Blanding's Turtles typically nest in the general vicinity of a wetland that is either used as summer habitat for all or part of the active season (e.g. permanent wetland), or as staging habitat used only during the nesting period. Females might use small wetlands and vernal pools as staging areas to rehydrate and feed (Grgurovic and Sievert 2005). Reported average distances between nests and the nearest wetland range from 99.5 to 242 m, with maximum distances of 256 m to 721 m (References removed; Joyal et al. 2001; Beaudry et al. 2010; Équipe de rétablissement des tortues du Québec unpublished data 2012). Blanding's Turtles often travel long distances to seek out suitable nesting habitat, marking the importance of staging habitat that females use during nesting forays, and sometimes even after nesting (Fortin, pers. comm. 2014). Individuals have been observed nesting up to 6 km from their wetland of origin, with a mean distance of 0.9 km observed in Ontario and Quebec (References removed). In

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<sup>20</sup> Polyandry: A mating system in which a female animal has two or more male mates, either simultaneously or successively.

Canada, hatchlings generally emerge throughout September and October (References removed).

### *Thermoregulation*

Blanding's Turtles require habitats that provide a number of basking sites (COSEWIC 2016), which they use to regulate their body temperature. End of April and May correspond to peak basking activity in Ontario and Quebec, after which turtles were found to bask less often (References removed; Équipe de rétablissement des tortues du Québec unpublished data 2012). Peak activity coincides with emergence from overwintering, a time when water temperature is low and when individuals can benefit from increased energy gain through basking (Dubois et al. 2009). During this peak, Blanding's Turtles can often be found basking at the water surface, which also gives them an opportunity to forage (References removed). Other aquatic basking sites include muskrat and beaver lodges, stumps, piles of driftwood, submerged logs, rocks, bog mats, or shallow water surrounding emergent vegetation and root masses (Reference removed; Ernst and Lovich 2009; Reference removed; Gillingwater, pers. comm. 2012). In addition to using basking sites within the aquatic habitat, this species may bask on open shoreline areas with full or partial sunlight (Joyal et al. 2001). Blanding's Turtles may also bask in open areas while travelling over land through upland wooded areas (Joyal et al. 2001). Gravid<sup>21</sup> females were found basking more often than males and non-gravid females, which promotes the development of eggs (References removed).

### *Foraging*

Many important food items are found in aquatic habitat with an abundance of submerged vegetation and filamentous algae (COSEWIC 2005; Reference removed). Adult Blanding's Turtles are primarily carnivorous and will consume anything from crayfish, worms, leeches, snails, slugs, frogs, and fish, to insects (References removed; Ernst and Lovich 2009). Small wetlands and vernal pools can be important foraging sites as they provide concentrated food sources, such as amphibian and insect egg masses and larvae (Grgurovic and Sievert 2005). Juveniles prefer to forage in areas that contain thick aquatic vegetation (e.g., sphagnum, water lilies, and algae); these areas provide refuge, decreasing the potential of predation, which is high due to their small size, as well as provide sufficient foraging opportunities (COSEWIC 2005).

### *Summer Inactivity<sup>22</sup>*

In some parts of its range, including Quebec and Maine, upland terrestrial habitat, in addition to wetland habitat, can be used by this species for late summer inactivity from July through September (Joyal et al. 2001; Reference removed), although this has not been observed during studies in Ontario (Reference removed). In Quebec, individuals were found to be inactive for a maximum of 10 days, spending these inactive periods either upland buried under litter or in a wetland (Reference removed).

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<sup>21</sup> Gravid: carrying eggs.

<sup>22</sup> Summer inactivity is also often referred to as aestivation.

### *Movements (Commuting and Dispersal)*<sup>23</sup>

Blanding's Turtles regularly move between different aquatic and terrestrial habitat types to access recurrently or seasonally required resources (e.g. nesting and overwintering sites, food items). As a result, it is important that the different habitats that they use are linked, or in reasonable proximity to one another so that individuals can move between them with ease to carry out all specific life stages. Natural habitat linkages available to the Blanding's Turtle provide access to the local resources it needs within its home range (i.e., commuting). They also favour immigration and emigration (i.e., dispersal), which in turn allows for the rescue effect<sup>24</sup> and increase gene flow, thereby helping to maintain genetic diversity and increase the species' resilience to environmental stressors.

Aquatic movement can occur in a variety of habitats, including wetlands, streams, rivers, lakes, and channels (COSEWIC 2016). It has been hypothesized that Blanding's Turtles prefer upland forest to open habitats for movement on land, thus access to resources could be facilitated in forested landscapes (Reference removed). Composition of the landscape (e.g. proportion of wetland and agriculture) seem to have little influence on movements (Fortin et al. 2012), but the presence of roads can modify movement patterns and act as a partial barrier to movement of some individuals (Reference removed). Natural barriers to movement include large lakes (e.g. the Great Lakes), fast-flowing rivers, and mountain ranges (COSEWIC 2005).

The home range size and length of the Blanding's Turtle vary greatly among individuals of a region and among different regions as well. Observed home range size in Ontario and Quebec averaged between 12 and 60 ha, with a maximum of 173 ha (References removed). The same studies reported average home range lengths between 0.8 km and 3.2 km, and a maximum of 7.4 km (Reference removed). (Reference removed) observed that home range size was higher in individuals tracked for multiple years, indicating that the home range's location can move from one year to another. However, the same study reported that Blanding's Turtles showed fidelity to at least a portion of their home range.

Longer movements have been observed after emergence from overwintering (May), with females moving more in June due to their nesting forays (References removed). Individuals have been noted to use up to 20 different wetlands per year, with average inter-wetland movement ranging between 230 and 500m (References removed; Beaudry et al. 2009;).

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<sup>23</sup> Movement habitat is the aquatic or terrestrial habitat that the species uses to move between habitats. Commuting here refers to short-distance movement within the home range in order to complete different life stages (e.g., mating, foraging), while dispersal refers to long-distance movement related to emigration of individuals.

<sup>24</sup> Rescue effect: Immigration of individuals that have a high probability of reproducing successfully, such that extirpation or decline of a wildlife species can be mitigated.

### 3.4 Biological Limiting Factors

Turtles have certain common life history traits that can limit their ability to adapt to high levels of disturbance and that help explain their susceptibility to population declines (Reference removed; Gibbons et al. 2000; Turtle Conservation Fund 2002). They have a reproductive strategy that depends on high adult survival rates and extreme longevity to counterbalance the low recruitment rates because of:

- 1) late sexual maturity;
- 2) the high rate of natural predation on eggs and juveniles under the age of two; and,
- 3) external incubation of eggs, with specific environmental conditions required for embryo development, and no parental care of hatchlings.

As a consequence of these life history traits, turtle populations cannot adjust to an increase in adult mortality rates. Long-term studies indicate that high survival rates of adults (particularly adult females) are critical for maintaining turtle populations. Even a 2–3% increase in the annual adult mortality rate could result in population declines (References removed; Cunnington and Brooks 1996).

The climatic ranges within which this species can survive limit its range in northern areas (Hutchinson et al. 1966; McKenney et al. 1998). Climate plays a vital role in recruitment, as this species relies on the external environment for incubation of eggs. Incubation time constitutes a major limitation for northern turtle populations (Reference removed), as the short northern summer typically makes it possible to produce only one clutch per year and can result in nest failure in cooler years. Recruitment can vary from one year to the next depending on weather conditions, particularly during the summer. Sex determination for the Blanding's Turtle is temperature-dependent and occurs during incubation (Ernst and Lovich 2009); therefore climate could have an impact on the ratio of males and females recruited into the population.

In Canada, local populations of the Blanding's Turtle are at the northern limit of their range (Seburn and Seburn 2000). Blanding's Turtles in northern populations reach sexual maturity later than their southern counterparts (COSEWIC 2016). Because the species is at the northern limit of its range in Canada, the availability of suitable nesting sites with adequate temperature conditions may constitute a limiting factor for this species.



### 3.5 Species Cultural Significance

Archaeological data illustrate that the Blanding's Turtle was already present in several parts of its current range (including Manitoulin Island, Wendake South, the Iroquois Plain, the Norfolk Sand Plain and the St. Clair Clay Plains in southern Ontario) several hundred years ago, long before European colonization (Reference removed).

Turtles play an important role in Indigenous spiritual beliefs and ceremonies. To the First Nations peoples, the turtle is a teacher, possessing a great wealth of knowledge. It plays an integral role in the Creation story, by allowing the Earth to be formed on its back. For this reason, most First Nations people traditionally call North America "Turtle Island." Indigenous peoples also use the turtle shell to represent a lunar calendar, with the 13 scutes representing the 13 full moons of the year.

Several First Nations peoples have used, and continue to use turtles, including the Blanding's Turtle, for food, crafts and ceremonial purposes. For example, rattles made from turtle shells can be used as symbols or percussion instruments in traditional ceremonies or dances. They often represent the turtle in the Creation story or are used for celebration and healing purposes (Reference removed; Bell et al. 2010). Turtles also appear in other traditional stories, including the Anishinaabe stories "How the turtle got its shell" and "How the Blanding's Turtle got its yellow chin" (Reference removed; Bell et al. 2010). In Indigenous legends, the Blanding's Turtle is referred to as "the turtle with the sun under its chin" (Reference removed).

## 4. Threats

### 4.1 Threat Assessment

The Blanding's Turtle threat assessment is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system. Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational). Limiting factors are not considered during this assessment process. For purposes of threat assessment, only present and future threats are considered. Historical threats, indirect or cumulative effects of the threats, or any other relevant information that would help understand the nature of the threats are presented in the Description of Threats section.

**Table 1. Threats Assessment Table Calculator Assessment \*(taken from COSEWIC [2016])**

IUCN No.	Threat description	Impact <sup>a</sup>	Scope <sup>b</sup>	Severity <sup>c</sup>	Timing <sup>d</sup>	Detailed threats
1	Residential & commercial development	Medium	Restricted (11-30%)	Serious (31-70%)	High (continuing)	
1.1	Housing & urban areas	Medium	Restricted (11-30%)	Serious (31-70%)	High (continuing)	See Description of Threats, section 4.2 below.
1.2	Commercial & industrial areas	Negligible	Negligible (<1%)	Serious (31-70%)	High (continuing)	See Description of Threats, section 4.2 below.
1.3	Tourism & recreation areas	Low	Small (1-10%)	Slight (1-10%)	High (continuing)	See Description of Threats, section 4.2 below.
2	Agriculture & aquaculture	Low	Small (1-10%)	Slight (1-10%)	High (continuing)	
2.1	Annual & perennial non-timber crops	Low	Restricted (11-30%)	Slight (1-10%)	High (continuing)	See Description of Threats, section 4.2 below.
2.3	Livestock farming & ranching	Negligible	Negligible (<1%)	Negligible (<1%)	High (continuing)	Blanding's Turtles are known to nest on ranchlands/pasture in Quebec. In Ontario no new areas of this are expected; grazing is generally decreasing.

IUCN No.	Threat description	Impact <sup>a</sup>	Scope <sup>b</sup>	Severity <sup>c</sup>	Timing <sup>d</sup>	Detailed threats
3	Energy production & mining	Unknown	Restricted (11-30%)	Unknown	High (continuing)	
3.2	Mining & quarrying	Unknown	Restricted (11-30%)	Unknown	High (continuing)	Hundreds of active mines, quarries and claims occur in or near areas used by Blanding's Turtles. While mines do not generally go directly into wetlands, they can affect water bodies nearby by changing hydrology and causing pollution, and they can cause fragmentation of habitat (since Blanding's Turtles use multiple wetlands). Furthermore, individuals are not deterred from moving through these areas and are attracted to quarries for nesting (demonstrated by radio tracking in Ontario and Quebec). Adults, nests and hatchlings may be harmed by equipment.
3.3	Renewable energy	Negligible	Negligible (<1%)	Negligible (<1%)	High (continuing)	In Ontario, several wind farm developments are approved and proposed in Blanding's Turtle habitat. Related roadways are expected to have the greatest impact, rather than the turbines themselves.
4	Transportation & service corridors	High-medium	Pervasive (71-100%)	Serious-moderate (11-70%)	High (continuing)	
4.1	Roads & railroads	High	Pervasive (71-100%)	Serious (31-70%)	High (continuing)	See Description of Threats, section 4.2 below.
4.2	Utility & service lines	Negligible	Small (1-10%)	Negligible (<1%)	High (continuing)	Threat is from use of heavy equipment for brush clearing and other maintenance activities.
5	Biological resource use	Low	Pervasive (71-100%)	Slight (1-10%)	High (continuing)	
5.1	Hunting & collecting terrestrial animals	Medium	Pervasive (71-100%)	Moderate (11-30%)	High (continuing)	See Description of Threats, section 4.2 below.
5.3	Logging & wood harvesting	Low	Large (31-70%)	Slight (1-10%)	High (continuing)	See Description of Threats, section 4.2 below.

