

Recovery Strategy for the Queensnake (*Regina septemvittata*) in Canada

Queensnake



2015

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For copies of the recovery strategy, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](http://www.sararegistry.gc.ca/)¹.

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¹ <http://www.sararegistry.gc.ca/>

RECOVERY STRATEGY FOR THE QUEENSNAKE (*Regina septemvittata*) IN CANADA

2015

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

In the spirit of cooperation of the Accord, the Government of Ontario has given permission to the Government of Canada to adopt the *Recovery Strategy for the Queensnake (Regina septemvittata) in Ontario* (Part 2, the Ontario recovery strategy) under Section 44 of the *Species at Risk Act* (SARA). Environment Canada has included a federal addition (Part 1) which completes the SARA requirements for this federal recovery strategy.

Environment Canada is adopting the Ontario recovery strategy (Part 2) with the exception of section 2, Recovery. In place of Section 2, Environment Canada has established a performance indicator and population and distribution objective that is consistent with the provincial recovery goal, and is adopting the government-led and government-supported actions of the *Queensnake: Ontario Government Response Statement*² (Part 3) as the broad strategies and general approaches to meet the population and distribution objective, and is adopting the habitat regulated under Ontario's *Endangered Species Act, 2007* as critical habitat for the Queensnake.

The federal recovery strategy for the Queensnake in Canada consists of three parts:

Part 1 – Federal Addition to the *Recovery Strategy for Queensnake (Regina septemvittata) in Canada*, prepared by Environment Canada.

Part 2 - *Recovery Strategy for the Queensnake (Regina septemvittata) in Ontario*, prepared by Scott D. Gillingwater for the Ontario Ministry of Natural Resources³.

Part 3 – *Queensnake Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

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

³ On June 26, 2014, the Ontario Ministry of Natural Resources (OMNR) became the Ontario Ministry of Natural Resources and Forestry (OMNRF).

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Part 2 – *Recovery Strategy for the Queensnake (Regina septemvittata) in Ontario*, prepared by Scott D. Gillingwater for the Ontario Ministry of Natural Resources.

Part 3 – *Queensnake Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

PART 1 - Federal Addition to the *Recovery Strategy for the Queensnake* (*Regina septemvittata*) *in Canada*, prepared by Environment Canada

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)⁴ 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 five years after the publication of the final document on the SAR Public Registry.

The Minister of the Environment and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Queensnake and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. It has been prepared in cooperation with the Ontario Ministry of Natural Resources and Forestry. SARA section 44 allows the Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Ontario Ministry of Natural Resources (now the Ontario Ministry of Natural Resources and Forestry) led the development of the attached recovery strategy for the Queensnake (Part 2) in cooperation with Environment Canada and the Parks Canada Agency.

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 Canada and 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 Queensnake 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 Canada and 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 the recovery strategy identifies critical habitat, there may be regulatory implications as SARA sets out a process to evaluate existing protection mechanisms under other Acts of Parliament and provincial and territorial legislation, and if necessary, to put in place additional protection under SARA. For critical habitat located on federal lands outside of federal protected areas the Minister of the Environment must either report on existing legal protection or make an order to provide protection. The Minister of the Environment will assess whether critical habitat is effectively protected on non-federal lands. The discretion to protect critical habitat that is not effectively protected rests with the Governor in Council.

⁴ <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

Acknowledgements

Judith Jones, Winter Spider Eco-Consulting, prepared the initial draft of this addition under the direction of the Canadian Wildlife Service, Environment Canada. Thanks are extended to The Nature Conservancy Canada and the Huron Stewardship Council for providing information from 2012-2013 field work and to Joe Crowley for the use of the photograph on the cover. Bruna Peloso (formerly Environment Canada, Canadian Wildlife Service – Ontario), Angela McConnell, Madeline Austen, Angela Darwin, Kathy St. Laurent and Lesley Dunn (Environment Canada, Canadian Wildlife Service – Ontario), Paul Johanson (Environment Canada, Canadian Wildlife Service – National Capital Region), Joe Crowley, Jay Fitzsimmons, and Aileen Wheeldon (Ontario Ministry of Natural Resources and Forestry), Michael Oldham (Ontario Natural Heritage Information Centre) and Cavan Harpur, Michael Patrikeev, Jeff Truscott, Gary Allen (Parks Canada Agency) reviewed and provided comments and advice during the development of this document.

Acknowledgement and thanks is given to all other parties that provided advice and input used to help inform the development of this recovery strategy including various Aboriginal organizations and individuals, landowners, citizens and stakeholders who provided input and/or participated in consultation meetings.

Additions and Modifications to the Adopted Document

The following sections have been included to address specific requirements of SARA that are not addressed in the Province of Ontario's *Recovery Strategy for the Queensnake (Regina septemvittata) in Ontario* (Part 2) and to provide updated or additional information.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Therefore, statements in the provincial recovery strategy referring to protection of critical habitat may not directly correspond to federal requirements, and are not being adopted by Environment Canada as part of the federal recovery strategy. Whether particular measures or actions will result in protection of critical habitat under SARA will be assessed following publication of the federal recovery strategy.

1. Species Status Information

The Queensnake is listed as Endangered⁵ on Schedule 1 of the federal *Species at Risk Act* (SARA). In Ontario, the Queensnake is listed as Endangered⁶ under the Ontario *Endangered Species Act, 2007* (S.O. 2007, ch 6) (ESA). It is also designated as a Specially Protected Reptile under the Ontario *Fish and Wildlife Conservation Act* (S.O. 1997, c.41).

The global conservation status⁷ for Queensnake is Secure (G5) (Appendix A). It is Nationally Imperilled (N2) in Canada and Nationally Secure (N5) in the United States (Appendix A). The species is Imperilled (S2) in Ontario while its status ranges from Secure to Extirpated in the 23 American states where it has been recorded (NatureServe 2014) (Appendix A). The International Union for Conservation of Nature (IUCN) considers the Queensnake of "Least Concern"⁸ (van Dijk 2013).

Approximately 5% of the global range of Queensnake occurs in Canada (COSEWIC 2010).

⁵ Endangered (SARA): A wildlife species facing imminent extirpation or extinction in Canada.

⁶ Endangered (ESA): A species that lives in the wild in Ontario but is facing imminent extinction or extirpation.

⁷ Global, national and state conservation ranks and their definitions are listed in Appendix A.

⁸ A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category (IUCN, 2012).

2. Recovery Feasibility Summary

Based on the following four criteria that Environment Canada uses to establish recovery feasibility, the recovery of the Queensnake has been deemed feasible.

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 in Ontario, which may be able to sustain the species in Canada. COSEWIC (2010) noted the total number of mature individuals in Canada as unknown but estimated it is likely fewer than 2,500. A mark-recapture study (NCC and HSC 2013) estimated one population to have as many as 200 individuals. The size of other populations in the study was unknown due to a limited number of sightings, however, they are suspected to be small (COSEWIC 2010). Neonate⁹ Queensnakes were observed in 2012 (Harvey et al. 2013), providing evidence of successful reproduction in some populations. There are also secure populations within the United States, however, relocating individuals from the United States to Canada to sustain Canadian populations would require further study and the use of reintroduction techniques which, to date, have not been investigated.

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

Yes. Sufficient habitat is available to support the species. In Ontario, Queensnakes utilize permanent water bodies such as rivers and streams, wet meadows, and marshes (COSEWIC 2010). Although some Queensnake habitat has been lost and/or degraded as a result of urban and agricultural development and invasive species, suitable habitat remains available within the Canadian range. Management and restoration techniques can be used to increase the amount of suitable habitat available for the species in order to help maintain or increase Queensnake populations (COSEWIC 2010; Gillingwater 2011).

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

Yes. The main threat to this species is habitat loss, degradation, or fragmentation, which may be mitigated through restoration of former habitats and/or avoiding further habitat destruction through legislation, stewardship and landscape planning. Habitat loss or degradation might also be caused by pollution from agricultural activities and by the invasion of non-native plants, such as non-native Common Reed, both of which can successfully be mitigated at a local scale

⁹ A newborn snake.

through the implementation of Best Management Practices (BMPs) and other forms of intervention.

Queensnakes are also at risk from direct human persecution and are often killed out of fear or ignorance. Recreational activities (such as angling, all-terrain vehicle [ATV] use, horseback riding, etc) can negatively affect Queensnake and its associated habitats. These threats may be mitigated through implementation of regulations and policies and through general education and outreach.

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 protection through land acquisition, regulations, zoning, and landscape planning, along with stewardship approaches have been successfully used for some populations (Seburn and Seburn 2000). Some Best Management Practices exist and others could be developed and implemented in a reasonable timeframe to help protect vulnerable populations from the following threats: habitat destruction, degradation and fragmentation that is not irreversible; and pollution resulting from agricultural activities. Other techniques such as public awareness/educational materials could be developed and may help address or reduce threats such as intentional killing of individuals and recreational activities within Queensnake habitats. Impacts caused by invasive plant species, such as non-native Common Reed, can be controlled through local interventions (e.g., removal of dense stands). Reintroduction of Queensnake individuals to historic locations might also be considered to augment the Canadian population, if it was deemed to be an appropriate and feasible option.

3. Population and Distribution Objectives

The provincial recovery strategy contains the following recovery goal for the recovery of Queensnake in Ontario:

- The long-term recovery goal is to halt further declines and to achieve stable or increasing populations of Queensnake in Ontario at all sites with extant occurrences throughout the current distribution and, where and when feasible, at sites within the historic distribution that have suitable habitat.

The *Government Response Statement*¹⁰ for the province of Ontario lists the following goal for the recovery of the Queensnake in Ontario:

- The government's goal for the recovery of Queensnake is to halt further decline

¹⁰ The Government Response Statement is the Ontario government's policy response to the scientific advice provided in the recovery strategy.

and to achieve stable or increasing populations of Queensnake in Ontario throughout the current distribution. The government supports investigating the feasibility of reintroducing populations at historic locations within the Ontario range.

Under SARA, a population and distribution objective for the species must be established. Consistent with the goal set out in the Government of Ontario's Government Response Statement, Environment Canada's population and distribution objective for the Queensnake in Canada is to:

- Halt further decline and to achieve stable or increasing populations of Queensnake throughout the species' current Canadian distribution.