IUCN No.	Threat description	Impact <sup>a</sup>	Scope <sup>b</sup>	Severity <sup>c</sup>	Timing <sup>d</sup>	Detailed threats
5.4	Fishing & harvesting aquatic resources	Negligible	Negligible (<1%)	Unknown	High (continuing)	Blanding's Turtles are sometimes caught incidentally (fishing bycatch), and may not always be released since there is a ready market for them.
6	Human intrusions & disturbance	Low	Large (31-70%)	Slight (1-10%)	High (continuing)	
6.1	Recreational activities	Low	Large (31-70%)	Slight (1-10%)	High (continuing)	See Description of Threats, section 4.2 below.
6.2	War, civil unrest & military exercises	Negligible	Negligible (<1%)	Unknown	High (continuing)	Military exercises and vehicles may harm individuals and nests on bases.
6.3	Work & other activities	Negligible	Restricted (11-30%)	Negligible (<1%)	High (continuing)	Occurs in a few areas.
7	Natural system modifications	Unknown	Large (31-70%)	Unknown	Moderate (possibly in short term, <10 years)	
7.1	Fire & fire suppression	Negligible	Negligible (<1%)	Unknown	High (continuing)	Threat not well studied. Has been known to affect Spotted Turtles. Blanding's Turtles at two southern Ontario sites have been observed with fire-damaged shells.
7.2	Dams & water management/use	Medium-low	Restricted-small (1-30%)	Serious-moderate (11-70%)	High (continuing)	See Description of Threats, section 4.2 below.
7.3	Other ecosystem modifications	Low	Small (1-10%)	Serious-moderate (11-70%)	High (continuing)	See Description of Threats, section 4.2 below.
8	Invasive & other problematic species & genes	High-medium	Large (31-70%)	Serious-moderate (11-70%)	High (continuing)	
8.1	Invasive non-native/alien species	High-medium	Large (31-70%)	Serious-moderate (11-70%)	High (continuing)	See Description of Threats, section 4.2 below.
8.2	Problematic native species	Medium	Large (31-70%)	Moderate (11-30%)	High (continuing)	See Description of Threats, section 4.2 below.

IUCN No.	Threat description	Impact <sup>a</sup>	Scope <sup>b</sup>	Severity <sup>c</sup>	Timing <sup>d</sup>	Detailed threats
9	Pollution	Unknown	Restricted (11-30%)	Unknown	High (continuing)	
9.1	Household sewage & urban waste water	Unknown	Restricted (11-30%)	Unknown	High (continuing)	Nutrient and sediment loading in southwestern Ontario; also affects Georgian Bay coastal populations.
9.2	Industrial and military effluents	Unknown	Small (1-10%)	Unknown	High (continuing)	Some evidence of mercury from mining sources.
9.3	Agricultural and forestry effluents	Unknown	Restricted (11-30%)	Unknown	High (continuing)	Mostly in agricultural areas; not expected from forestry operations.
9.6	Excess energy	Unknown	Unknown	Unknown	High (continuing)	
11	Climate change and severe weathers	Unknown	Unknown	Unknown	High (continuing)	
11.1	Habitat shifting & alteration	Not calculated (outside the assessment time)	Restricted (11-30%)	Unknown	Low (possibly in long term, >10 years)	Water levels in Lake Erie and Lake Huron are dropping due to warmer temps; coastal wetland habitat availability is reducing. Blanding's Turtle has a narrow thermal tolerance range and appears to be highly sensitive to climate change; 50-75% of currently suitable areas across the range are predicted to become unsuitable for Blanding's Turtle by 2050, dropping to <25% by 2080. Most of southwestern Ontario may not be climatically suitable for this species by 2080 and due to large-scale habitat fragmentation in the region, these subpopulations will not be able to migrate north.
11.2	Droughts	Unknown	Unknown	Unknown	High (continuing)	Lower water levels in Lake Erie and Lake Huron is causing drying and succession in coastal marshes. Drought is the suspected cause of a mass mortality event at a Provincial Park when 53 of 101 marked turtles died within a short time period. The exact cause is unknown but drought may have led to lower water levels allowing predators more access, or shallower water led

IUCN No.	Threat description	Impact <sup>a</sup>	Scope <sup>b</sup>	Severity <sup>c</sup>	Timing <sup>d</sup>	Detailed threats
						turtles to freeze during winter, subsequently being scavenged.
11.3	Temperature extremes	Not calculated (outside the assessment time)	Pervasive (71-100%)	Unknown	Low (possibly in long term, >10 years)	May affect sex ratio as sex determination is temperature dependent; may affect nesting success as eggs may not incubate properly.
11.4	Storms & flooding	Unknown	Unknown	Unknown	High (continuing)	At least one nesting site in Ontario washed away by storms. Not well studied.

<sup>a</sup> **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. The median rate of population reduction for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75%), 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 time (e.g., timing is insignificant/negligible [past threat] or low [possible threat in long term]); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

<sup>b</sup> **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%).

<sup>c</sup> **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or three-generation time frame. For this species, a 10-year time frame was used. Severity is 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%).

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

## 4.2 Description of Threats

This section describes the threats outlined in Table 1, emphasizing key points of interest. The COSEWIC status report (2016) provides more detailed information. Although threats are listed individually, an important concern is the long-term cumulative effect of such a variety of threats on Blanding's Turtle local populations. It should be noted that some threats apply only during the active season (generally April to October) since they lead to direct mortality or mutilation of individuals. Moreover, exposure to threats increases in periods in which Blanding's Turtles are more mobile (e.g., emergence from overwintering, nesting). Among mechanisms through which threats can impact Blanding's Turtles local populations, isolation through habitat loss and fragmentation is of special concern, as it leads to a breakdown of metapopulation dynamics and limits the possibility of the rescue effect. Threats are listed according to the level of impact calculated in Table 1. The following sections summarize the main impacts of the threats identified.

### 4.2.1 Road and railway networks

#### IUCN Threat 4.1 Road and railroads (high impact)

Since Blanding's Turtles travel large distances overland (Reference removed; Beaudry et al. 2008; COSEWIC 2016), where movements are slow, mortality resulting from vehicle collisions is a concern, particularly in areas where heavily travelled roads run through or near wetlands. In less urbanized areas, Blanding's Turtles are at risk of being crushed by all-terrain vehicles (ATVs) and trucks on trails and logging roads (Newton and Herman 2009). Females are more often encountered on roads than males (Steen et al. 2006) because they travel large distances on land during the nesting season (References removed), use the shoulders of paved and unpaved roads to nest (References removed), or nest directly on unpaved roads and ATV trails. Newly created roads and trails may attract Blanding's Turtle females in search of suitable nesting habitat (e.g. bare ground). Expansion of road networks near occupied habitat may create new nesting locations, but they may well act as ecological traps because of the increased risk of collisions associated with such locations (Kruschenske, pers. comm. 2014, *in* COSEWIC 2016). According to information reported by COSEWIC (2016), road and trail maintenance can pose a threat to turtles and nests during grading and vegetation removal/control in summer and fall. Cleaning ditches can cause turtles to leave their overwintering site, weakening them and potentially resulting in their death.

Increased mortality rates in females may result in a male-biased sex ratio of turtle populations in wetlands surrounded by a dense road network (Reference removed; Marchand and Litvaitis 2004a; Gibbs and Steen 2005). Loss of adult females is especially harmful to local Blanding's Turtle populations given the species' reproductive strategy (extreme longevity, low recruitment rates). Nests and emerging hatchlings can be crushed by vehicles, particularly when clutches are laid on unpaved roads and trails.

In addition to causing direct mortality, roads also remove suitable habitat, alter adjacent areas and hydrological patterns, and subdivide local populations. Major roads that are

heavily trafficked or built in such a way that they impede the movement of individuals are considered barriers to movement (Reference removed; NatureServe 2018). Expansion of the road network is associated with increased mortality and reduced gene flow between local populations, contributing to their isolation and limiting a potential rescue effect from surrounding local populations (COSEWIC 2016).

COSEWIC (2016) reports several records of live or dead individuals found on railway tracks throughout the species' range. For example, 3 of 13 dead Blanding's Turtles incidentally encountered between 2009 and 2011 were found on a railway track that crossed a wetland (Reference removed). Many turtle bones and dried out carapaces were found along the same railway track, but the species could not be identified. In addition to the risk of collisions, individuals that become trapped between two railway tracks can die from dehydration (References removed). Like road networks, railway networks contribute to the loss and fragmentation of suitable habitat and to the isolation of Blanding's Turtle local populations.

In Ontario, the road network is growing rapidly, especially in the southern portion of the province, where major roads grew by 28 000 km over a 60-year period (Fenech et al. 2005). Road mortality is of major concern in this province, and road sections with high mortality rates of freshwater turtles have been identified in many areas, including national and provincial parks (Reference removed; Crowley and Brooks 2005; Ontario Road Ecology Group 2010; Crowley pers. comm. 2014). In Ontario, road mortality on less heavily travelled roads, although high, is lower than on major roadways. Once logging roads and gravel county roads are taken into account, there are few Blanding's Turtle sub-populations in southern Ontario that do not occur within 10 km of a road. On the basis of estimated road kill rates of 0.2 to 0.3 turtles/km from standardized surveys conducted along four major Ontario roadways, it is estimated that between 265 and 400 Blanding's Turtles ( $\geq 15$  cm plastron length) are killed each year on roads in the province (COSEWIC 2016). In Quebec, the area occupied by the Blanding's Turtle is fragmented by an extensive network of roads and trails, with many ATV trails at known occupied sites (Reference removed). Several cases of road mortality have been reported in this region (References removed; Desroches and Picard 2005), and the risk of mortality is considered high in over half of the sites studied (37/72 sites) (Reference removed). However, no road mortality was documented in a three-year telemetry survey of 51 adults (Reference removed). Even low mortality rates can be detrimental to Blanding's Turtle local populations, given their vulnerability to increased adult mortality (see Section 3.4). Mitigation measures that have shown to reduce road mortality in turtles include the creation of ecopassages (e.g. culverts) with exclusion fencing (Reference removed; Ontario Road Ecology Group 2010). The effectiveness of ecopassages is compromised when turtles can use alternate routes (e.g. incomplete fencing) (Reference removed), showing the importance of careful design of these mitigation measures.



#### 4.2.2 Exotic and invasive species (European Common Reed)

##### IUCN Threat 8.1 Invasive non-native/alien species (high-medium impact)

In some areas, particularly around Lake Erie, Lake Huron, and Lake St. Clair, and along some major rivers, European Common Reed (*Phragmites australis* ssp. *australis*) has invaded wetlands, forming monocultures that have altered conditions and reduced habitat quality for Blanding's Turtles and other turtle species (Gillingwater, pers. comm. 2012; COSEWIC 2016). This species is expected to continue to spread and it is estimated that its range will completely overlap with that of the Blanding's Turtle, Great Lakes / St. Lawrence population, by 2030 (Catling and Mirtrow 2011), which would lead to an estimated population decline of between 11% and 70% over the next three generations (120 years) (COSEWIC 2016). Although the Blanding's Turtle may occasionally use the flooded edges of European Common Reed stands, it generally avoids the interior of dense stands (COSEWIC 2016; Markle and Chow-Fraser 2018). The expansion of the road network also facilitates the spread of invasive plant species, especially in southern Ontario (Gelbard and Belnap 2003). Blanding's Turtles nest in open, unshaded areas exposed to heat from the sun. In a study conducted along Lake Erie, Ontario, it was found that European Common Reed had reduced the amount of suitable nesting habitat because the plants' growth had altered the microenvironment (particularly the temperature) of turtle nests during incubation (Reference removed).

Other invasive species might have an impact on the Blanding's Turtle and its habitat, including the Rough Mannagrass (*Glyceria maxima*), the Common Carp (*Cyprinus carpio*), and exotic pets such as the Red-eared Slider (*Trachemys scripta elegans*). For example, the introduction of Red-eared Slider into the natural environment following a period of captivity can lead to competition and/or transmission of diseases to native turtles (Cadi and Joly 2003, 2004; Pearson et al. 2015). It is known that this species is now able to successfully reproduce in the wild in some parts of Ontario (e.g., Greater Toronto Area) (OMNR 2014, unpublished data; Seburn 2015). More information on the direct impacts on the Blanding's Turtle populations is necessary to understand the level of threat each of these invasive species poses to the Blanding's Turtle.

#### 4.2.3 Residential and commercial development

##### IUCN Threats 1.1 Housing & urban areas (medium impact), 1.2 Commercial & industrial areas (negligible impact), 1.3 Tourism and recreation areas (low impact)

Conversion of suitable aquatic and terrestrial habitats for development is a significant threat to the Blanding's Turtle, Great Lakes / St. Lawrence population. Land conversion (for residential and urban development, recreation and tourism) means that natural habitats are permanently altered. Elimination of wetlands occupied by Blanding's Turtles forces them to move to other aquatic habitats, exposing them to other threats (e.g. road and railway networks, human-subsidized predators) and can lead to the use of lower quality habitat.

Conversion of upland areas surrounding aquatic habitats can eliminate important nesting sites and areas used for thermoregulation, their period of summer inactivity, and

movements. The alteration of features along the shoreline (e.g. nesting sites, basking sites) can impact local Blanding's Turtles populations inhabiting such areas. Terrestrial habitats modified by human activity may remain occupied, and increased availability of open nesting habitats may attract individuals to disturbed areas. In some regions, the Blanding's Turtle is more present in forest landscapes, and tree clearing can make the landscape less suitable (Reference removed).

Land conversion fragments habitat patches (both aquatic and terrestrial), which isolates local populations, reduces genetic variation, and increases the risk of death during travel through inhospitable areas. Densely urbanized areas are considered a barrier to movement because they lack suitable habitat for turtles to use (NatureServe 2018), isolating local populations and limiting a potential rescue effect from other local populations (COSEWIC 2005). Some research has found that turtles are less abundant in more isolated wetlands (Marchand and Litvaitis 2004a). One study also suggests that small populations of Blanding's Turtles may be genetically diminished in comparison with larger populations (Reference removed). This may be due to reduced ability for successful dispersal of individuals, which can limit gene flow and result in a loss of genetic variation (Gray 1995). Loss of genetic variation in small, isolated populations can in turn cause a loss of population fitness and adaptability, and increase the risk of extinction in the wake of a catastrophic event or epidemic<sup>25</sup> (Frankham 1995; Reed and Frankham 2003).

#### **4.2.4 Illegal collection**

##### IUCN Threat 5.1 Hunting and collecting (medium impact)

Worldwide, many turtle species are impacted by both casual and large-scale systematic illegal collection for use as pets, food, and traditional medical remedies (Bodie 2001; References removed). The export rate of freshwater turtles, for both the pet and food trades, is high in the United States (Mali et al. 2014), but low in Canada (Commission for Environmental Cooperation 2017). For example, no Blanding's Turtles were exported from Canada during the period 2013-2017 (CITES 2018). In Canada, the commercial import of live turtles for use as pets is prohibited under the *Health of Animals Act* (S.C. 1990, c. 21). However, turtles have been illegally imported into Canada for decades because they generally sell for a much higher price in Canada than in the United States. The high price in Canada creates an added incentive for poaching and smuggling (Commission for Environmental Cooperation 2017) Moreover, reptile species are more likely to be involved in the international pet trade if they are categorized as at risk than if they are not considered at risk (Bush et al. 2014), consistent with a general demand for rare wildlife (Courchamp et al. 2006). Using data on turtles sales from a major Hong Kong-based internet forum, Sung and Fong (2018) determined that the price of a turtle is generally proportional to the species' risk status, that individuals of native origin are more highly sought after than farmed individuals, and that roughly 36% of the 77 species represented were illegally collected. The extent of the illegal organized turtle harvest is poorly documented in Canada for the Blanding's

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<sup>25</sup> Epidemic: A rapid spread of disease.

Turtle, but captive-bred individuals have been found for sale online, and a case of illegal harvesting of Blanding's Turtles in Ontario, which resulted in fines being laid under SARA, was reported in the Chatham Daily News (2008). COSEWIC (2016) reports that Blanding's Turtles are occasionally collected and kept in captivity by individuals living near the species' habitat. Blanding's Turtles are also illegally harvested in Canada for use in Asian food products and traditional remedies, and demand for such products is generally on the rise (Miller, pers. comm. 2014, *in* COSEWIC 2016).

The illegal collection of Blanding's Turtles removes individuals from all age classes from the population which, given the species' reproductive strategy (extreme longevity, low recruitment rates), may greatly reduce recruitment (COSEWIC 2016). Adult females are easier to locate and catch because they sometimes aggregate at easily accessible sites to nest (e.g. road shoulders, beaches) and show strong fidelity to their nesting sites. They are also more sought after as they might provide eggs (COSEWIC 2005). The loss of adult females has a major impact on the viability of local populations (see section 3.4).

#### **4.2.5 Human-subsidized predators**

IUCN Threat 8.2 Problematic native species (medium impact)

In many areas, the low density or absence of top predators and increased food availability from human sources (e.g. food handouts, garbage, crops) have led to a greater abundance of turtle predators than natural conditions would have historically supported (Mitchell and Klemens 2000). Main predators of the Blanding's Turtles include raccoons, skunks, opossums, foxes, domestic and feral dogs and cats, coyotes, and some birds (e.g. crows and ravens). The abnormally high level of many predator populations can lead to very high rates of predation, especially on eggs and hatchlings. Predation rates on nests can be higher at human-altered sites (e.g. roadsides) where opportunistic nest discovery is facilitated, and at sites that contain several nests (Marchand and Litvaitis 2004b; Reference removed). Predators can also feed on or injure juveniles and adults (COSEWIC 2016). Turtles are more vulnerable to predation when they are travelling on land, whether juveniles during dispersal or females during nesting forays.

Elevated predation by raccoons has been identified as the likely cause of low recruitment and a shifting age structure in a Blanding's Turtle population along Lake Erie, Ontario (Browne and Hecnar 2007). Turtle nest predation rates of between 80% and 100% have been observed at this location (References removed). In Quebec, 12% of the 113 Blanding's Turtles captured between 2009 and 2011 had a partially missing limb or tail (Reference removed), and predation is believed to be a probable cause (along with other possible causes). Methods to deal with elevated predation rates (e.g. use of cages and fencing to protect nests) have been developed and used with varying degrees of success (Reference removed).

#### **4.2.6 Modification of natural systems (water management and dredging)**

IUCN Threats 7.2 Dams and water management/use (medium-low), 7.3 Other ecosystem modifications (low impact)

Any alteration of the natural water regimes of wetland complexes can result in the temporary or permanent loss or degradation of aquatic habitat for the Blanding's Turtle. In addition, water level changes in aquatic habitats can lead to changes in surrounding terrestrial habitats (e.g. soil humidity, vegetation structure), potentially resulting in the loss of suitable nesting and basking sites. In Quebec, Blanding's Turtle habitat is composed largely of wetland complexes maintained by beaver dams (Reference removed). The removal of beaver dams to prevent flooding (of roads, buildings, agricultural fields, etc.) and the natural deterioration of dams have been observed at many locations in the Outaouais region and have caused rapid declines in water levels in wetlands occupied by the Blanding's Turtle (Reference removed). Moreover, partial draining of wetlands reduces the area available to Blanding's Turtles for foraging and can remove suitable overwintering sites. Draining wetlands below a certain level makes the habitat unsuitable for Blanding's Turtles, forcing individuals to move to other habitat patches (Hall and Cuthbert 2000). Searching for new suitable habitat forces individuals to use terrestrial habitat, exposing them to other threats, such as road mortality and predation. The removal of dams around the time of or during overwintering could expose individuals to low fall or winter temperatures or force them into using less suitable overwintering sites, which could weaken or kill individuals. Permanent structures to control the water level in wetlands maintained by beaver dams have been used in portions of the range, and have been shown to successfully avoid overflow on infrastructure without causing habitat destruction (Cook and Jacob 2001). Water level control structures that are designed to maintain or restore wetlands (e.g., for waterfowl) and that are suitable for the Blanding's Turtle are generally not considered a threat. In managed wetlands maintained by artificial dams, adequate control of water levels is critical in order to avoid draining or filling them to the point that they no longer provide suitable habitat for the Blanding's Turtle (e.g. deep water with little vegetation). It has been hypothesized that movements of individuals across the Ontario–Quebec border are limited due to damming for hydroelectricity (COSEWIC 2005), resulting in the isolation of local populations.

Small water control structures installed for the purpose of wetland maintenance or restoration may benefit Blanding's Turtle if they are designed with considerations of the ecological needs of Blanding's Turtle and with appropriate mitigation of impacts to the species.

According to COSEWIC (2016), dredging of wetlands, particularly during the overwintering period, presents a mortality risk for Blanding's Turtles, mainly in southern Ontario, where the wetlands available for Blanding's Turtles have often been created for the purpose of providing waterfowl habitat. Dredging can also alter Blanding's Turtle habitat. In Ontario, for instance, shallow wet meadows with abundant vegetation have been converted to deep, open-water ponds devoid of cover and foraging opportunities (Gillingwater, pers. comm. 2016). The use of aquatic weed mowers to clear boat

channels also poses a risk of injury or mortality for turtles in coastal wetlands (Bolton, pers. comm. 2015, *in* COSEWIC 2016). Dredging, aquatic weed cutting and the creation of waterfowl habitat are likely common in wildlife management areas and are likely a cause of Blanding's Turtle mortality.

#### **4.2.7 Agriculture**

IUCN Threat 2.1 Annual & perennial non-timber crops (low impact)

From the early 1800s to the mid-1900s, wetland conversion for agriculture occurred in southern Ontario and Quebec. Agricultural expansion still continues today, but at a slower pace and is not anticipated to cause large declines in Blanding's Turtle habitat over the next 10 years (COSEWIC 2016). However, the species may use agricultural fields as staging areas (prior to oviposition), as nest sites or for movements to and from nest sites (References removed; Dillon Consulting 2014). The use of agricultural machinery on these lands constitutes a risk of mortality and injury to individuals at all stages of development, and particularly to adult females and hatchlings that use agricultural fields during nesting (COSEWIC 2016). Mutilation of limbs can reduce turtle mobility, and damage to the carapace can directly inhibit or limit their growth (Saumure and Bider 1998). In addition, agricultural runoff can contribute to wetland degradation through increased sediment and contaminant loading (COSEWIC 2016).

#### **4.2.8 Forestry**

IUCN Threat 5.3 Logging & wood harvesting (low impact)

Forestry is a threat to the Blanding's Turtle primarily in Ontario. In fact, over half of the species' Ontario range overlaps with forestry sectors on Crown land (i.e., in the Georgian Bay ecoregion and northern Ontario; COSEWIC 2016). In Quebec, the species occurs in protected areas or on private land used primarily for agriculture (Dubois, pers. comm. 2014, *in* COSEWIC 2016). The long-term impacts of timber harvesting on the Blanding's Turtle are recognized as having fewer effects as compared to other activities that involve tree clearing (Natural Heritage and Endangered Species Program 2007). However, forestry operations require a network of forest access roads, thereby increasing the impact on Blanding's Turtles (COSEWIC 2016; see section 4.2.1). Heavy machinery used in forestry operations can also result in injury or mortality to turtles, including hatchlings and juveniles. Logging can also alter, destroy or cut off access to important habitat elements, such as vernal pools (Natural Heritage and Endangered Species Program 2007). The study by Currylow et al. (2012) of another turtle species that uses forest habitat (Eastern Box Turtle [*Terrapene carolina*]) showed that timber harvesting that creates canopy gaps larger than 2.7 ha can reduce habitat quality since air temperatures in the centre of these gaps are at the upper limit of the turtles' thermal optima. Moreover Agha et al. (2018) show that this same species uses primarily the edges of harvested areas as they are able to move more easily to more closed canopy forest habitats where temperatures are lower. Activities involving the handling of debris (e.g., forest harvest residues) and soil can sometimes result in individuals becoming buried or crushed beneath the substrate or debris. In nesting habitat, machinery can destroy nests by compacting or disturbing the substrate. In

Ontario, guidelines have been adopted under the *Crown Forest Sustainability Act* (S.O. 1994, c. 25) to minimize adverse effects. The primary purpose of such practices is to minimize the impact of operations on individuals during sensitive periods, but also to protect suitable overwintering, nesting and summer habitats (Ontario Ministry of Natural Resources and Forestry 2016). Other measures have been implemented to mitigate the adverse impact of roads on Blanding's Turtles on Crown lands subject to timber harvesting. They include awareness activities, strategies designed to reduce traffic speed and volume on forest roads and the prohibition of the construction of new roads near (< 30 m) nest sites or suitable summer habitat (Ontario Ministry of Natural Resources and Forestry 2016). Given these measures, the impact of forestry on the Blanding's Turtle Great Lakes - St. Lawrence population is likely small (COSEWIC 2016).

#### **4.2.9 Recreational activities**

##### IUCN Threat 6.1 Recreational activities (low impact)

Blanding's Turtles that use coastal wetlands connected to larger bodies of water can be injured or killed by motorboat propellers or in commercial fisheries (Bennett and Litzgus 2014; Gillingwater, pers. comm. 2016). In southwestern Ontario, unpublished data reported in COSEWIC (2016) indicate that close to 10% of the individuals captured at one site had scarring indicative of propeller strikes. The threat is likely present in other local populations where pleasure boating is common.