Both the distribution and abundance of the Canadian population of Queensnake are not well understood but are suspected of being in decline (COSEWIC 2010). Recent studies reveal that all but one known local population occur in low densities (COSEWIC 2010). This may leave local populations even more vulnerable to extirpation if threatened by habitat loss, invasive species, or direct human persecution. The objective of this recovery strategy is to ensure stable or increasing local populations at all known extant occurrences of Queensnake in Canada.

The broad strategies adopted from the *Queensnake: Ontario Government Response Statement* (Part 3) work towards the recovery of the species, with an emphasis on protection and maintenance and/or expansion of existing populations. Actions, such as the development of a long-term monitoring and survey program, and the identification and location of key habitat features, will help gather critical information about the species' distribution, abundance, habitat requirements, and life history, which are required in order to focus further recovery efforts (government-supported actions #1 to 4 - Part 3). Concurrently, other types of actions will be undertaken, focusing on the protection and management of extant occurrences, including threat mitigation and public awareness/education (government-supported actions #6 to 11 - Part 3). Environment Canada supports investigating the feasibility and appropriateness of reintroducing Queensnake populations at historic locations within the Canadian range through the adoption of government-supported action #5 (Part 3). Reintroduction may play an important role in the recovery of the species at historic sites and in improving the viability of extant local populations.

4. Broad Strategies and General Approaches to Meet Objectives

The government-led and government-supported actions from the *Queensnake Ontario Government Response Statement* (Part 3) are adopted as the broad strategies and general approaches to meet the population and distribution objective. Environment Canada is not adopting the approaches identified in Section 2 of the *Recovery Strategy for the Queensnake* (*Regina septemvittata*) *in Ontario* (Part 2).

4.1 Actions Already Completed or Currently Underway

As of Jan 1st, 2014, the Queensnake's habitat is protected through a habitat regulation under the *Endangered Species Act* (ESA) (Ont. Reg.323/13 s.13; O.Reg. 242/08 s.29).

Environment Canada has funded projects related to Queensnake conservation in Ontario through the Habitat Stewardship Program (HSP). From 2006 to 2012, 26 projects directly benefited Queensnake, and the species will also benefit from six projects that are currently underway. Projects have included activities such as: undertaking targeted surveys; identifying important habitat of local populations; acquisition of properties for habitat conservation; restoration of degraded habitat; studying the severity of and/or mitigating threats; soliciting observations/encouraging public reporting of sightings; and educating landowners and/or the public on species identification, threats, and stewardship options.

The Nature Conservancy of Canada (NCC) and the Huron Stewardship Council have been carrying out significant field work on the Queensnake in Ontario since 2012. One of the studies, by Harvey et al. (2013), observed 24 Queensnakes along seven waterways in Ontario and documented two potential hibernacula. This study also confirmed several populations as extant, provided details on habitat parameters, and mapped habitat extent. The observations collected result in an expansion of the formerly known distribution of Queensnake by up to 3 km along some of these waterways. Additional studies by the NCC and the Huron Stewardship Council (2012-2013) discovered two live-birthing and two gestation¹¹ sites, and three areas with potential hibernacula were identified (Choquette et al. 2013; Edelsparre et al. 2014).

Choquette et al. (2013) reported an increase of the known distribution of the Queensnake in Huron County, from approximately 52 km² (prior to 2011) to 68 km². This increase in known distribution is likely a result of a greater survey effort and does not necessarily indicate an increase in population size.

Data collected from these recent studies has provided information on parameters required for habitat suitability and abundance of Queensnakes that helps estimate the overall Canadian Queensnake population size. Furthermore, these studies provide an indication of the large survey effort required to locate and observe this secretive species.

¹¹ Pregnancy

5. Critical Habitat

5.1 Identification of the Species' Critical Habitat

Section 41 (1)(c) of SARA requires that recovery strategies 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. Under SARA, critical habitat is "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".

Identification of critical habitat is not a component of the provincial recovery strategy under the Province of Ontario's ESA. However, following the completion of the provincial recovery strategy for this species, a provincial habitat regulation was developed for the Queensnake, and came into force January 1, 2014. A habitat regulation is a legal instrument that prescribes an area that will be protected¹² as the habitat of the species by the Province of Ontario. The habitat regulation identifies the geographic area within which the habitat for the species is prescribed and the regulation may apply, and explains how the boundaries of regulated habitat are determined (based on biophysical and other attributes). The regulation is dynamic and automatically in effect whenever the condition(s) described in the regulation are met within the specified geographic area.

Environment Canada adopts the description of the Queensnake habitat under section 29 of Ontario Regulation 242/08¹³ made under the provincial ESA as the critical habitat in the federal recovery strategy. The area defined under Ontario's habitat regulation contains the biophysical attributes required by the Queensnake to carry out its life cycle processes. To meet specific requirements of SARA, the biophysical attributes of critical habitat are further detailed below (Table 1).

The areas prescribed under **Ontario Regulation 242/08 – Queensnake habitat** are described as follows:

29. (1) For the purpose of clause (a) of the definition of "habitat" in subsection 2 (1) of the Act, the areas described in subsection (2) that are located in the geographic areas of Brant, Bruce, Chatham-Kent, Essex, Haldimand, Huron, Lambton, Oxford, Middlesex, Norfolk and Waterloo are prescribed as the habitat of queensnake. O. Reg. 323/13, s. 13.

(2) Subsection (1) applies to the following areas:

- 1. A queensnake hibernaculum.*
- 2. All areas within 50 metres of an area described in paragraph 1.*

¹² Under the federal *Species at Risk Act* (SARA), there are specific requirements and processes set out regarding the protection of critical habitat. Protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

¹³ http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_080242_e.htm#BK71

3. *Any part of a river, stream or other body of water or marsh that is below the high water mark and that,*
 - i. *is being used, or has been used at any time in the previous five years, by a queensnake,*
 - ii. *is within 250 metres of an area described in subparagraph i, or*
 - iii. *is situated between two or more areas described in subparagraph ii that are within 500 metres of each other and provides suitable conditions for dispersal of queensnake.*
4. *The area adjacent to the part of a river, stream or other body of water or marsh described in subparagraph 3 i or ii and within 30 metres above the relevant high water mark.*
5. *The area adjacent to the part of a river, stream or other body of water or marsh described in subparagraph 3 iii and within five metres above the relevant high water mark. O. Reg. 323/13, s. 13.*

The habitat for the Queensnake is protected under the ESA for any occurrence observed less than 50 years ago, until it has been demonstrated by a qualified professional that Queensnake have been absent for a period of at least five years. Aquatic habitat is protected up to 250m from a known Queensnake occurrence. This distance is based on data which indicate Queensnakes in Ontario will travel up to 250 m and is precautionary to ensure the species' movement corridors are all protected (OMNRF 2014; Gillingwater unpub. data in Gillingwater 2011). Terrestrial habitat (measured from the high water mark) is protected up to a distance of 30 m from a known Queensnake occurrence. This distance is based on data that indicate that Queensnake in Ontario travel up to 15 m from the water (Piraino and Gillingwater 2007 in Gillingwater 2011) and is precautionary to ensure that necessary features such as gestation, birthing, shedding, and thermoregulation sites, as well as terrestrial movement corridors remain intact (OMNRF 2014). Movement corridors between observations (that are within 500 m of each other) are also protected to ensure the ability for gene flow and migration between populations (OMNRF 2014).

The area defined under Ontario's habitat regulation contains the biophysical attributes required by Queensnake to carry out its life cycle activities. These biophysical attributes are described in Table 1.

Table 1: Detailed Biophysical Attributes of Critical Habitat for the Queensnake in Canada

Life Cycle Activities	Biophysical Attributes	References
Thermoregulation, gestation, live-birthing habitat	<p>Area adjacent to a river, stream or other body of water (e.g., pond, drainage canal, ditch) or marsh having:</p> <ul style="list-style-type: none"> • overhanging shrubby vegetation and/or low-lying broad-leaved plants and grass-like plants; • open rocky areas and open clay areas along the shore and on the bank above; • available natural (e.g., shoreline rocks, bank overhang) or artificial (e.g., geotextile mats used 	Campbell (1977); Ernst and Ernst (2003); Gillingwater (2011); Gillingwater and Piraino (2002); Layne and Ford (1983); Wood (1949)

	<ul style="list-style-type: none"> for erosion control) cover materials adjacent to water; and/or • areas that provide a sufficiently warm microclimate. 	
Hibernation habitat	<p>Biophysical features that:</p> <ul style="list-style-type: none"> • are protected from frost (e.g. below frost line) • have high humidity to prevent snakes from drying out; • are protected from flooding (e.g. above high water mark); • are protected from predators. 	<p>Bauchot (1994); Campbell (1977); Ernst (2003); Gillingwater (2011); Harding (1997); Mattison (1995; 1999)</p>
Foraging habitat	<p>River, stream or other body of water; wet meadows or marsh having:</p> <ul style="list-style-type: none"> • shallow water, flowing or still with temperatures at or above 18.3 °C for the majority of the active season; • rocky or gravelly areas or in non-rocky aquatic habitats, cover of marsh plants and mud; and, • presence of native crayfish. 	<p>Behler and King (1988); Branson and Baker (1974); Campbell (1977); Ernst (2003); Ernst and Barbour (1989); Gillingwater (2002); Gillingwater (2011); Mattison (1995, 1999) Wood (1949)</p>
Movement (commuting ^a and dispersal ^b) habitat	<ul style="list-style-type: none"> • natural linkages (barrier^c free; terrestrial or aquatic) that allow for free movement between locations of hibernation, gestation, live-birthing, thermoregulation and foraging; • river, stream or other body of water; wet meadows or marsh having: <ul style="list-style-type: none"> ◦ shallow water, flowing or still with temperatures at or above 18.3 °C for the majority of the active season 	

^a Commuting habitat – habitat that supports short distance movements within a home range in order to carry out different life processes (e.g. movements between hibernacula and foraging sites and thermoregulation sites).

^b Dispersal habitat – habitat that supports long distance movements related to emigration/immigration of individuals between populations.

^c Barriers are features that almost completely prevent movement or dispersal of the species, thereby obstructing or severely limiting gene flow (NatureServe 2014b). For example, a dam could be a barrier for aquatic and semi-aquatic animals, such as the Queensnake.