Blanding's turtles are known to move along or nest on ATV and bicycle trails and in old quarries used by ATVs (Reference removed; Nova Scotia Blanding's Turtle Database 2014; Gillingwater, unpubl. data *in* COSEWIC 2016). This presents a risk of injury or mortality to individuals and potential for destruction or damage to nests (Parks Canada 2012; Woods 2014; Nova Scotia Blanding's Turtle Database 2014).

#### **4.2.10 Threats with a negligible or unknown impact**

IUCN Threats 1.2 Commercial & industrial areas, 2.3 Livestock farming & ranching, 3 Energy production & mining, 4.2 Utility & service lines, 5.4 Fishing & harvesting aquatic resources, 6.2 War, civil unrest & military exercises, 6.3 Work & other activities, 7.1 Fire & fire suppression, 9 Pollution, 11 Climate change & severe weather

Threats with a negligible or unknown impact as assessed in Table 1 are not described in detail in this document. For information on these threats, readers are invited to refer to the descriptions presented in the latest COSEWIC status report on the Blanding's Turtle (2016).

## 5. Population and Distribution Objectives

The long-term (~50 years) population and distribution objectives are:

- To increase abundance and maintain, and if possible increase, the area of occupancy of the Blanding's Turtle, Great Lakes / St. Lawrence population in Canada.
- To ensure the viability<sup>26</sup> of Blanding's Turtle local populations<sup>27</sup> where they occur in Canada.

To work towards achieving the long-term population and distribution objectives, the following medium-term sub-objective (~10–15 years) has been identified:

- To maintain the presence of known Blanding's Turtle local populations.

According to COSEWIC (2016), continued habitat loss and fragmentation within the species' range has led to a population decline of more than 60% over the last three generations. The decline is projected to continue at a rate of 40% over 80 years (two generations) and 50% over 117 years (just under three generations) based on inferred declines due to excessive road mortality in many parts of Ontario. Such a decline would also result in a reduction in local populations. The goal of this recovery strategy is to reverse the population decline by addressing threats to the species through threat reduction and mitigation as well as habitat management. Threats need to be addressed taking into account their temporality and their variable severity across different regions. While studies in Quebec and Ontario have provided significant insights into habitat use and movement of the Blanding's Turtle, there is still limited information on trends and abundance of the Great Lakes / St. Lawrence population. At most studied locations, available information consists of presence/absence data or a number of captured individuals. Thus, it will be necessary to obtain more precise baseline abundance and trend information to monitor progress towards achieving viable local populations. This long-lived species has specific ecological requirements, complex life cycle needs, and a limited ability to compensate for the loss of individuals through reproduction or through recruitment from adjacent local populations. As a result, active broad strategies and general approaches undertaken on several fronts over a long period of time and sometimes over large regions will be required to achieve these objectives. A special focus is given to maintaining areas of suitable habitat large enough for local populations to thrive. To increase abundance and area of occupancy, habitat creation and restoration are also advised where necessary and feasible.

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<sup>26</sup> A local population that is sufficiently abundant and well adapted to its environment for long-term persistence (in the face of demographic, genetic and environmental stochasticity, plus natural catastrophes) without significant ongoing management and investment of resources.

<sup>27</sup> For the purpose of this recovery strategy, a local population is defined as a discrete interbreeding population.

Given that some uncertainties exist as to the feasibility of avoiding or sufficiently mitigating some of the main threats to the Blanding's Turtle, Great Lakes / St. Lawrence population, the achievement of the long-term population and distribution objectives may not be possible. The established objectives reflect the best technically and biologically achievable scenario according to available information, and are informed by the scientific principles of conservation.

## **6. Broad Strategies and General Approaches to Meet Objectives**

### **6.1 Actions Already Completed or Currently Underway**

In 2013, the Canadian Amphibian and Reptile Conservation Network (CARCNET) and the Canadian Association of Herpetologists (CAH) passed a motion to merge together to form the Canadian Herpetological Society (CHS). At the national level, the CHS is the main non-profit organization dedicated to advancing amphibian and reptile conservation by promoting scientific research and disseminating the results, facilitating collaboration among herpetologists, carrying out public education programs and community projects, compiling and analyzing historical data and leading conservation and stewardship projects.

Environment and Climate Change Canada has been funding projects related to turtle conservation across Quebec and Ontario through the Habitat Stewardship Program (HSP) and Aboriginal Fund for Species at Risk (AFSAR) since 2001 and the Interdepartmental Recovery Fund (IRF) since 2004. Projects have included activities such as: undertaking targeted surveys for the species; identifying important habitat of local populations; studying the severity of and/or mitigating threats such as road mortality; soliciting observations and encouraging public reporting of sightings; and educating landowners and/or the public on species identification, threats, and stewardship options. Some of these projects, along with those funded by the provinces and others, are described below.

#### *Ontario*

An Ontario Multi-Species Turtles at Risk Recovery Team was established in the early 2000s by a group of people interested in turtle recovery, and focused on six turtle species at risk: the Blanding's Turtle, the Eastern Musk Turtle (*Sternotherus odoratus*), the Northern Map Turtle (*Graptemys geographica*), the Spiny Softshell (*Apalone spinifera*), the Spotted Turtle (*Clemmys guttata*), and the Wood Turtle (*Glyptemys insculpta*). This group has coordinated and initiated a number of recovery efforts, including conducting educational and outreach programs on reptiles and various management initiatives such as nest protection projects and nest site rehabilitation projects (Reference removed).



In 2013, the Ministry of Natural Resources and Forestry (MNRF) produced a general habitat description for the Blanding's Turtle, which provides greater clarity on the habitat protected under the *Endangered Species Act, 2007*. The MNRF has funded numerous turtle conservation and stewardship projects across Ontario through the Ontario Species at Risk Stewardship Fund and other provincial funding programs. In 2010, the MNRF released the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (The Stand and Site Guide) (OMNR 2010). This tool, designed for forest managers, provides direction on planning and conducting forest operations at the stand and site level (i.e., 10s of m<sup>2</sup> to 100s of km<sup>2</sup>) so that forest biodiversity will be conserved, and it includes standards, guidelines and best management practices for turtles found in the Area of the Undertaking, including Blanding's Turtles.

Since 2009, Ontario Nature has been coordinating the development of a new Ontario Reptile and Amphibian Atlas and is working with the Natural Heritage Information Centre and other organizations (Ontario Nature 2013). By soliciting occurrence records from the public, researchers, government and non-governmental organizations, this project is improving our knowledge of the distribution and status of reptiles and amphibians in Ontario, including the Blanding's Turtle (Crowley pers. comm. 2014).

There have been several large-scale inventory, survey, and monitoring programs targeting turtles, including the Blanding's Turtle, in Ontario, such as the Ontario Turtle Tally (Toronto Zoo), the Kawartha Turtle Watch (Trent University), initiatives of the Nature Conservancy of Canada and Ontario Nature as well as many local survey and monitoring programs (e.g. by researchers and First Nations). In addition, research has been conducted on the Blanding's Turtle in various parts of Ontario to fill knowledge gaps, including studies on home ranges, demographics, habitat use, ecology, and threats (References removed).

Various restoration, threat mitigation, and other conservation initiatives have been undertaken in Ontario (e.g. by Parks Canada Agency within National Parks and Rouge National Urban Park, Nature Conservancy of Canada, and numerous other organizations). Notably, several organizations have been involved in the protection of nests and hatchlings and/or headstarting programs (e.g. Toronto Zoo, Parks Canada Agency, Ontario Turtle Conservation Centre). In the context of Rouge National Urban Park's legislated responsibility to conserve nature, culture and agriculture, Parks Canada has initiated landscape enhancement projects in collaboration with the agricultural community and other stakeholders. This approach will serve as a model for integrated habitat and farmland enhancement benefitting the Blanding's Turtle and other species. The Ontario Turtle Conservation Centre (OTCC) in Peterborough also rehabilitates wild turtles that were injured in the hopes of recovering and releasing them (<https://ontarioturtle.ca/>). The number of turtles that the centre treats annually is rising.

There are many organizations and agencies that offer outreach and educational programs on turtle species at risk to school groups, First Nations, and the general public (e.g., Scales Nature Park, Reptiles at Risk on the Road Project, the Georgian Bay Biosphere Reserve [and previously the Georgian Bay Reptile Awareness Program], Ontario Nature, Ontario Ministry of Natural Resources, Ontario Parks, the Parks

Canada Agency, Toronto Zoo, and the Upper Thames River Conservation Authority). The Toronto Zoo Adopt-a-Pond Wetland Conservation Program is one of several projects that have developed turtle conservation curricula for schools, while the Toronto Zoo Turtle Island Conservation Program promotes turtle conservation and awareness among First Nations and non-Indigenous groups (Toronto Zoo 2018). Turtle SHELL (Safety, Habitat, Education and Long Life) has prepared booklets and installed turtle crossing signs.

Many projects are being carried out as a requirement under the Ontario *Endangered Species Act, 2007* and are directly benefitting turtle populations. For example, turtle fencing and ecopassages are now incorporated into the design of most new highways whenever they bisect the habitat of one at-risk turtle species (Ontario Road Ecology Group 2010; OMNR 2013).

### Quebec

The Quebec Turtle Recovery Team was created in 2005. One of its mandates is to develop and implement a recovery plan for five species of turtles: the Wood Turtle, the Northern Map Turtle, the Blanding's Turtle, the Eastern Musk Turtle and the Spotted Turtle (Reference removed). In 2012, this team merged with the Spiny Softshell (*Apalone spinifera*) Recovery Team, thus including a sixth species of turtle. To ensure implementation of the recovery actions, four Implementation Groups were established, each working on a specific turtle species or group of species. One of these groups is the Blanding's Turtle and Eastern Musk Turtle Implementation Group, and is made up of partners from many organizations and independent consultants, including (over the years) the Quebec Ministère des Forêts, de la Faune et des Parcs (MFFP), Environment and Climate Change Canada, the National Capital Commission, Nature Conservancy of Canada, Hydro-Québec, and McGill University.

An amphibian and reptile database (Atlas des Amphibiens et des Reptiles du Québec) exists and is managed by the Société d'Histoire Naturelle de la Vallée du Saint-Laurent (SHNVSL). The Atlas des Amphibiens et des Reptiles du Québec was a source database of the Centre de données sur le patrimoine naturel du Québec (CDPNQ) until 2014. The CDPNQ is held by the MFFP for data on threatened or vulnerable species, including the Blanding's Turtle. In 2012, the CDPNQ mapped element occurrences of the Blanding's Turtle in Quebec.

In the last decade, numerous activities have been undertaken to better understand the Blanding's Turtle in Quebec, including surveys (References removed), research on the ecology, population structure, habitat use and habitat composition, residences and movements (References removed; Fortin et al. 2012), and research on threats such as mortalities and injuries caused by road and railway networks, and water management, specifically alterations caused by beaver dams (Reference removed). A population monitoring protocol has been produced (Reference removed). In addition, a habitat conservation plan promoting beaver management that is compatible with maintaining Blanding's Turtle habitat has been produced and is beginning to be implemented

(Reference removed). A protection plan for the Blanding's Turtle is also currently under production by the Wildlife Protection Branch of the MFFP.

Considering what is known about the distribution of the species, seven priority conservation areas were established in the Outaouais region (Reference removed). With these conservation areas, several acquisition projects have been implemented by the MFFP and partners such as Nature Conservancy Canada to conserve habitats used by the Blanding's Turtle in Quebec. Nature Conservancy Canada has secured over 3000 ha of terrestrial and aquatic habitats used by the Blanding's Turtle in the Outaouais region. Also, several stewardship and communication initiatives have been put forward to conserve Blanding's Turtles and their habitat (e.g. maintenance of habitats at managed sites; distribution of brochures and pamphlets to the public; presentations in schools, at general public information days and in television and newspaper reports; and development of a web page). All these actions have been conducted by government and para-governmental organizations, First Nations, conservation organizations, research or zoological institutions, or volunteers.