The area within 30 m of the high water mark incorporates the biophysical features that Queensnakes depend on for thermoregulation, gestation, live-birthing, and hibernation. A distance of 250 m up and downstream from a Queensnake observation occurring in a watercourse, or within 250 m of an observation within a marsh is a precautionary approach to ensure seasonal movement areas are protected.

Through this recovery strategy, the areas prescribed as habitat for the Queensnake under section 29 of Ontario Regulation 242/08 become critical habitat identified under SARA. Since the provincial habitat regulation is dynamic and automatically in effect whenever the conditions described in the regulation are met, if any new locations of the Queensnake are confirmed within the geographic areas listed under subsection (1) of the regulation (see Figure 1), the habitat regulation under the ESA applies. Refer to the *Habitat Protection Summary for Queensnake* (OMNR 2014) for further details on the provincial habitat regulation and its application. Should critical habitat need to be revised

to incorporate new occurrences or sites with documented non-use, this will be done in an updated federal recovery strategy or subsequent federal action plan.

The identification of critical habitat is based on available observations (up to October 2014) for the Queensnake from the past 50 years. The Queensnake is a secretive species and recent survey effort for some populations is limited, thus it is appropriate to include observations from the past 50 years unless the habitat has been determined to no longer be suitable or the location has been designated as extirpated by the Ontario Natural Heritage Information Centre (NHIC). This approach to identify sites as critical habitat is consistent with the approach taken by the OMNRF for habitat regulated under section 29 of Ontario Regulation 242/08.

In applying the critical habitat criteria to the best available data (as of October 2014), critical habitat for the Queensnake is identified at 63 sites in Canada, totaling approximately 1,230 ha¹⁴ (Figure 2, see also Table 3). The critical habitat identified is considered a partial identification of critical habitat, insufficient to meet the population and distribution objective because critical habitat is not identified for all populations of Queensnake throughout the species' current Canadian distribution. A schedule of studies has been developed to provide the information necessary to complete the identification of critical habitat (see section 5.2). Specifically, there are locations that may still support Queensnakes that i) have not been recently or sufficiently surveyed or ii) may be contributing to population viability but critical habitat could not be identified due to insufficient data. Targeted surveys of historic occurrences and areas with anecdotal observations, using proper survey methods to determine detection probabilities, are required.

Critical habitat identified for the Queensnake is presented using a 10 X 10 km UTM grid. This 10 x 10 km UTM grid is part of a standardized grid system that indicates the general geographic areas containing critical habitat which can be used for land use planning and/or environmental assessment purposes, and is a scale appropriate to reduce risks to the species and its habitat (e.g., to persecution and human disturbance). The areas of critical habitat within each grid square occur where the description of critical habitat above is met. More detailed information on the regulated habitat may be requested on a need-to-know basis from the Ontario Ministry of Natural Resources and Forestry. More detailed information on critical habitat to support protection of the species and its habitat may be requested on a need-to-know basis by contacting Environment Canada – Canadian Wildlife Service at: RecoveryPlanning_Pl@ec.gc.ca.

¹⁴ This is a maximum extent of critical habitat based on habitat boundaries estimated from available geospatial layers (e.g., water bodies) and high resolution aerial photography. Actual critical habitat occurs only in those areas described in subsection 2 of the provincial regulation for Queensnake habitat and, therefore, the actual area could be less than this and would require field verification.

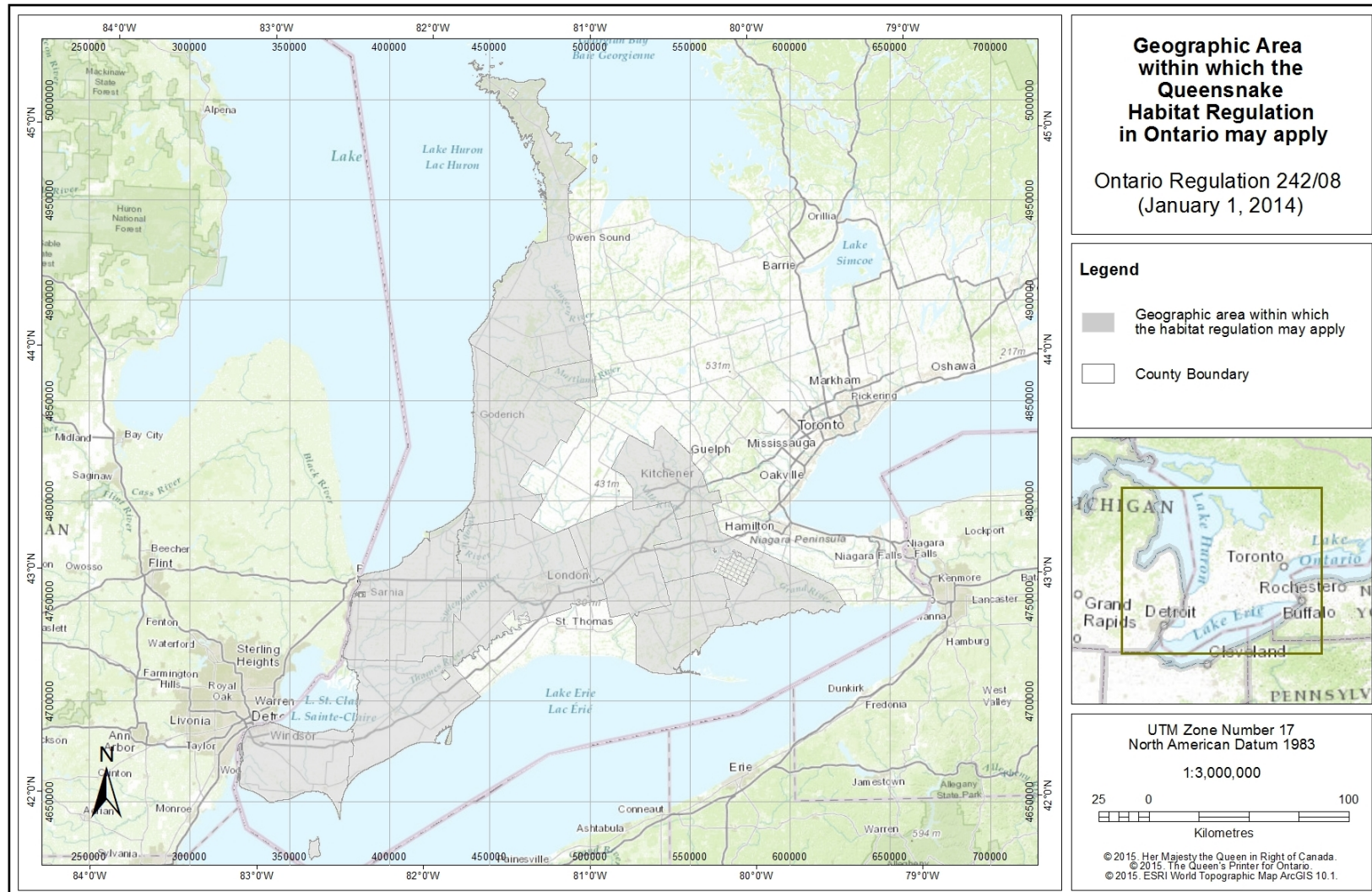


Figure 1. The geographic area within which the habitat regulation for the Queensnake may apply if the conditions described in section 29 of Ontario Regulation 242/08 under the provincial ESA are met.

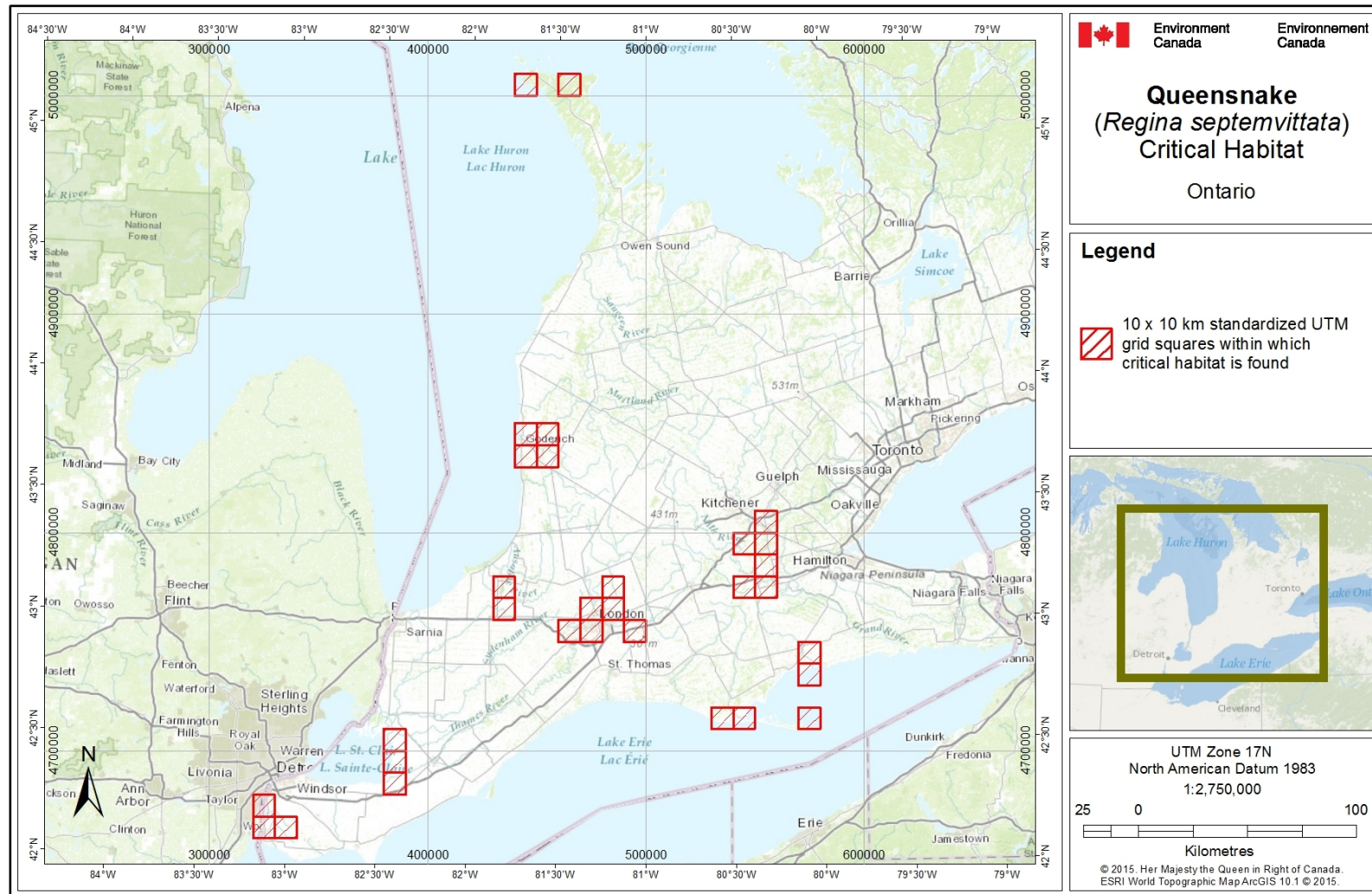


Figure 2. Grid squares that contain critical habitat for the Queensnake in Canada. Critical habitat for the Queensnake occurs within these 10 x 10 km standardized UTM grid squares (red hatched outline), where the description of critical habitat in Section 5 is met. The grid squares contain approximately 1,230 ha of critical habitat.

Table 3. Grid squares that contain critical habitat for the Queensnake in Canada.
Critical habitat for the Queensnake occurs within these 10 x 10 km standardized UTM grid squares where the description of critical habitat is met.

10 x 10 km Standardized UTM Grid Square ID ^d	Province/ Territory	UTM Grid Square Coordinates ^e		Land Tenure ^f
		Easting	Northing	
17LG26	Ontario	320000	4660000	Other Federal Land and Non-Federal Land
17LG27	Ontario	320000	4670000	Other Federal Land and Non-Federal Land
17LG36	Ontario	330000	4660000	Non-Federal Land
17LG88	Ontario	380000	4680000	Non-Federal Land
17LG89	Ontario	380000	4690000	Federal Protected Area (St. Clair National Wildlife Area: St. Clair Unit) and Non-Federal Land
17LH80	Ontario	380000	4700000	Federal Protected Area (St. Clair National Wildlife Area: Bear Creek Unit) and Non-Federal Land
17MH36	Ontario	430000	4760000	Non-Federal Land
17MH37	Ontario	430000	4770000	Non-Federal Land
17MH65	Ontario	460000	4750000	Non-Federal Land
17MH75	Ontario	470000	4750000	Other Federal Land and Non-Federal Land
17MH76	Ontario	470000	4760000	Non-Federal Land
17MH86	Ontario	480000	4760000	Other Federal Land and Non-Federal Land
17MH87	Ontario	480000	4770000	Other Federal Land and Non-Federal Land
17MH95	Ontario	490000	4750000	Other Federal Land and Non-Federal Land
17MJ43	Ontario	440000	4830000	Non-Federal Land
17MJ44	Ontario	440000	4840000	Other Federal Land and Non-Federal Land
17MJ53	Ontario	450000	4830000	Non-Federal Land
17MJ54	Ontario	450000	4840000	Non-Federal Land
17ML40	Ontario	440000	5000000	Non-Federal Land
17ML60	Ontario	460000	5000000	Federal Protected Area (Bruce Peninsula National Park) and Non-Federal Land
17NH31	Ontario	530000	4710000	Federal Protected Area (Big Creek National Wildlife Area: Hahn Unit) and Non-Federal Land
17NH41	Ontario	540000	4710000	Federal Protected Area (Big Creek National Wildlife Area: Hahn Unit and Big Creek Unit) and Non-Federal Land
17NH47	Ontario	540000	4770000	Non-Federal Land
17NH49	Ontario	540000	4790000	Non-Federal Land
17NH57	Ontario	550000	4770000	Other Federal Land and Non-Federal Land
17NH58	Ontario	550000	4780000	Non-Federal Land
17NH59	Ontario	550000	4790000	Non-Federal Land
17NH71	Ontario	570000	4710000	Federal Protected Area (Long Point National Wildlife Area: Long Point Unit) and Non-Federal Land

17NH73	Ontario	570000	4730000	Non-Federal Land
17NH74	Ontario	570000	4740000	Non-Federal Land
17NJ50	Ontario	550000	4800000	Other Federal Land and Non-Federal Land
Total = 31 grid squares				

^d Based on the standard UTM Military Grid Reference System (see <http://www.nrcan.gc.ca/earth-sciences/geography-boundary/mapping/topographic-mapping/10098>), where the first two digits represent the UTM Zone, the following two letters indicate the 100 x 100 km standardized UTM grid followed by two digits to represent the 10 x 10 km standardized UTM grid containing all or a portion of the critical habitat unit. This unique alphanumeric code is based on the methodology produced from the Breeding Bird Atlases of Canada (See <http://www.bsc-eoc.org/> for more information on breeding bird atlases).

^e The listed coordinates are a cartographic representation of where critical habitat can be found, presented as the southwest corner of the 10 x 10 km standardized UTM grid square containing all or a portion of the critical habitat. The coordinates may not fall within critical habitat and are provided as a general location only.

^f Land tenure is provided as an approximation of the types of land ownership that exist where critical habitat has been identified and should be used for guidance purposes only. Accurate land tenure will require cross referencing critical habitat boundaries with surveyed land parcel information.

5.2 Schedule of Studies to Identify Critical Habitat

Table 4. Schedule of Studies to Identify Critical Habitat

Description of Activity	Rationale	Timeline
Conduct appropriate surveys at all extant and historic sites to determine presence and/or absence of Queensnake, including the presence of hibernacula. Priority will be given to sites where critical habitat has not been identified. Additional surveys may be conducted at areas known to have suitable habitat.	Collect additional information on species' movements at extant and historical sites to confirm habitat use and identify additional critical habitat (e.g., hibernacula) as appropriate.	2015-2025
Conduct studies to determine type (e.g., natural or artificial), site-specific characteristics and extent of hibernacula (e.g., subsurface and internal structure).	Determine numbers and frequency of use of hibernacula to inform critical habitat identification.	2015-2025

5.3 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 part 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 activity or multiple activities at one point in time or the cumulative effects of one or more activities over time (Government of Canada 2009).

Destruction of critical habitat for the Queensnake can result from activities undertaken at a variety of scales and in both aquatic and terrestrial habitats. It may occur from an activity taking place either within or outside of the critical habitat boundary and it may occur in any season of the year. Activities are evaluated based on the species' functional requirements (e.g., foraging, hibernation, movement habitat, etc.) and the portion(s) of impacted area. For example, some activities may not result in the destruction of critical habitat used for movement (commuting and dispersal) provided that barriers to movement are not created, but the same activity may be likely to result in destruction of critical habitat used for live birthing, gestation, thermoregulation, mating, foraging and hibernation habitat. These instances will need to be evaluated on a case-by-case basis to determine what restrictions or mitigation should be put in place to prevent the destruction of critical habitat (e.g., shoreline development, drainage of wetlands).

Activities described in Table 5 are examples of those likely to cause destruction of critical habitat for the species; however, destructive activities are not necessarily limited to those listed.

Table 5. Activities Likely to Destroy Critical Habitat of the Queensnake

Description of activity	Description of effect (biophysical attribute or other)	Location where the activity is likely to destroy critical habitat			
		Within the critical habitat unit			Outside the critical habitat unit
		Gestation, live-birthing, thermoregulation, foraging habitat	Movement habitat (Commuting, dispersal)	Hibernation	
Activities that reduce or remove shoreline or wetland vegetation or cover objects, and compact substrate ⁹ , including activities such as allowing livestock access to aquatic habitats, clearing shorelines for aesthetic reasons, ATV use, horseback riding.	Complete or partial clearing of natural features may cause loss of thermoregulation, gestation, live-birthing, and/or hibernation sites. Removal of natural features and vegetation destroys the suitable features required for Queensnakes to successfully utilize areas for life functions. Such activities (e.g., ATV use, horseback riding) may also lead to soil compaction and removal of cover objects (both natural and man-made; man-made objects may include geotextiles used for erosion control or snake habitat creation) which remove thermoregulation sites. Queensnakes exhibit high fidelity to cover objects and would be negatively impacted by their removal. Overgrazing by livestock can destroy critical habitat by removing vegetation or cover objects. Removal of vegetation or other structures could result in changes to critical habitat so that it would no longer provide suitable characteristics such as cover, warmth, and shading, for activities such as live-birthing, thermoregulation, mating, foraging, hibernation and movement.	X	X	X	
Shoreline development (e.g., replacement of natural shoreline with erosion control structures such as gabion baskets, concrete walls or rip-rap).	Changes to the structure and composition of shores/banks (e.g., removal of vegetation, addition of stabilizing materials such as concrete, loss of river or stream meanders and associated fine and coarse substrates) may create unsuitable conditions for hibernation, live-birthing, thermoregulation, and foraging habitat. Shoreline hardening or other structures (e.g., concrete walls) may also impede movement (commuting and dispersal) which may inhibit the Queensnake's ability to access suitable habitat areas. Such activities occurring outside critical habitat may lead to changes in sediment deposition and current flow, and therefore could impact critical habitat leading to its degradation over time.	X	X	X	X

Activities that increase nutrient loading, alter water flow and/or degrade water quality (e.g. runoff of contaminated water from agricultural land or urban areas, operation of water control structures, allowing livestock access to aquatic habitats).	Changes in water quality/suitability may occur due to: alteration of water flow rates, depth, temperature, and quality; siltation and sedimentation; and presence of toxins from pollution. These changes might affect not only the Queensnakes, but also their prey, crayfishes, making them unsuitable to support populations of either species. If these activities were to occur outside the bounds of critical habitat, it could result in destruction of critical habitat if the water body or wetland characteristics that contribute to critical habitat suitability are not maintained (e.g., hydrology of critical habitat). Farming practices (e.g., direct livestock access to shorelines and waterways) may lead to alteration of critical habitat. It may cause rutting, erosion, sedimentation, excessive nutrients and removal of vegetation cover through overgrazing which destroys critical habitat.	X		X	X
Activities that introduce exotic and/or invasive species (e.g. non-native Rusty Crayfish; non-native Common Reed).	Exotic and/or invasive species introduction may lead to degradation or complete loss of gestation, live-birthing, foraging, and thermoregulation habitat.	X			X
Activities that fragment habitat and disrupt water flow, such as the creation of new water control structures.	Dams may permanently fragment suitable habitat and/or create a barrier for Queensnake to access suitable habitat. Alteration of the hydrology through the creation of dams or other water control structures may lead to degradation or elimination of hibernacula, thermoregulation, gestation, and live-birthing sites. High water levels can temporarily or permanently saturate various suitable habitats affecting the possibility of their use by Queensnakes. Recurrent low water levels can promote the growth of vegetation on suitable habitat, preventing access to hibernacula and decreasing the number of foraging sites. If these activities were to occur outside of critical habitat, it could result in the destruction of critical habitat if the water levels that contribute to critical habitat suitability are not maintained (e.g., hydrology of critical habitat).	X	X	X	X
Destruction or alteration of features providing hibernacula.	Hibernacula are essential habitat features for the Queensnake. Destruction of, or alteration to, natural and/or man-made structures that provide hibernacula sites may eliminate suitable sites for overwintering, leaving the species unable to complete its annual life cycle. Important features for hibernacula are not well understood at this point (see Schedule of Studies – section 5.2). Some examples of features that might provide hibernation habitat include: bedrock fissures, small mammal burrows and building foundations.			X	

⁹ The surface on or in which plants, algae, or certain animals, such as barnacles or clams, live or grow. A substrate may serve as a source of food for an organism or simply provide support (The American Heritage Science Dictionary, n.d.).