## 6.2 Strategic Direction for Recovery

**Table 2. Recovery Planning Table**

Threat <sup>a</sup> or Limitation	Broad Strategy for Recovery	Priority <sup>b</sup>	General Description of Research and Management Approaches
All Threats	Law and Policy	High	<ul style="list-style-type: none"> <li>- Enforce and promote compliance with existing laws, regulations, and policies applicable to Blanding's Turtle individuals and habitat on all types of land tenure.</li> </ul>
1, 3, 4, 5, 6, 7, 8, 9	Reduction of Adult Mortality, Injury, and Illegal Collection	High	<ul style="list-style-type: none"> <li>- Identify and prioritize sites where mortality, injury and illegal collection of adults are threatening local Blanding's Turtle populations.</li> <li>- Develop or improve, implement, and evaluate mitigation techniques (e.g. best management practices) to address threats to individuals at priority sites.</li> <li>- Develop, implement, and evaluate a federal/provincial strategy to address illegal collection.</li> </ul>
1, 2, 3, 6, 7, 8, 9	Conservation, Management, and Restoration of Habitat	High	<ul style="list-style-type: none"> <li>- Identify and prioritize sites where habitat loss, degradation, and fragmentation are threatening local Blanding's Turtle populations, and assess habitat restoration needs.</li> <li>- Develop or improve, implement, and evaluate mitigation and habitat restoration techniques to address threats to habitat at priority sites.</li> <li>- Conserve areas large enough to maintain viable populations and increase connectivity through administrative and stewardship tools.</li> </ul>
All Threats	Communication and Outreach	Medium	<ul style="list-style-type: none"> <li>- Develop and implement communication strategies appropriate to target audiences and to major initiatives to reduce adult mortality, reduce threats and conserve habitat.</li> <li>- Improve and maintain co-operation between Governments, First Nations and key stakeholders (e.g. partner agencies, interest groups, landowners).</li> <li>- Encourage and support the transfer and archiving of information and tools, including Traditional Ecological Knowledge (TEK).</li> <li>- Promote and engage partners in research initiatives necessary to fill knowledge gaps.</li> </ul>
All Threats	Improvement of Recruitment where Needed	Medium	<ul style="list-style-type: none"> <li>- Document recruitment needs at locations where the Blanding's Turtle is declining or where the viability is deemed to be compromised.</li> <li>- Where needed, develop or improve, implement, and evaluate techniques to reduce nest destruction and/or increase recruitment.</li> </ul>
Knowledge Gaps	Surveying and Monitoring	Medium	<ul style="list-style-type: none"> <li>- Develop and implement monitoring plans for each province (e.g. population, habitat, threats).</li> <li>- Develop and promote the appropriate use of standardized protocols (e.g., data collection, handling, marking) and databases.</li> <li>- Prioritize and conduct targeted surveys.</li> <li>- Increase knowledge of local populations (e.g., abundance, distribution, key habitats, and threats).</li> </ul>

Threat <sup>a</sup> or Limitation	Broad Strategy for Recovery	Priority <sup>b</sup>	General Description of Research and Management Approaches
Knowledge Gaps	Research	Medium	<ul style="list-style-type: none"> <li>- Determine minimal habitat and population requirements to ensure local population viability (e.g., suitable habitat size, number of mature individuals).</li> <li>- Determine the full range of adverse effects (e.g., indirect effects, knowledge gaps) from identified threats and potential threats.</li> <li>- Refine knowledge of habitat needs at various life stages (e.g. nesting and associated staging habitat) and in different regions in order to develop a better understanding of spatial and temporal use.</li> </ul>

<sup>a</sup> Threats or limitations: 1) Road and railway networks, 2) Exotic and invasive species, 3) Residential and commercial development, 4) Illegal collection, 5) Human-subsidized predators, 6) Water management and dredging, 7) Agriculture, 8) Forestry, 9) Recreational activities.

<sup>b</sup> "Priority" reflects the degree to which the broad strategy contributes directly to the recovery of the species or is an essential precursor to an approach that contributes to the recovery of the species.

### 6.3 Narrative to Support the Recovery Planning Table

Considering the main threats faced by the Blanding's Turtle, Great Lakes / St. Lawrence population, habitat conservation, management and restoration remain the primary needs of the species to achieve recovery since such activities help to maintain, improve or create suitable habitat, and also contribute to reducing adult mortality (i.e., reducing threat severity). The area delineated as critical habitat defines a key "conservation zone" for this species, more precisely an area within which recovery efforts (reducing adult mortality and threats, habitat management) need to occur. Habitat management is also necessary on a wider scale (e.g. landscape) in order to minimize some threats affecting the Blanding's Turtle (e.g. land conversion). Maintaining the highest possible adult survival, especially for females, is another key strategy, taking into account the Blanding's Turtle reproductive strategy (extreme longevity, low recruitment rates). Unfortunately, some biological traits of the species (i.e., terrestrial habits, use of bare ground and disturbed habitats to nest) make it sensitive to many human activities (e.g., transportation, agriculture, illegal collection) so it is deemed urgent to undertake a particularly proactive integrated approach with land owners and land users to limit threats to adult Blanding's Turtles. Such approaches should focus primarily on the specific spatial and temporal scales where most of the adult mortality, injury, and illegal collection occur. Approaches targeting Blanding's Turtle adults and habitat must be coordinated and implemented through collaboration between various stakeholders (e.g., land owners, land users, land planners, First Nations, non-governmental organizations, and governments). Considering the large numbers of stakeholders engaged in the recovery of the Blanding's Turtle as well as the wide spectrum of threats affecting it, specific communication and outreach approaches are necessary. Improved recruitment is also necessary for certain local populations to reverse the decline, in which case additional approaches are proposed. To achieve the population and distribution objectives, it will be necessary to fill certain knowledge gaps highlighted in Table 2 and in the schedule of studies to identify critical habitat (Table 4); this includes obtaining baseline information on local population abundance and trends.

## 7. Critical Habitat

Under SARA, critical habitat is defined as "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species." Paragraph 41 (1)(c) of SARA requires recovery strategies to include an identification of the species' critical habitat to the extent possible, as well as examples of activities that are likely to result in its destruction. This federal recovery strategy identifies critical habitat to the extent possible, based on the best available information for the Blanding's Turtle, Great Lakes / St. Lawrence population, as of December 2013. Section 41 (1)(c. 1) also requires the inclusion of a schedule of studies to identify critical habitat, where available information is inadequate, which is the case for the Blanding's Turtle, Great Lakes / St. Lawrence population. More precise boundaries may be mapped, and

additional critical habitat may be added in the future if additional research supports the inclusion of areas beyond those currently identified.

## 7.1 Identification of the Species' Critical Habitat

In this recovery strategy, the critical habitat for the Blanding's Turtle, Great Lakes / St. Lawrence population, is partially identified. A schedule of studies outlines the activities necessary to complete the identification of critical habitat (see Section 7.2). The identification of critical habitat will be updated when the information becomes available, either in a revised recovery strategy or action plan(s).

The identification of critical habitat is based on two criteria: habitat occupancy and habitat suitability (includes suitable habitat for all aspects of the life cycle).

### 7.1.1 Habitat occupancy

This criterion refers to the presence and use of a habitat by the Blanding's Turtle. The habitat occupancy criterion for the Blanding's Turtle can be met under two circumstances:

- When a minimum of two Blanding's Turtle individuals have been observed in any single year in the past 40<sup>28</sup> years (an indicator of site quality); or
- When a single individual has been observed in two or more years in the past 40 years (an indicator of site fidelity).

Nesting records automatically meet the criterion, because two individuals are needed to produce a viable embryo. A 40-year period for the habitat occupancy criteria has been chosen to represent the generation time for the Blanding's Turtle, which is considered to be >40 years according to COSEWIC (COSEWIC 2016). This large time frame allows for inclusion of local populations that likely persist but for which Blanding's Turtle individuals may not have been detected in recent years. Site quality is targeted by the habitat occupancy criterion to increase confidence that a site will likely contribute to the maintenance of a local Blanding's Turtle population. Site fidelity is considered because Blanding's Turtles are shown to exhibit high fidelity to their nesting sites and overwintering sites and, to a lesser extent, to their home range (see Section 3.3).

Records considered for the identification of critical habitat include data from all known sources, e.g. professional surveys, incidental sightings, telemetry studies, nest site and overwintering site observations, dead individuals, and observations in unsuitable habitat (e.g., roads). These records must be spatially precise ( $\leq 150$  m) or provide enough detail to be associated with a specific location (e.g. adjacent waterbody). Critical habitat is not identified for locations where survey efforts made in the last decade have not confirmed Blanding's Turtle persistence or habitat use and/or where extirpation is considered

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<sup>28</sup> The 1974–2013 period has been used in this recovery strategy to identify critical habitat. When more critical habitat is identified in a subsequent action plan or an amended recovery strategy, the period will be adjusted to correspond to the year of the new identification.

likely. Distance threshold between records to fulfill the criteria is provided in Section 7.1.2.

### **7.1.2 Habitat suitability**

Blanding's Turtles use a variety of aquatic and terrestrial habitat features. Because of their close relationship with survival and recruitment of individuals as well as some ecological traits of the Blanding's Turtle (e.g., reproductive strategy), nesting and overwintering habitats are addressed separately from other, more general habitat.

Habitat suitability refers to conditions in which individuals can carry out any of the components of their life cycle (i.e., overwintering, mating, nesting, thermoregulation, foraging, and summer inactivity) as well as their movements. Suitable habitat can therefore be described as a mosaic of aquatic and terrestrial habitats in which specific biophysical attributes can be associated with essential life stages and needs. Within suitable habitat, the biophysical attributes required by the Blanding's Turtle will vary over space and time with the dynamic nature of ecosystems. In addition, particular biophysical attributes will be of greater importance to individuals at different points in time, e.g. seasonal need for nesting habitat. Suitable habitat recognizes that certain biophysical attributes do not need to be immediately adjacent to each other, as long as they remain connected so that the individuals can move between them easily to meet all their biological needs and respond to disturbances. The specified distances determining the extent of suitable habitat are specific to the Blanding's Turtle and are based on the species' biological and behavioural requirements (see Section 3.3). The biophysical attributes of suitable habitat for the Blanding's Turtle are detailed in Table 3, while Figure 2 shows suitable habitat features that are used within a life cycle.

#### Nesting habitat

Nest site availability and selection are likely to be especially important for local population persistence given the Blanding's Turtle long-term reproductive success strategy and the fidelity of females to those sites. Rarity of natural nesting sites may explain long-distance pre-nesting movements, strong nest site fidelity, and the use of human-altered habitats (e.g. road shoulders) (see Section 3.3).

A distance of 150 m around a nesting site refers to the minimal spatial accuracy of occurrence records used to identify critical habitat, as mentioned in section 7.1.1. This distance is consistent with results obtained in Quebec for a closely related turtle species (Wood Turtle), where more than 50% of females in a local population were present within 200 m of the nesting site in the days preceding nesting (Walde et al. 2007). This distance also provides for a protected travel corridor for hatchlings to migrate to suitable aquatic habitat. Confirmed nesting sites are identified wherever they are found. The entire feature presenting suitable nesting habitat (e.g. beach, rocky outcrop) is identified, along with a 150-m staging habitat around nesting habitat (or record if nesting habitat is not delineated). Critical habitat in these suitable areas corresponds to the biophysical attributes of bare ground and sparsely vegetated areas (Table 3).



### Overwintering habitat

Habitat features that support overwintering Blanding's Turtles are also of special importance to the survival and recovery of local populations due to limited movement capacities of individuals during an extended dormancy period, and because of the fidelity to and communal use of those sites (which may indicate a low availability of optimal sites, see Section 3.3). Overwintering occurs within suitable aquatic habitat features (Table 3), typically in permanent or seasonal wetlands. Confirmed overwintering sites are identified within the limits of functional habitat, as described below. The feature presenting suitable biophysical attributes is identified, up to the high water mark.

### Functional habitat

Given the lack of information on habitat quantity that is required for life cycle activities, the following approach has been used to identify functional habitat that meets the species' mating, thermoregulation, foraging, and summer inactivity needs throughout the home range, and which allows individuals to move between required resources. Moreover, this functional habitat will also include the vast majority of nesting and overwintering habitats, which is important considering that few precise sites are known.

The distances used to set the functional habitat boundaries are based on current knowledge of the species' needs (see Section 3.3 for specific references). A 2-km radial distance around occurrence records is selected based on the intermediate values of average home range length observed in Ontario and Quebec (References removed). In Canada, the average distance from a nest to the nearest wetland ranged between 115 and 243 m (Reference removed; Équipe de rétablissement des tortues du Québec, unpublished data 2012), with similar averages observed in the United States (see Section 3.3). Because Blanding's Turtles move long distances to nest, a terrestrial distance of 240 m was chosen to encompass most movement between required resources within the home range. Functional habitat for the Blanding's Turtle corresponds to 1) permanent or seasonal wetlands (measured up to the high water mark) located within a radial distance of 2 km of a record (see 7.1.1) along with 2) suitable terrestrial habitat extending up to 240 m landward of those features. To allow for movement, functional habitat also includes watercourses or waterbodies within a radial distance of 2 km of a record. Adjacent areas of functional habitat are merged if they spatially overlap. Critical habitat in these suitable areas corresponds to the biophysical attributes of suitable aquatic and terrestrial habitat features (Table 3).