6. Measuring Progress

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

- Declines of Queensnake populations have been halted, and stable or increasing population trends have been achieved throughout their current Canadian distribution.

7. Statement on Action Plans

One or more action plans for the Queensnake will be posted on the Species at Risk Public Registry by December 31, 2022.

8. 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*](#)¹⁵. The purpose of a 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 achievement of any of the [*Federal Sustainable Development Strategy's*](#)¹⁶ (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.

Recovery measures for the Queensnake will help to maintain riparian and wetland habitats, and the associated hydrology, in a natural state. Many other species that rely on these habitats are under stress from the same threats that affect the Queensnake. Therefore, measures to address threats to the Queensnake and protect its habitat are expected to have beneficial effects for other flora and fauna including rare wet prairie

¹⁵ <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

¹⁶ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1

vegetation (Small White Lady's Slipper [*Cypripedium candidum*]; Eastern Prairie-Fringed Orchid [*Platanthera leucophaea*]), turtles (Northern Map Turtle [*Graptemys geographicala*]; Spiny Softshell [*Apalone spinifera*]), frogs, wetland birds, benthic invertebrates, and other snake species. Research activities such as inventory or monitoring will have little or no negative effect on other species, and studies of non-native and invasive crayfish species, in particular, may lead to beneficial results for all species negatively affected by this invasive species. Furthermore, native crayfish, in general, are doing poor globally (Richman et al. 2015), and efforts directed at their conservation would therefore be beneficial. Outreach and education programs to reduce negative perceptions of Queensnakes will benefit all snake species.

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Appendix A. Subnational Conservation Ranks of Queensnake (*Regina Septemvittata*) in Canada and the United States

Rank Definitions (NatureServe 2014)

QUEENSNAKE (<i>Regina septemvittata</i>)				
Global (G) Rank	National (N) Rank (Canada)	Sub-national (S) Rank (Canada)	National (N) Rank (United States)	Sub-national (S) Rank (United States)
G5	N2	Ontario (S2)	N5	Alabama (S5), Arkansas (S2), Delaware (S1), District of Columbia (S1), Florida (SNR), Georgia (S5), Illinois (S4), Indiana (S4), Kentucky (S4), Maryland (S5), Michigan (S4), Mississippi (S3), Missouri (SX), New Jersey (S1), New York (S1), North Carolina (S4), Ohio (SNR), Pennsylvania (S3), South Carolina (SNR), Tennessee (S5), Virginia (S5), West Virginia (S4), Wisconsin (S1)

S1: Critically Imperilled - At very high risk of extirpation in the jurisdiction (i.e., N - nation, or S - state/province) due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

N2/S2: Imperilled - At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

S3: Vulnerable: At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

S4: Apparently Secure: At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

G5/N5/S5: Secure – At very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.

SNR: Unranked – National or subnational conservation status not yet assessed.

SX: Presumed Extirpated—Species or ecosystem is believed to be extirpated from the jurisdiction (i.e., nation, or state/province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

**PART 2 - *Recovery Strategy for the Queensnake (Regina septemvittata) in Ontario*, prepared by Scott D. Gillingwater
for the Ontario Ministry of Natural Resources**

Queensnake

(*Regina septemvittata*) in Ontario

Ontario Recovery Strategy Series

Recovery strategy prepared under the *Endangered Species Act, 2007*

February 2011

Natural. Valued. Protected.

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, 2007) 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, 2007, 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, 2007 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. There is a transition period of five years (until June 30, 2013) to develop recovery strategies for those species listed as endangered or threatened in the schedules of the ESA, 2007. 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 Natural Resources Species at Risk webpage at: www.ontario.ca/speciesatrisk

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DECLARATION

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

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

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

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

RESPONSIBLE JURISDICTIONS

Ontario Ministry of Natural Resources
Environment Canada, Canadian Wildlife Service - Ontario
Parks Canada Agency

EXECUTIVE SUMMARY

In Canada, Queensnake (*Regina septemvittata*) only occurs within southern Ontario and is the least reported snake species in the province due to both its rarity and cryptic behaviour. Formerly found in approximately 26 localities in Ontario, it is now extant at about half of those sites. It is listed as endangered by COSEWIC (Committee On the Status of Endangered Wildlife In Canada), threatened under the *Species at Risk Act* and endangered under Ontario's *Endangered Species Act, 2007*.

Threats and limiting factors affecting this species include habitat loss and degradation, intentional and unintentional human-caused mortality, genetic isolation, habitat specialization, prey specialization, pollution and invasive species.

The long-term recovery goal is to halt further declines and to achieve stable or increasing populations of Queensnake in Ontario at all sites throughout the current distribution and, where and when feasible, at sites within the historic distribution that have suitable habitat. In order to successfully recover this species, the following short term objectives have been established:

1. Increase knowledge of distribution, abundance, life history, and habitat needs of Queensnake in Ontario;
2. Determine population abundance and dynamics;
3. Maintain/enhance the quantity and quality of Queensnake habitat;
4. Inventory crayfish diversity at each extant and historic Queensnake location, investigate diversity, relative abundance, habitat needs and the presence of the exotic Rusty Crayfish;
5. Investigate the feasibility for supplementation or reintroduction of Queensnake to parts of its current and historic range;
6. Reduce or mitigate threats to Queensnake and its habitat where feasible;
7. Coordinate recovery efforts with appropriate conservation groups to protect individuals, and to maintain or recover populations and habitat;
8. Provide awareness and educational resources to individuals and communities living near extant Queensnake populations or using extant Queensnake locales for recreation.

Recovery should be accomplished by reducing mortality through the protection and maintenance of vital aquatic and terrestrial habitats, restoring degraded habitat, preventing the loss of the primary food source and through public education and awareness.

It is recommended that the area prescribed as habitat in a habitat regulation for Queensnake include the extent of known terrestrial and aquatic habitat within all remaining sites where the species persists. We recommend prescribing Queensnake

habitat as the area 250 m up and down stream from each occurrence, and 30 m from the high water mark on each side of the water course along this area. Where the shoreline is not immediately apparent, an area of 250 m in all directions from the observation should be included. Also, all terrestrial and aquatic habitat within 50 m of all foraging, hibernacula, thermoregulation, parturition and shedding sites that do not lie within 30 m of the high water mark should be prescribed as habitat in a habitat regulation. This would provide protection for hibernation, gestation, parturition, thermoregulation, shedding and foraging habitats, as well as habitat for prey (i.e., crayfish). If re-introduction is considered feasible, recovery habitat should also be defined in the habitat regulation.

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BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Queensnake¹

SCIENTIFIC NAME: *Regina septemvittata*

SARO List Classification: Endangered

SARO List History: Endangered (2010), Threatened (2004)

COSEWIC Assessment History: Threatened (1999); Threatened (2000); Endangered (2010)

SARA Schedule 1: Threatened (June 5, 2003)

RANKINGS: GRANK: G5 NRANK: N2 SRANK: S2

¹ The species' common name was changed from Queen Snake to Queensnake on the SARO List on September 10, 2009.

The glossary provides definitions for the abbreviations above.

1.2 Species Description and Biology

Species Description

The Queensnake (*Regina septemvittata*) is a slender, moderately sized, semi-aquatic snake of the family Colubridae, with keeled scales and a divided anal plate (Conant and Collins 1998). Dorsally, the colour is brownish olive with three narrow black stripes running longitudinally down the midline and along each side on the fifth and sixth scale rows. The dorsal stripes are less apparent in older individuals and the belly stripes often become mottled with age (Gillingwater pers. obs.). The belly is pale yellow with four dark longitudinal stripes (Smith 1999). Queensnake is the only Ontario snake that has a longitudinally striped underside. Queensnake can attain a length of up to 90 cm, but is generally in the range of 40 to 60 cm. There are no subspecies of Queensnake throughout its range in the eastern North America (Crother et al. 2008).

The non-venomous Queensnake is harmless to humans but if handled will often writhe and exude a strong-smelling liquid from the cloaca. It is a strong swimmer and is usually found in, or in close proximity, to water (Froom 1981). It is most commonly associated with rocky creeks and rivers, but may sometimes be found in marsh and wet meadow habitats. It feeds almost exclusively on freshly moulted crayfish (Conant and Collins 1998).

Species Biology

The Queensnake is viviparous, with no distinguishable eggshell formation during any point of development (Branson and Baker 1974). The young are born between July and September (Campbell and Perrin 1979, Froom 1981, Behler and King 1988). Both a gestation and parturition site are necessary for embryo development and birthing respectively, though gestation sites may also be used for birthing (Gillingwater 2009).

Branson and Baker (1974) found that female Queensnakes in Kentucky did not normally reproduce until their third year, whereas males matured during their second year. Maturity may be further delayed in Ontario due to a shortened active season compared to Kentucky. Successful copulation may take place in both the spring and fall. No maternal care has been noted and no information is available on the frequency of reproduction.

The reported active season for Queensnake in Ontario is generally shorter than has been described for southern portions of the American range. In Ontario this species has been observed as early as April 15 (Piraino and Gillingwater 2003), and as late as October 16 (M.J. Oldham, pers. comm.). In Ohio, activity has been reported from April to September (Conant 1938a) similar to the Ontario range, with the exception of a single report of a Queensnake found in January atop the ice of a creek (Conant 1938b). Observations of aggregations of Queensnakes in the late fall (Wood 1944, Neill 1948, Wood 1949, Wood and Duellman 1950), and in the early spring (Gillingwater 2002, Gallagher 2003 pers. comm., Piraino and Gillingwater 2003) in both the United States and Canada have been reported.

Queensnake is a prey specialist, dependent primarily on freshly moulted crayfish for survival (Raney and Roecker 1947, Judd 1955 and 1962, Branson and Baker 1974). Crayfish populations are not likely affected to any extent from Queensnake depredation, especially in Ontario where Queensnake populations are quite small. Campbell and Perrin (1979) found that the predominant crayfish species at Queensnake sites in Ontario was *Orconectes propinquus*, though other crayfish species are consumed throughout the species' North American range. Queensnake has been found to consume other prey items, including small fish, albeit on an irregular basis (Surface 1906, LeRay 1928, Conant 1938a, Raney and Roecker 1947, Wood 1949, Adler and Tilley 1960). Although few data exist on feeding behaviour in the field (Wood 1949), this species has been found to either forage among stones and detritus in swift, shallow water or to remain motionless, with only the head exposed in calm pools (Raney and Roecker 1947, S. Gillingwater pers. obs.). Wood (1949) observed a Queensnake scavenging a dead crayfish and Ernst and Ernst (2003) observed Queensnakes flushing out freshly moulted crayfish and consuming them tail first.

1.3 Distribution, Abundance and Population Trends

The distribution of Queensnake extends from southwestern Ontario, southwestern New York, and southeastern Pennsylvania, south to the Gulf Coast at the Florida/Alabama

border; west to southeastern Wisconsin and eastern Mississippi. Additional records also exist from northern Michigan, southwestern Mississippi, Arkansas and southwestern Missouri (Conant and Collins 1998) (Figure 1). The Canadian range of the species is currently restricted to southern Ontario where it occurs discontinuously west of the Niagara Escarpment, from northern Bruce Peninsula south to Lake Erie and west to Essex County. The former range may have extended east to Toronto, but no specimens have been found in this area since the mid-1800's (Lamond 1994), and the original observation may be in error.



Figure 1. Queensnake North American Distribution Map (Map courtesy of the Natural Heritage Information Centre)

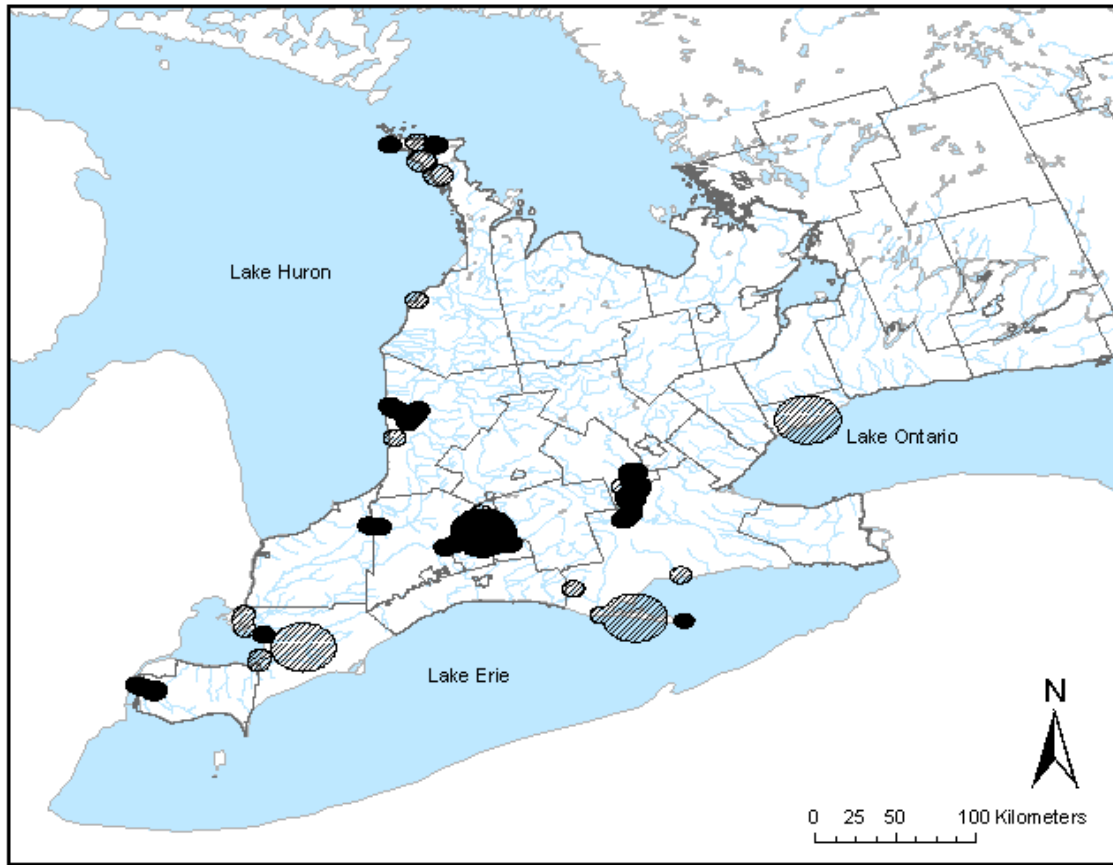


Figure 2. Distribution of the Queensnake in southern Ontario where hatched areas represent historic records (over 20 years old) and solid areas represent recent records (less than 20 years old) (based on NHIC 2010).

The Queensnake was designated endangered in 2010 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but currently remains listed as threatened under the federal *Species at Risk Act* as of January 2011. This species was originally listed as threatened under the *Endangered Species Act, 2007* (ESA), but was uplisted to endangered on September 28, 2010. It currently receives species and habitat protection under the ESA. Queensnake has been listed as a specially protected reptile under Ontario's *Fish and Wildlife Conservation Act, 1997* since January 1, 1999.

Queensnake is relatively widespread in the United States and ranked as globally secure (G5) (Table 1). Canada's population represents less than five percent of the global population.

Table 1. Conservation Status throughout the North American Range
(Information obtained from NatureServe 2010).

Rank	Location
S1 (Critically Imperiled)	Delaware, District of Columbia, Wisconsin, New York
S2 (Imperiled)	Ontario, Arkansas
S3 (Vulnerable)	Pennsylvania, Mississippi
S4 (Apparently Secure)	Illinois, Indiana, Kentucky, Michigan, North Carolina, West Virginia
S5 (Secure)	Alabama, Georgia, Maryland, Tennessee, Virginia
SH (Possibly Extirpated)	New Jersey
SNR (Unranked)	Florida, Ohio, South Carolina
SX (Presumed Extirpated)	Missouri
N2 (Imperiled)	Canada
N5 (Secure)	United States
G5 (Secure)	Globally

Relatively little is known of this species throughout its entire global range; therefore an estimate of global population size is unavailable. Similarly, no formal studies have been conducted to determine absolute population size in Ontario. Localized distribution at surveyed sites suggests limited dispersal. Branson and Baker (1974), through a mark-recapture study, found that this species had relatively small home ranges, with most individuals not moving more than 30 m from their original point of capture, though one individual moved 122 m over a two week period. At one Ontario site on the Thames River, movements of 100 m were typical between hibernation and gestation sites (Gillingwater 2009), with movements of up to 250 m recorded (Gillingwater unpub. data).

The Queensnake has always been considered uncommon in Ontario (LeRay 1928, Mills 1948, Logier 1958, Campbell 1977, Oldham 1986, Lamond 1994). It appears relatively abundant at some locations, yet very rare or absent from other seemingly adequate areas (Spurr 1978, Gillingwater 2008). Queensnake abundance, behaviour and habitat use in a given area is also subject to change throughout the active season as snakes move between hibernacula, foraging grounds and thermoregulation/gestation sites (Gillingwater 2002, Piraino and Gillingwater 2004), making estimation of abundance difficult. The overall scarcity, cryptic behaviour and aquatic habits make assessment of populations difficult. Queensnake has thin skin with limited elasticity (compared to other Ontario snake species of similar size), and frequent movements throughout a rocky terrain has been noted to cause abrasions on lumps under the skin (e.g., PIT tags and likely radio tags). Queensnake is also exceptionally stress and heat intolerant compared to other mid-sized snake species, rapidly showing signs of distress (i.e., open mouth breathing, fatigue and unresponsiveness) and thus may not serve as a good candidate species for telemetry research (Gillingwater pers. obs.). Only one location has been sampled intensively or consistently enough to derive a rough estimate of population size. A population of approximately 50 adults were located in open habitat (very little canopy cover) along a 200 m section of the North Thames River (Gillingwater 2002, Piraino and Gillingwater 2004). No additional animals were found outside of this area despite frequent surveys each season. Survey methods included intensive timed

surveys and PIT (Passive Integrated Transponder) tagging. Despite a number of surveys across the province, all Ontario studies suggest low population density, limited local distribution, little potential for individuals to migrate between populations and an overall declining trend.

The Queensnake is one of the least reported snake species in Ontario (based on the number of records in the NHIC database) with only 29 element occurrences (NHIC 2010). Results of frequent surveys within the Thames River Watershed over the past 15 years suggest that some Queensnake populations may have been lost as recently as 2002 (Gillingwater 2002, Gillingwater 2009) and others throughout much of Ontario have not been observed for over 40 years (Campbell 1977, Fletcher and Gillingwater unpub data 1997). Queensnake was recorded along the Canard River in 1985 (Oldham 1986), with additional sightings in 2002 (Waldron pers. comm. 2003). In 2009, observations on Fighting Island in the Detroit River were also recorded (Jones pers. comm. 2009). Francis and Campbell (1983) rediscovered Queensnake in the Waterloo region after a 50-year absence of recorded sightings. This finding is more likely the result of inadequate or infrequent surveys over the time interval. Populations along the Bruce Peninsula may have been lost, in particular at Scugog Lake, where the species has not been reported since 1927, and at Baie du Doré, where it was last seen in 1969. A Queensnake was encountered near Emmett Lake in the central part of Bruce Peninsula National Park in 2005, and subsequent surveys from 2006 to 2008 resulted in a small number of new observations (Brinker 2007, Jalava 2009). Unsuccessful surveys were also conducted at the historic Scugog Lake and Cameron Lake sites over the same period (Jalava 2009). A Queensnake was reported at Baptist Harbour (northwest end of the Bruce Peninsula) in 2003, but subsequent surveys in 2008 were unsuccessful (Jalava 2009).