### Unsuitable habitat

Any man-made structure (e.g., houses, urban areas, docks, boat launches), any habitat type that does not correspond to the biophysical attributes of suitable habitat (Table 3) is considered unsuitable habitat. At the present time active roads and shoulders, active cropland and active sand and gravel pits are presumed to be ecological traps thus considered as unsuitable habitat. However, when abandoned or inactive, it is acknowledged that those habitats provide suitable nesting substrate and thus are considered suitable habitat in Table 3. Further work is required to assess the extent to

which active roads and shoulders, active cropland and active sand and gravel pits are ecological traps (Table 4).

Natural and man-made barriers can isolate Blanding's Turtle local populations by restricting movement and precluding access to suitable habitats located beyond reach (COSEWIC 2005; NatureServe 2018). Known barriers to movement include large lakes and reservoirs (e.g. the Great Lakes), fast-flowing rivers, mountain ranges, busy highways, as well as densely urbanized areas lacking aquatic or wetland habitat. All known natural and man-made barriers are considered unsuitable habitat, along with suitable habitat features located beyond these barriers.

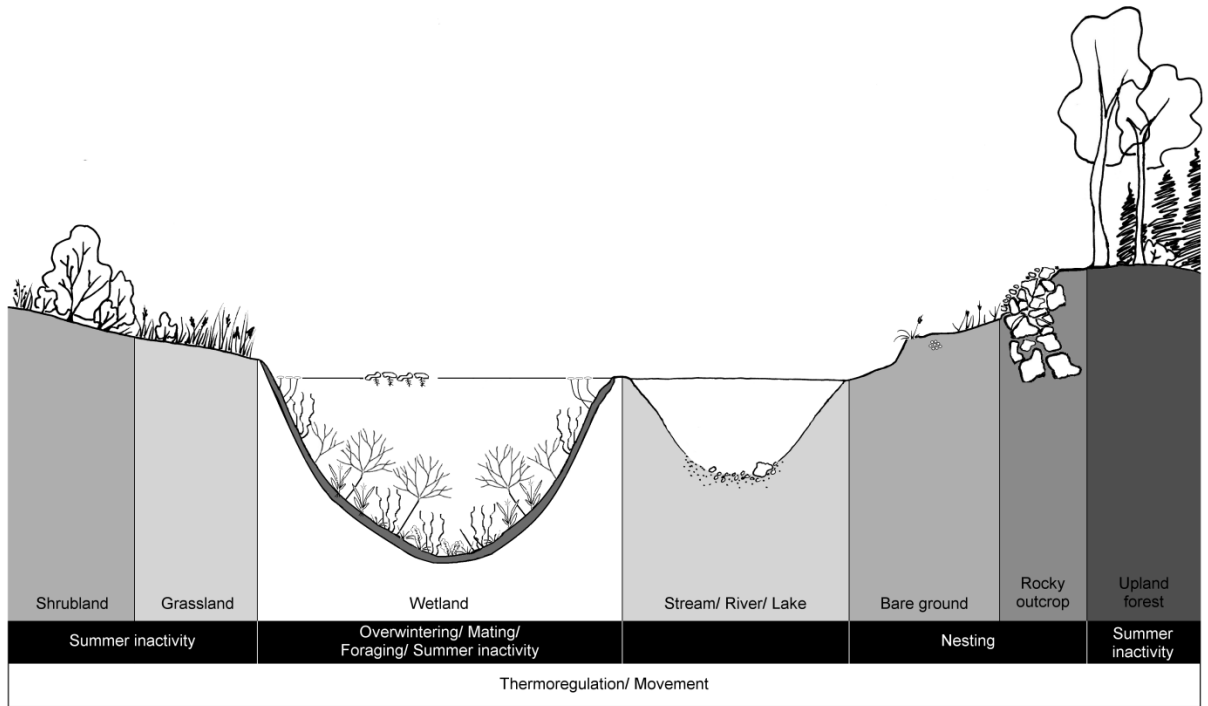
**Table 3. Detailed biophysical attributes of suitable habitat for specific life cycle activities of the Blanding's Turtle, Great Lakes / St. Lawrence population**

<b>Suitable Aquatic Habitat</b>		
<i>Habitat Feature(s)</i>	<i>Biophysical Attributes</i>	<i>Life Cycle Activities</i>
Permanent or seasonal wetlands, including: <ul style="list-style-type: none"> <li>marshes, swamps, bogs, fens</li> <li>beaver regulated wetlands</li> <li>vernal pools</li> <li>shallow water</li> </ul>	<ul style="list-style-type: none"> <li>Presence of static or slow-flowing water</li> <li>Soft organic or sandy substrate</li> <li>Presence of emergent, floating, and/or submerged vegetation</li> <li>Presence of basking sites, e.g. hummocks, shoreline, vegetation mats, emergent logs and rocks</li> </ul>	<ul style="list-style-type: none"> <li>Mating</li> <li>Thermoregulation</li> <li>Foraging</li> <li>Summer inactivity</li> <li>Movement</li> </ul>
Permanent or seasonal wetlands, channels, areas of pooled water	<ul style="list-style-type: none"> <li>Presence of free (unfrozen) water</li> <li>Soft organic substrate</li> </ul>	<ul style="list-style-type: none"> <li>Overwintering</li> </ul>
Watercourses or waterbodies, including: <ul style="list-style-type: none"> <li>streams, rivers</li> <li>lakes</li> <li>artificial channels</li> </ul>	<ul style="list-style-type: none"> <li>Presence of water</li> <li>Littoral zone<sup>a</sup></li> </ul>	<ul style="list-style-type: none"> <li>Movement</li> </ul>
<b>Suitable Terrestrial Habitat</b>		
<i>Habitat Feature(s)</i>	<i>Biophysical Attributes</i>	<i>Life Cycle Activities</i>
Bare ground and sparsely vegetated areas, including <ul style="list-style-type: none"> <li>beaches, sand bars</li> <li>rocky outcrops</li> <li>abandoned roads, trails, and their shoulders</li> <li>abandoned agricultural fields</li> <li>abandoned gravel and sand pits</li> <li>beaver or muskrat lodges</li> </ul>	<ul style="list-style-type: none"> <li>Sparse or no vegetation throughout incubation period</li> <li>Receiving full to partial sunlight</li> <li>Sand, gravel, rock or sandy loam soils</li> <li>Well-drained soils</li> </ul>	<ul style="list-style-type: none"> <li>Nesting</li> <li>Thermoregulation</li> <li>Movement</li> </ul>
Shrubland <sup>b</sup> and grassland <sup>c</sup>	<ul style="list-style-type: none"> <li>Presence of refuges (shrubs, grasses)</li> <li>Presence of openings allowing for basking</li> </ul>	<ul style="list-style-type: none"> <li>Thermoregulation</li> <li>Summer inactivity</li> <li>Movement</li> </ul>
Upland forest	<ul style="list-style-type: none"> <li>Deciduous, mixed and resinous forest stands</li> <li>Presence of refuges (e.g. leaf litter)</li> <li>Presence of openings allowing for basking</li> </ul>	<ul style="list-style-type: none"> <li>Thermoregulation</li> <li>Summer inactivity</li> <li>Movement</li> </ul>

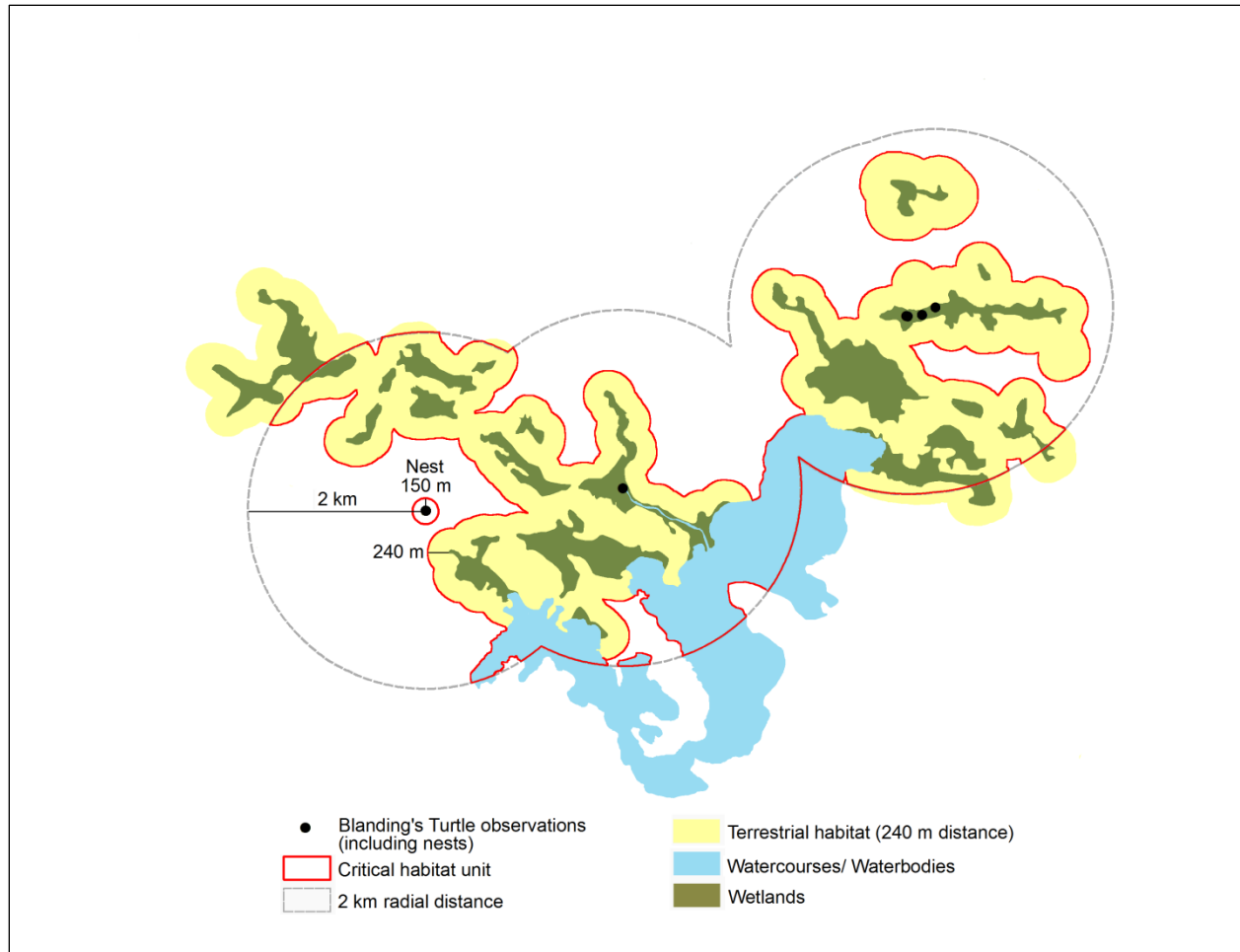
<sup>a</sup> In freshwater, littoral zones occur on the edge of lakes and rivers, often with extensive areas of wetlands, where the light reaches the bottom. Based on the Minnesota Department of Natural Resources (2015), littoral zone is defined as the portion of waterbodies or watercourses less than 4.5 m in depth. This value is very conservative since the species is mostly found in water under 2 m.

<sup>b</sup> Shrubland: Areas dominated by shrubs with scattered forbs and grass-like plants.

<sup>c</sup> Grassland: Areas dominated by native grasses, sedge family (i.e., Cyperaceae), other grass-like plants, or forbs with less than 10% shrub or tree cover.



**Figure 2: Habitat Features of the Blanding's Turtle Suitable Habitat for each Life Cycle Activity**



**Figure 3. Schematic of Critical Habitat Criteria for the Blanding's Turtle, Great Lakes / St. Lawrence Population.** The habitat occupancy and habitat suitability criteria are used to define a critical habitat unit. At occupied locations, a critical habitat unit is defined as the mosaic of permanent and seasonal wetlands along with surrounding suitable terrestrial habitat within 240 m from the wetlands, and the watercourses and waterbodies, located within 2 km of Blanding's Turtle records. A critical habitat unit also includes nesting sites wherever they occur along with surrounding suitable terrestrial habitat within 150 m of the nesting site. Critical habitat units are merged together where they spatially overlap. Critical habitat is the habitat located within a critical habitat unit, and which corresponds to the detailed biophysical attributes described in Table 3.