1.4 Habitat Needs

During a study in Ohio, Wood (1949) summarized the habitat necessary for the subsistence of Queensnake in a given area. The following three conditions were deemed necessary: a permanent body of water, still or flowing, with temperatures at or above 18.3°C for the majority of the active season; an abundance of cover material, such as flat rocks submerged and/or found along the bank; a large population of crayfish. These features are present at most sites occupied by Queensnake in Ontario, but at outer Long Point, Walpole Island and Lake St. Clair, rocky cover of this sort is rare or absent, and the species may use crayfish (e.g., *Cambarus diogenes*, *Orconectes immunis* and *Fallicambarus fodiens*) burrows for cover. Additionally, shoreline vegetation is commonly used for thermoregulation at many sites.

Queensnake is commonly associated with rock or gravel bottomed streams or rivers (Duellman 1951, Conant 1960, Oldham 1986, Johnson 1989, Gillingwater 2002). The types of streambed substrates reported to be associated with Queensnake vary, but the most commonly noted includes limestone (Wood 1949) and slate (Triplehorn 1949). This species may be less commonly encountered in other habitats such as marsh

(Conant 1960), ponds (Wood and Duellman 1947), lakes (Duellman 1947) and quarries (Mattison 1995). Some Ontario records include the shorelines of large lakes such as Long Point on Lake Erie. However, most snakes occur in the extensive inland marshes/meadows rather than the Lake Erie shoreline itself. In addition, one population on the Bruce Peninsula occurs among rocky meadow marsh shorelines on small inland lakes which may dry up in summer (Jalava 2009).

The Queensnake is a highly aquatic species rarely venturing far overland. During the active season, it is usually confined to within three to five metres of a shoreline (Campbell and Perrin 1979, Gillingwater 2008, M. Fletcher pers. comm. 2004, K. Vlasman pers. obs. 1997). Of 185 Queensnake captures along the Thames River by Piraino and Gillingwater (2007), 177 (96%) were located within 5 m of the river's edge and the remainder were found up to 15 m from the water at a hibernaculum. Calm waters, such as small pools along creeks and rivers, appear to be necessary for foraging behaviour, cover and possibly thermoregulation (Gillingwater, unpub. data). Since the Queensnake relies almost exclusively on crayfish as a food source, Queensnake habitat must include features that support crayfish. Queensnake is often associated with shrubs and trees along the shores of rivers and streams, where they bask on overhanging branches (Campbell and Perrin 1979, Layne and Ford, 1983; Ernst and Barbour 1989; Gillingwater 2008). Campbell and Perrin (1979) found Queensnakes in southwestern Ontario in close association with willow (*Salix* spp.) and Eastern Cottonwoods (*Populus deltoides*) as well as herbaceous meadow marsh species, but snakes avoided shorelines with a heavy canopy. The area occupied by one Queensnake population along the Thames River was open to sunlight for approximately eight hours a day; rocks covered portions of the shore, along with open clay areas, low-lying broad-leaved plants, grasses, and scattered shrub willow (Gillingwater and Piraino 2002). Queensnakes used both natural items (e.g., shoreline rocks, bank overhang) as well as anthropogenic features such as geotextile for cover, thermoregulation, gestation, shedding and parturition (Gillingwater 2009; Gillingwater unpub. data).

Hibernacula are critical for over winter survival (Bauchot 1994; Mattison 1995), and thus represent one of the most important habitat features for this species in Ontario. In Ontario, a single hibernation site has been located along the Thames River. It occurred along a seepage area on an open south-facing clay slope above the river's high water mark. Both a small mammal burrow and openings along tree roots provided access to the hibernaculum (Gillingwater 2009).

1.5 Limiting Factors

Prey specialization, limited home range size and reliance on a narrow band of shoreline habitat for survival, taken collectively rather than distributively, increase susceptibility to stochastic events. While the viviparous method of reproduction may be beneficial for a mainly aquatic species (Hall 1969) within a northern range, it may also leave the female susceptible to additional threats while on land during gestation (Greene 1997;

Gillingwater 2002). Additionally, the amount of energy involved in this mode of reproduction may also draw heavily on energy stores (Greene 1997).

The small population sizes, gaps between populations and general rarity of the species may limit migration between populations, likely resulting in genetic isolation. Prey specialization, permeable skin (which results in rapid dehydration) and reliance on water may limit inland movements and dispersal outside of watershed boundaries, further contributing to genetic isolation and reduced gene flow. Current Ontario Herpetofaunal Summary data reveal the scattered and isolated nature of Queensnake populations occurring throughout southwestern Ontario. Such isolation may leave each of the remaining populations vulnerable to inbreeding depression, demographic and environmental stochasticity, and changes in habitat/food supply. Under these circumstances, individuals may have limited opportunity to move to more suitable areas (Campbell and Perrin 1979, Fletcher and Gillingwater unpub. data 1997; Gillingwater 2002).

Specificity for certain features required for overwintering may limit Queensnake. Although no specific data for Queensnake are available, long hibernation cycles may harm some individuals. Extremely cold winters and the inundation of water within a hibernation site have been found to cause mortality in other snake species during hibernation (Bauchot 1994, Mattison 1999). Northern snake species may also be susceptible to increased levels of environmental exposure and predation upon emergence in early spring (Porchuk 1996, Mattison, 1999).

1.6 Threats to Survival and Recovery

The following threats to survival and recovery are not listed in order of significance.

Habitat Destruction, Degradation and Fragmentation

Habitat loss, fragmentation and degradation are the biggest threats to Queensnake in Ontario (Cook 1970, Smith 1999, Gillingwater 2008). The already limited range and small size of remaining habitat used by Queensnake is further compromised by changes in the composition of the landscape. Such changes can affect spatial and activity patterns of the Queensnake and limit the capacity of a region to support all ecological needs of the species. Retaining the appropriate habitat composition for both Queensnake and crayfish, their primary food source, is necessary to ensure the long term viability of this species.

The four primary threats to Queensnake habitat include:

- 1) the absolute loss of specific habitats (e.g., hibernation sites),
- 2) an alteration in the relative proportions or configuration of the habitat features or
- 3) the fragmentation of habitat features with roads and other barriers, and
- 4) transformation of vegetation or ecological function of the habitat through invasion by non-native plant species (e.g. European Common Reed).

In the intensively cultivated landscape of southwestern Ontario, natural riparian habitat is often eliminated or reduced to narrow fragments along river banks. Habitat has remained only because some of the rivers are associated with steep valley slopes where agriculture has not been possible. In places, livestock has been allowed free access to rivers and streams causing rutting, erosion, sedimentation, excessive nutrients, and removal of vegetation cover through overgrazing. The loss of suitable habitat for Queensnake through direct physical destruction from cattle along riparian zones has been documented by Homyack and Giuliano (2002). Campbell and Perrin (1979) noted that agricultural development severely altered creeks and marshes near Lake St. Clair, making the habitat unsuitable for Queensnake. Any type of land use that extends to the edge of a waterway can be detrimental if the cover and structure that form important habitat for Queensnake are removed. Additionally, the drainage of wetlands, eutrophication due to livestock or poultry waste runoff into streams, overuse of water resources by human recreational activities, and large impoundments can all negatively affect Queensnake populations (NatureServe 2010). Hamr (1998) documented the recent decline of *Orconectes propinquus* throughout Ontario watersheds, possibly due to competition with *Orconectes rusticus*, a non-native species, and from air and water pollution, sedimentation and potentially water velocity.

In some urban areas, development on lands surrounding the floodplain can increase surface water drainage from storm sewer outfalls. Runoff can degrade riparian Queensnake habitat through sedimentation, siltation, erosion, contamination, and greater changes in river levels (Gibbons and Dorcas 2004). In addition, channelization, bridges and erosion control structures further limit natural habitat by replacing natural shoreline with gabion baskets, concrete walls, and rip-rap. Although legally protected in Missouri, the Queensnake has been extirpated from the state due to habitat loss from the construction of dams (Conant 1960, Anderson 1965, Ashton 1976). Dams, urban discharge, water use and other anthropogenic alterations can cause changes in the hydrology of southern Ontario rivers, likely affecting all riparian species through reduced base-flows and/or rapid influx of water.

Invasive plants such as European Common Reed (*Phragmites australis* ssp. *australis*) and Purple Loosestrife (*Lythrum salicaria*) may limit use of current sites in the long term. European Common Reed has rapidly expanded through much of southwestern Ontario in recent decades, now dominating many systems including some sites inhabited by Queensnake such as along the St. Clair, Long Point and Big Creek National Wildlife Areas and Nanticoke Creek (Gillingwater pers. com.). The European Common Reed has been noted to have reduced thermoregulation habitat of Queensnake in Ohio (Bekker 2007). Plant succession, which creates a heavy canopy cover from large shoreline trees, can shade out existing Queensnake habitat (Gillingwater 2009). In some cases, adjacent habitat has been lost already, leaving few areas for safe recolonization of snakes retreating from natural and invasive plant succession.

Intentional Human-caused Death or Disturbance

Queensnakes, although infrequently encountered in Ontario, are at risk from direct human persecution. Campbell and Perrin (1979) and Spurr and Smith (1979) found

dead Queensnakes that had apparently been bludgeoned to death by humans. In the United States, Queensnake are often encountered and killed by anglers fearing a loss of game fish to the reptile (Harding 1997), and Ernst and Ernst (2003) note the killing of many individuals by gun. Negative attitudes toward snakes are common throughout North America, and even harmless species such as garter snakes are routinely killed (Gillingwater, pers. obs.) out of fear or ignorance. Due to the rarity of the species, they are susceptible to collection as pets, or may suffer mortality or habitat disturbance through the photographic pursuits of keen naturalists and reptile enthusiasts (Gillingwater pers. obs.).