### 7.1.3 Application of the critical habitat criteria

Application of the critical habitat criteria to available data identifies 306 units<sup>29</sup> that contain up to a maximum of 11 650 km<sup>2</sup> of critical habitat for the Blanding's Turtle, Great Lakes /St. Lawrence population, in Canada: 292 in Ontario (11 036 km<sup>2</sup>) and 14 in Quebec (614 km<sup>2</sup>) (Appendix B). Critical habitat for the Blanding's Turtle, Great Lakes / St. Lawrence population, corresponds to the detailed biophysical attributes (Table 3) within critical habitat units, and thus the area of actual critical habitat may be smaller than the maximum extent presented in this recovery strategy. In Ontario, critical habitat is identified for 98 of the 139 extant element occurrences, for 39 of the 74 historic element occurrences, and for 76 new locations for which element occurrences have not been defined yet. In Quebec, critical habitat is identified for 23 of the 29 extant element occurrences, and for 4 locations for which no element occurrence has been defined yet. Element occurrences and records that are not captured by critical habitat are considered in the Schedule of Studies (see Section 7.2).

Due to the vulnerability of the Blanding's Turtle, Great Lakes / St. Lawrence population to illegal collection, critical habitat has been presented using 50 x 50 km Standardized Universal Transverse Mercator (UTM) grid squares in order to avoid disclosing sensitive information. The UTM grid is part of a standardized national grid system that indicates the general geographic areas containing critical habitat, for land use planning and/or environmental assessment purposes. The areas of critical habitat within each grid square are defined by the criteria described in Sections 7.1.1 through 7.1.3. More detailed information on the location of critical habitat to support conservation of the species and its habitat may be requested on a need-to-know basis by contacting Environment and Climate Change Canada – Canadian Wildlife Service at [ec.planificationduretablissement-recoveryplanning.ec@canada.ca](mailto:ec.planificationduretablissement-recoveryplanning.ec@canada.ca).

## 7.2 Schedule of Studies to Identify Critical Habitat

Critical habitat for the Blanding's Turtle, Great Lakes / St. Lawrence population, is partially identified in this recovery strategy as it may be insufficient to meet the population and distribution objectives for the species. In Ontario and Quebec, a total of 285 Blanding's Turtle records do not fulfill the occupancy criterion (single records), and therefore critical habitat was not identified at those locations. In total, 40 of the 168 extant element occurrences in Ontario and Quebec correspond to single records and thus do not fulfill the occupancy criteria. Lack of confidence in the data (data is historic, spatially imprecise, or cannot be associated with a location) has also led to the exclusion of some records which were not used to identify critical habitat. These locations may be contributing to overall population viability, but have not been recently or sufficiently surveyed to confirm habitat occupancy by the Blanding's Turtle. Targeted surveys of locations with only single records and areas with anecdotal (historic or imprecise) observations, using proper survey methods, are required. Concurrently,

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<sup>29</sup> Georeferenced polygons representing the maximum extent of critical habitat at a particular location.

research is needed to determine if and to what extent active roads and shoulders, active cropland and active sand and gravel pits (or quarries) can help to increase recruitment in local populations under certain conditions and assess the extent to which the use of these habitats to nest is an ecological trap.

The timeline outlined in the schedule of studies considers the longevity of the Blanding's Turtle.

**Table 4. Schedule of Studies to Identify Critical Habitat**

Description of Activity	Rationale	Timeline
Confirm habitat occupancy at locations where only a single observation of the Blanding's Turtle is available or where records are historic, spatially imprecise or cannot be associated with specific locations.	This activity is needed to identify critical habitat at locations not currently containing critical habitat and to complete critical habitat at locations where critical habitat units are already identified. Survey needs should be prioritized provincially based on: habitat suitability, proximity of identified critical habitat and records' characteristics (e.g., years, spatial precision).	2026
Assess the extent to which active roads and shoulders, active cropland and active sand and gravel pits are ecological traps and, if possible, determine conditions where they may help to maintain local populations.	This activity is needed to determine if active roads and shoulders, active cropland and active sand and gravel pits can qualify as critical habitat.	2023

### 7.3 Activities Likely to Result in the Destruction of Critical Habitat

Understanding what constitutes destruction of critical habitat is necessary for the protection and management of critical habitat. Destruction is determined on a case-by-case basis. Destruction would result if parts of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single or multiple activities at one point in time or from the cumulative effects of one or more activities over time.

Destruction of critical habitat for the Blanding's Turtle, Great Lakes / St. Lawrence population, can happen at a variety of levels (e.g., may occur as a result of an activity either within or outside of a critical habitat boundary) and time (i.e., year round or within specific seasons - life stages). Critical habitat for the Blanding's Turtle may be destroyed by any alteration that adversely modifies any biological, chemical or physical features to the extent that individuals can no longer use its environment for any of its life stages, including overwintering, mating, nesting, thermoregulation, foraging, summer inactivity, and movement. Within the critical habitat boundary, activities that ultimately alter the structure and composition of suitable aquatic and terrestrial habitat (Table 3) can negatively impact the habitat of the Blanding's Turtle. Given the importance of overwintering and nesting habitats (see Section 7.1.2), special attention is required for

these two life stages. Activities taking place outside the critical habitat are also less likely to result in the destruction of critical habitat.

The following are examples of activities that could result in the destruction of critical habitat. The activities described in Table 5 are neither exhaustive nor exclusive and have been guided by the threats assessed and described in Section 4 (Threats). For some activities, the identification of thresholds may lead to the refinement or more precise description of the aspects of an activity that is likely to destroy critical habitat.

**Table 5. Activities Likely to Destroy Critical Habitat for the Blanding's Turtle**

Description of Activity	Description of Effect	Details of Effects
Complete or partial drainage or filling of wetlands	Complete or partial draining or filling of wetlands (e.g. marsh, beaver-regulated wetlands) may cause temporary or permanent loss or degradation of overwintering, mating, thermoregulation, foraging, summer inactivity, and movement habitat. It may also fragment or isolate suitable habitat, precluding movement.	There is an increase in the likelihood that such activities could result in the destruction of critical habitat during the overwintering period. If this activity were to occur at any time of year within critical habitat boundaries, it is likely that the effects on critical habitat would be direct and cumulative. The effects of this activity apply year-round, but they would be more severe during the overwintering period (from about October to April). If this activity were to occur outside critical habitat boundaries, it could destroy the critical habitat by altering the hydrology or the availability of other wetlands located within critical habitat boundaries.
Deforestation, forest alteration and other conversion of natural terrestrial habitat (e.g., residential, industrial, and commercial development, habitat conversion to cropland, clear-cutting, commercial felled tree stacking areas, quarry creation)	Activities leading to the permanent removal of the forest, shrub, and grass cover, and conversion of bare ground and sparsely vegetated areas to human-made habitat may cause permanent loss or degradation of nesting, thermoregulation, summer inactivity, and movement habitat. It may also fragment or isolate suitable habitat, precluding movements. Activities leading to forest alteration (e.g. cutting, scarification, drainage) may result in temporary or permanent destruction (loss) or degradation of thermoregulation, summer inactivity, and movement habitat. They may also fragment or isolate suitable habitat, precluding movements.	Activities related to the maintenance of existing infrastructure or activities that occur within areas that do not meet the biophysical attributes of critical habitat are not likely to destroy the critical habitat. If this activity were to occur at any time of year within critical habitat boundaries, it is likely that the effects on critical habitat would be direct and cumulative. The effects of this activity apply year-round, but they would be more severe during the active period of the life cycle (from about April to October).  According to information available for two turtle species that also often use terrestrial environments in North America, namely the Wood Turtle and the Eastern Box Turtle, it has been determined that clearcuts over 1 ha can result in temporary habitat degradation by reducing the availability of cover and thermally suitable areas and by affecting the integrity of soil and water drainage regime (Wesley 2006;



Description of Activity	Description of Effect	Details of Effects
		Currylow et al. 2012). However, harvesting methods other than clearcuts (e.g., patching cutting with patches of less than 1 ha) can be beneficial (Agha et al. 2018). This type of information is currently not available specifically for the Blanding's Turtle.
Alteration of the shoreline (e.g. re-profiling, linearization or hardening of stream banks, removal of vegetation) or of the aquatic habitat substrate (e.g., by dredging).	Activities leading to alteration of the structure and composition of shoreline may result in temporary or permanent destruction (loss) or degradation of overwintering, nesting, thermoregulation, and summer inactivity habitat. Extended shoreline hardening may also fragment or isolate suitable habitat, precluding movements.	Conducting such activities upstream of the critical habitat boundary could also impact shoreline structure and composition downstream of critical habitat and thus result in its destruction. If this activity were to occur at any time of year within critical habitat boundaries, it is likely that the effects on critical habitat would be direct and cumulative. The effects of this activity apply year-round, but they would be more severe during the overwintering period (from about October to April).
Hydrological alteration (e.g. construction and management of water control structures, dismantlement of beaver dams)	Activities leading to alteration of hydrology may result in temporary or permanent loss or degradation of overwintering, mating, nesting, thermoregulation, foraging, summer inactivity, and movement habitat. Dams may also fragment or isolate suitable habitat, precluding movement. Creation of a large reservoir, stabilization as well as modification of water levels (e.g. increase, decrease) through the construction of water control structures may diminish wetland availability and suitability for the Blanding's Turtle (e.g. deep water with little vegetation).  High water levels can temporarily or permanently saturate nesting substrates, thereby preventing turtles from successfully using the nesting site. Conversely, repeated declines in water levels can promote the growth of vegetation on nesting sites and prevent their use for egg laying.  Alteration of natural hydrology can also result in changes in water depth and flow that are sufficiently large that they prevent the species from successfully overwintering (e.g., exposure of overwintering turtles to freezing temperatures caused by an abnormal drop in water levels).	If these activities were to occur outside the bounds of critical habitat, it could result in destruction of critical habitat if the water levels and flows that contribute to critical habitat suitability are not maintained. There is an increase in the likelihood that such activities could result in the destruction of critical habitat during the overwintering and nesting periods. The maintenance of existing water control structures, the use of water level control devices specific to beaver dams and the restoration of wetlands (e.g., for waterfowl) would not be deemed likely to destroy the critical habitat when water levels and habitat characteristics are maintained. The dismantling of newly established beaver dams where characteristic vegetation associated with wetlands is not yet present is not deemed likely to destroy critical Blanding's Turtle habitat.  With respect to the management of well-established beaver dams, which are known to support local Blanding's Turtle populations by creating suitable habitat, they will have to be managed on a case by case basis in the event of safety concerns (e.g., road washout).

Description of Activity	Description of Effect	Details of Effects
Construction of roads and railway infrastructure (e.g. roads, railways, bridges)	Construction of roads (paved, gravel or dirt surfaces), railways, and bridges may cause permanent loss or degradation of overwintering, mating, nesting, thermoregulation, foraging, summer inactivity, and movement habitat. Roads, railways, and culverts may also fragment or isolate suitable habitat, precluding movement	<p>Roads can also act as ecological traps by attracting Blanding's Turtles, particularly adult females, exposing them to a collision risk. The impact of this trap on the local population thus becomes a function of the weight, number and speed of the vehicles using these roads (the higher the values, the greater the impact).</p> <p>Existing roads and railways are not included in the description of critical habitat and therefore the continuation of maintenance activities on the road and railway bed (including shoulders) is not likely to result in destruction of critical habitat.</p>
Introduction or spreading of exotic and invasive plant species (e.g. planting and releasing non-native plant species, stripping of native vegetation adjacent to invasive species patches)	<p>The introduction or spread of exotic species may lead to permanent loss or degradation of overwintering, nesting, thermoregulation, foraging, summer inactivity, and movement habitat. Dense stands of invasive plant species (e.g. European Common Reed) can overgrow nesting and thermoregulation sites, and fill in wetland habitat, altering the structure and composition of critical habitat.</p> <p>Once introduced, any activities that involves the stripping of natural vegetation (e.g. the expansion of the road network) favours the spread of exotic and invasive plant species.</p>	Because of the dispersal capacities of exotic and invasive species, activities that introduce those species outside of the bounds of critical habitat could lead to its destruction over time.

## 8. Measuring Progress

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

### Medium-term performance indicators (~10–15 years)

- The presence of known Blanding's Turtle local populations has been maintained.

### Long-term performance indicators (~ 50 years)

- The abundance of the Blanding's Turtle, Great Lakes / St. Lawrence population, has increased;
- The area of occupancy of the Blanding's Turtle, Great Lakes / St. Lawrence population, is maintained or increased.
- The number of Blanding's Turtle local populations with a favourable viability estimate or other appropriate index has increased.

## 9. Statement on Action Plans

One or more action plans will be posted in the SAR Public Registry for the Blanding's Turtle, Great Lakes / St. Lawrence population by December 2023. Parks Canada multi-species action plans identify recovery measures specific to national parks and other national heritage places where species occur (for a list of current multi-species action plans including the Blanding's Turtle, Great Lakes / St. Lawrence population, refer to the documents section of the SAR Public Registry).

## 10. References

Due to the vulnerability of some species to illegal collection, specific references providing sensitive information have been removed from this version of the recovery strategy. To support protection of the species and its habitat, the exhaustive list of references may be requested on a need-to-know basis by contacting Environment and Climate Change Canada's Recovery Planning section at [ec.planificationduretablissement-recoveryplanning.ec@canada.ca](mailto:ec.planificationduretablissement-recoveryplanning.ec@canada.ca).

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## Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#)<sup>30</sup>. The purpose of an SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [Federal Sustainable Development Strategy](#)'s<sup>31</sup> (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

The needs of the Blanding's Turtle are met by a wide variety of aquatic and terrestrial habitats, centered on wetland features. Wetland ecosystems provide important ecological services (e.g. mitigation of floods, protection of coastal habitat, improvement of water quality) and are known to support a rich biodiversity (Cherry 2011). Conservation, management, and restoration of wetlands and surrounding habitats will be beneficial to the other species that coexist with the Blanding's Turtle and, more generally, will help to maintain a natural hydrological regime and a mosaic of unaltered aquatic and terrestrial habitat (e.g. wetland, shoreline, forest). Reduction, mitigation and research on threats may also benefit other species that face the same threats. Table B-1 presents examples of species that may benefit from the approaches described in Table 2 (Recovery Planning Table).

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<sup>30</sup> [www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1](http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1)

<sup>31</sup> [www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1](http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1)

**Table A-1. Some of the Species at Risk That May Benefit from Conservation of Blanding's Turtle Habitat**

Common Name	Scientific Name	SARA Status
Eastern Foxsnake <sup>a</sup>	<i>Pantherophis gloydi</i>	Endangered
Fowler's Toad	<i>Anaxyrus fowleri</i>	Endangered
King Rail	<i>Rallus elegans</i>	Endangered
Lake Erie Watersnake	<i>Nerodia sipedon insularum</i>	Endangered
Spotted Turtle	<i>Clemmys guttata</i>	Endangered
Pugnose Shiner	<i>Notropis anogenus</i>	Endangered
Massasauga (Carolinian population)	<i>Sistrutus catenatus</i>	Endangered
Massasauga (Great Lakes / St. Lawrence population)	<i>Sistrutus catenatus</i>	Threatened
Branched Bartonian	<i>Bartonia paniculata</i> ssp. <i>paniculata</i>	Threatened
Least Bittern	<i>Ixobrychus exilis</i>	Threatened
Eastern Hog-nosed Snake	<i>Heterodon platirhinos</i>	Threatened
Spiny Softshell	<i>Apalone spinifera</i>	Threatened
Eastern Sand Darter	<i>Ammocrypta pellucida</i>	Threatened
Eastern Musk Turtle	<i>Sternotherus odoratus</i>	Special Concern
Snapping Turtle	<i>Chelydra serpentina</i>	Special Concern
Northern Map Turtle	<i>Graptemys geographica</i>	Special Concern
Milksnake	<i>Lampropeltis triangulum</i>	Special Concern
Eastern Ribbonsnake (Great Lakes population)	<i>Thamnophis sauritus</i>	Special Concern
Bridle Shiner	<i>Notropis bifrenatus</i>	Special Concern
Grass Pickerel	<i>Esox americanus vermiculatus</i>	Special Concern

<sup>a</sup> Several designatable units (populations) of these species have the same status

Given that specific needs may differ for all of these species, management actions should recognize the potential for synergistic recovery actions. Wherever possible, natural ecosystem processes should be maintained and allowed to evolve without human interference, because these are the processes to which species are adapted.

## Appendix B: Critical Habitat for the Blanding's Turtle, Great Lakes / St. Lawrence Population, in Canada

**Table B-1. Critical Habitat for the Blanding's Turtle, Great Lakes / St. Lawrence Population, in Canada Occurs Within these 50 x 50 km Standardized UTM Grid Squares Where Criteria Described in Section 7 Are Met.**

50 x 50 km Standardized UTM Grid Square ID <sup>a</sup>	Province/Territory	UTM Grid Square Coordinates <sup>b</sup>	
		Easting	Northing
17TLGB	Ontario	300000	4650000
17TLGC	Ontario	350000	4600000
17TLGD	Ontario	350000	4650000
17TLHC	Ontario	350000	4700000
17TLHD	Ontario	350000	4750000
17TLLD	Ontario	350000	5050000
17TLMC	Ontario	350000	5100000
17TLMD	Ontario	350000	5150000
17TMGB	Ontario	400000	4650000
17TMHA	Ontario	400000	4700000
17TMHB	Ontario	400000	4750000
17TMHC	Ontario	450000	4700000
17TMKD	Ontario	450000	4950000
17TMLB	Ontario	400000	5050000
17TMLD	Ontario	450000	5050000
17TMMA	Ontario	400000	5100000
17TMMC	Ontario	450000	5100000
17TNHA	Ontario	500000	4700000
17TNHB	Ontario	500000	4750000
17TNHC	Ontario	550000	4700000
17TNHD	Ontario	550000	4750000
17TNJA	Ontario	500000	4800000
17TNJC	Ontario	550000	4800000
17TNJD	Ontario	550000	4850000
17TNKC	Ontario	550000	4900000
17TNKD	Ontario	550000	4950000
17TNLA	Ontario	500000	5000000
17TNLB	Ontario	500000	5050000
17TNLC	Ontario	550000	5000000
17TNLD	Ontario	550000	5050000

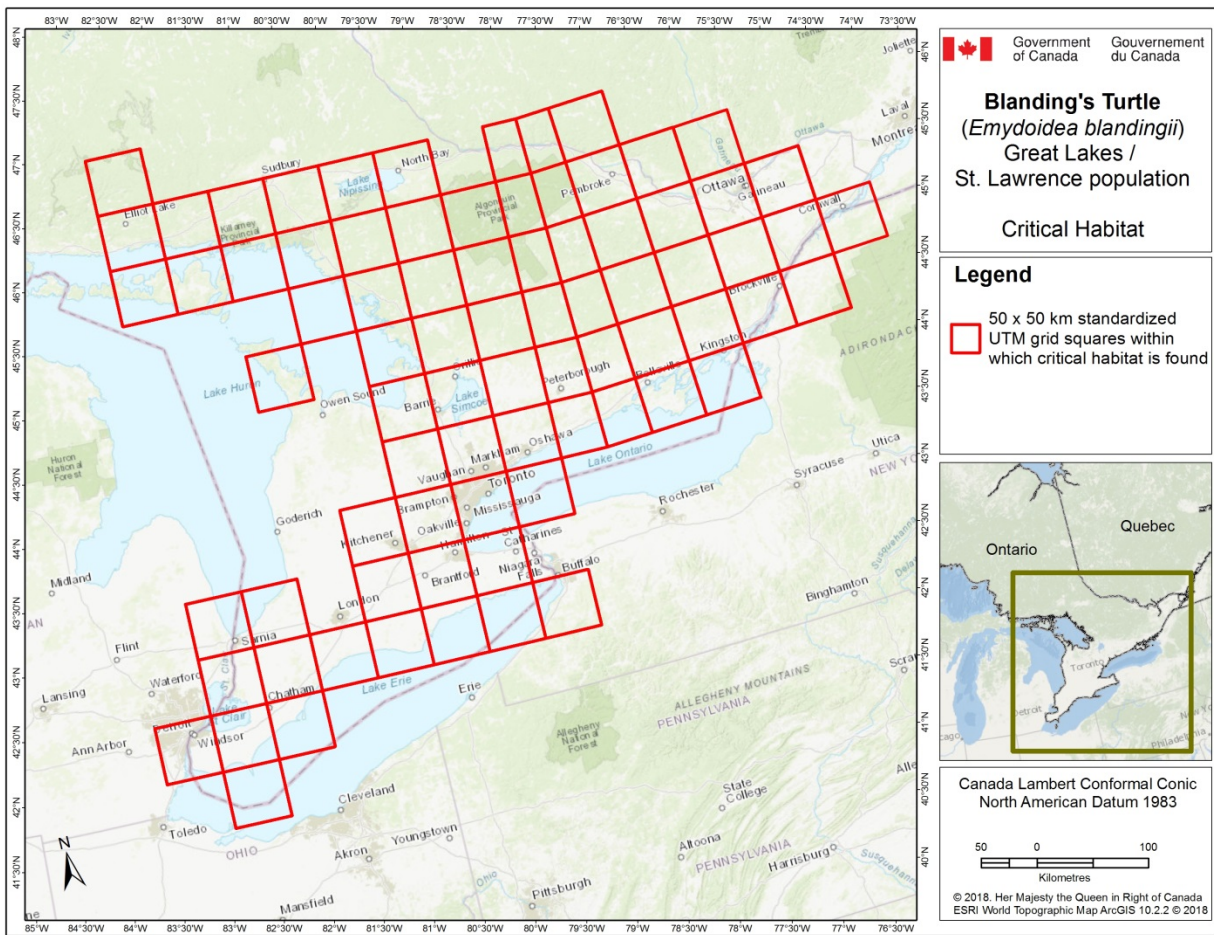
50 x 50 km Standardized UTM Grid Square ID <sup>a</sup>	Province/Territory	UTM Grid Square Coordinates <sup>b</sup>	
		Easting	Northing
17TNMA	Ontario	500000	5100000
17TNMC	Ontario	550000	5100000
17TPHA	Ontario	600000	4700000
17TPHB	Ontario	600000	4750000
17TPHC	Ontario	650000	4700000
17TPJA	Ontario	600000	4800000
17TPJB	Ontario	600000	4850000
17TPJC	Ontario	650000	4800000
17TPJD	Ontario	650000	4850000
17TPKA	Ontario	600000	4900000
17TPKB	Ontario	600000	4950000
17TPKC	Ontario	650000	4900000
17TPKD	Ontario	650000	4950000
17TPLA	Ontario	600000	5000000
17TPLB	Ontario	600000	5050000
17TPLC	Ontario	650000	5000000
17TPLD	Ontario	650000	5050000
17TPMA	Ontario	600000	5100000
17TQJB	Ontario	700000	4850000
17TQKA	Ontario	700000	4900000
17TQKB	Ontario	700000	4950000
17TQLA	Ontario	700000	5000000
17TQLB	Ontario	700000	5050000
17TQMA	Ontario	700000	5100000
18TTPB	Ontario	258527	4850000
18TTQA	Ontario	260346	4900000
18TTQB	Ontario	262183	4950000
18TTRA	Ontario	264028	5000000
18TTRB	Ontario	265897	5050000
18TTSA	Ontario	267767	5100000
18TUPB	Ontario	300000	4850000
18TUPD	Ontario	350000	4850000
18TUQA	Ontario	300000	4900000
18TUQB	Ontario	300000	4950000
18TUQC	Ontario	350000	4900000
18TUQD	Ontario	350000	4950000
18TURA	Ontario	300000	5000000

50 x 50 km Standardized UTM Grid Square ID <sup>a</sup>	Province/Territory	UTM Grid Square Coordinates <sup>b</sup>	
		Easting	Northing
18TURB	Ontario/Quebec	300000	5050000
18TURC	Ontario/Quebec	350000	5000000
18TURD	Ontario/Quebec	350000	5050000
18TUSA	Ontario	300000	5100000
18TVQA	Ontario	400000	4900000
18TVQB	Ontario	400000	4950000
18TVQC	Ontario	450000	4900000
18TVQD	Ontario	450000	4950000
18TVRA	Ontario/Quebec	400000	5000000
18TVRB	Quebec	400000	5050000
18TVRC	Ontario/Quebec	450000	5000000
18TWQB	Quebec	500000	4950000

<sup>a</sup> Based on the standard UTM Military Grid Reference System (see <https://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/maps/9789>): the first 2 digits represent the UTM Zone, followed by a letter that corresponds to the row of the UTM grid. The following 2 letters indicate the 100 x 100 km standardized UTM grid, followed by a letter to represent the 50 x 50 km standardized UTM grid containing all or a portion of the critical habitat unit. This unique alphanumeric code is based on the methodology used for the Breeding Bird Atlases of Canada (See <http://www.bsc-eoc.org/> for more information on breeding bird atlases).

<sup>b</sup> The listed coordinates are a cartographic representation of where critical habitat can be found, presented as the southwest corner of the 50 x 50 km standardized UTM grid square containing all or a portion of the critical habitat unit. The coordinates may not fall within critical habitat and are provided as a general location only.





**Figure B-1: Grid Squares Identified as Containing Critical Habitat for the Blanding's Turtle, Great Lakes / St. Lawrence Population.** Critical habitat for Blanding's Turtle occurs within these 50 x 50 km standardized UTM grid squares where the criteria described in Section 7 are met.