Unintentional Human-caused Death or Disturbance

Recreational use (hiking, angling, ATV use, horseback riding etc) can negatively affect Queensnake and associated habitats. People moving along shorelines may inadvertently alter gestation, foraging and thermoregulation habitat through shifting or compacting rocks and other cover items. This is of particular importance to Queensnakes because they demonstrate strong fidelity to cover items. In some areas, activities as seemingly benign as anglers moving across the habitat could cause long-term disturbance to gestation and thermoregulation sites and has resulted in the direct mortality of snakes through crushing injuries beneath rocks (Gillingwater 2008). In areas frequented by anglers along the Thames River and the Grand River, Queensnakes have been found dead and others have been found with crushing injuries to the head (Gillingwater 2008). Gestation sites have also been heavily disturbed along the Thames River, often repeatedly trodden upon, set on fire or displaced (S. Gillingwater pers. obs.). Although the majority of disturbances and mortalities are likely inadvertent, the effects of even moderate recreational use along sensitive sites can be devastating.

Pollution

The impact of pollution on Queensnake is not well understood, though water contamination from agricultural practices, direct urban runoff from larger cities such as London and Cambridge, and chemical spills are likely. Since Queensnakes have exceptionally permeable skin, they may be more susceptible than other snake species to pollutants within their aquatic environments (Stokes and Dunson 1982, Hulse et al. 2001, Gibbons and Dorcas 2004). A rapid decline in Ontario's already limited Queensnake populations could occur as a result of a decline or loss of crayfish. Regardless of species, all crayfish can be negatively affected by sedimentation, siltation, and pollution (Hamr 1998, David et al. 1994, Brie et al. 2009). During a study in Alberta, the crayfish species *O. virilis* was found to bio-accumulate mercury (Vermeer 1972), a trait likely shared by other species in the genus.

Invasive Wildlife

Invasive species may also contribute to the destruction and fragmentation of Queensnake habitat. The Common Carp (*Cyprinus carpio*) is known to increase turbidity and alter natural processes in aquatic environments (Parkos III et al. 2003). At one site along the Thames River, Zebra Mussels (*Dreissena polymorpha*) heavily encrust rocks formerly used for cover and foraging by Queensnakes. The mussels create a physical barrier restricting access between and under many large rocks, and

also create a potential hazard with the sharp margins of their shell (Gillingwater 2009). In Ohio, a large Queensnake population mostly disappeared between 2001 and 2004 due to the invasion by Round Goby (*Neogobius melanostomus*) (Bekker 2007), possibly due to heavy predation on crayfish populations (Davis 2003). The Rusty Crayfish (*O. rusticus*) has yet to fully occupy the Ontario range of the Queensnake and interactions between the two have consequently not yet been studied. The potential impact on Queensnake in Ontario through displacement of native crayfish species by the invasive exotic Rusty Crayfish is not yet understood.

1.7 Knowledge Gaps

Current Distribution and Population Trends

- Recent survey data for most extant and historic Queensnake sites are unavailable.
- At most sites, information is needed to better assess the condition of existing populations, to confirm the extirpation of apparently lost populations and to maintain consistent long-term data on Queensnake at extant sites.
- A standardized protocol for surveying and monitoring has not yet been developed.

Natural Life History Information

- Information on reproductive success, thermoregulation and gestation needs, foraging behaviour, prey selection, prey density limitations, home range size, seasonal movements and habitat selection and use is generally lacking.

Habitat Needs

- Detailed habitat information is lacking at most sites, especially detailed information on hibernacula, natural gestation sites and parturition sites.
- Additional ecological and habitat information for all life stages of this snake is lacking from most sites.

Genetic Isolation and its Effect on Populations

- It is unknown if inbreeding depression is a concern in isolated populations or if there is a strong relationship between extant populations in Ontario and elsewhere in its continental range.

Effects of Invasive Species

- Information on the threat of invasive plants and animals on the Queensnake and its habitats is lacking. It is unknown if introduced wildlife such as Rusty Crayfish, Round Goby and Carp have negative effects on the Queensnake and its habitat in Ontario.
- Invasive plant species (e.g., European Common Reed) appear to be causing habitat loss and fragmentation at existing sites, but no empirical data are available at this time.

1.8 Recovery Actions Completed or Underway

Species Reporting and Distribution

The Ontario Herpetofaunal Summary database (Oldham and Sutherland 1986, Oldham 1988, Oldham and Weller 1989, Oldham unpub. data, Ontario Herpetofaunal Summary) contains the most complete history of Queensnake sightings and distribution in Ontario. The data provide an opportunity to track available Queensnake records from both single encounters and research studies, in order to better monitor distribution and range in Ontario. These data, housed and updated through the Natural Heritage Information Centre (NHIC) should continue to aid in recovery efforts and provide a valuable resource for planners and biologists.

The Ontario Reptile and Amphibian Atlas project has recently been established to solicit reptile and amphibian sightings from researchers and the public across Ontario. These observations will also be included in the NHIC database.

Through funding from the Sault Ste. Marie Invasive Species Partnership Fund, the development of an Ontario Stream Assessment Protocol for Crayfish was recently initiated by Scott Reid (OMNR Aquatic Research), Eric Snyder (OMNR Invasive Species/Biodiversity) and Keith Somers (MOE Dorset). This protocol would assist in tracking crayfish across the province, including areas where Queensnake are known, or were known, to occur.

Surveying of Historic Queensnake Sites

A number of surveys have been conducted for Queensnake throughout southern Ontario. They have provided some of the only information available on Queensnake in Canada. Although the majority of these surveys were short term, they suggest a decline of this species throughout Ontario over time, highlighting local extirpations and changes in habitat (Judd 1955, Judd 1962, Campbell 1977, Campbell and Perrin 1979, Spurr and Smith 1979, Gartshore and Carson 1990, Lamond 1994, Fletcher and Gillingwater unpub. data 1997, OMNR 2003 - 2005, K. Vlasman pers. comm., D. Jacobs pers. comm., Piraino and Gillingwater 2003, Piraino and Gillingwater 2004, Piraino and Gillingwater 2007, Gillingwater 2008, Gillingwater 2009, Gillingwater unpub. data 2002-2009).

Biological and Ecological Research and Monitoring

Very little in-depth research has been conducted on Queensnake in Canada. Judd (1955, 1962) conducted a short-term study on the stomach contents of this species from a section of the Ausable River and a tributary of the Thames River. Campbell (1977) and Campbell and Perrin (1979) investigated some aspects of habitat, distribution, ecology and biology of the Queensnake in Canada. From 2002 to 2010, the first long-term study of a Queensnake population in Ontario was initiated along a section of the Thames River. Through a mark recapture program utilizing PIT tags, new information on this species' natural history and habitat in Canada was collected (Gillingwater 2002, Piraino and Gillingwater 2003, Piraino and Gillingwater 2004, Gillingwater 2009,).

Guelph District MNR surveyed a population along a tributary of the Grand River, using PIT tags as a mark recapture tool as recently as 2003 (K. Vlasman pers. comm.). The data from these studies have been used throughout this document. Creation of artificial gestation, parturition, shedding and thermoregulation habitat using geotextile, and the rehabilitation of natural habitat through the removal of debris and non-native vegetation has been ongoing since 2002 along a section of the Thames River. Initial efforts over the first eight years have proven successful, with further efforts continuing each season (Gillingwater 2009).

Recovery Teams

In addition to the efforts of the Queensnake Recovery Team, several multi-species and ecosystem-based recovery teams have incorporated Queensnake and its habitat requirements into recovery plans, including recovery teams for the Ausable, Grand and Thames rivers. These teams have been assembled to assess and recover many aspects of the aquatic habitats that Queensnakes and other aquatic at-risk species require for survival. Crayfish habitat is likely to benefit indirectly from these recovery initiatives. A continued long-term partnership among these recovery teams could be mutually beneficial from both economic and logistical standpoints.

Public Education and Awareness

Until 1997, efforts to further Queensnake awareness and education in Ontario were limited at best, with only occasional newspaper and newsletter articles and fact sheets available to the public (Judd 1962, McBride 1967, Spurr 1978, Oldham 1986, Oldham 1988). In 1997, a single page black and white fact sheet was created to further promote the species and complement survey efforts. This fact sheet was also included in a landowner stewardship package. In 2002, a full colour Queensnake fact sheet was developed as part of the Reptiles at Risk in the Thames River series. A full colour poster including the Queensnake was also developed in order to solicit public sightings within the Thames River watershed (Gillingwater 2002). As part of the ongoing Thames River Rare Reptile Research and Education Program, various talks, workshops and community displays continue to be delivered (2002-2010). Additionally, efforts by the Toronto Zoo, Upper Thames River Conservation Authority, Lower Thames Valley Conservation Authority, Maitland Valley Conservation Authority, Ausable Bayfield Conservation Authority, Grand River Conservation Authority, Carolinian Canada and the Ausable and Thames River ecosystem-based recovery teams have further promoted awareness of Queensnake through species at risk posters, web-sites and community interaction.

2. RECOVERY

2.1 Recovery Goal

The long-term recovery goal is to halt further declines and to achieve stable or increasing populations of Queensnake in Ontario at all sites with extant occurrences throughout the current distribution and, where and when feasible, at sites within the historic distribution that have suitable habitat.

2.2 Protection and Recovery Objectives

Table 2. Protection and recovery objectives

No.	Protection or Recovery Objective
1	Increase knowledge of distribution, abundance, life history, and habitat needs of Queensnake in Ontario.
2	Determine population abundance and dynamics
3	Maintain/enhance the quantity and quality of Queensnake habitat
4	Inventory crayfish diversity at each extant and historic Queensnake location, investigate diversity, relative abundance, and habitat needs; document the presence and abundance of the exotic Rusty Crayfish.
5	Investigate the feasibility for supplementation or reintroduction of Queensnake to parts of its current and historic range.
6	Reduce or mitigate threats to Queensnake and its habitat where feasible.
7	Coordinate recovery efforts with appropriate conservation groups to protect individuals, and to maintain or recover populations and habitat.
8	Provide awareness and educational resources to individuals and communities living near extant Queensnake populations or using extant Queensnake locales for recreation.

2.3 Approaches to Recovery

Table 3. Approaches to recovery of the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1. Increase knowledge of distribution, abundance, life history, and habitat needs of Queensnake in Ontario.				
Critical	Long Term	Inventory, Monitoring and Assessment	1.1 Conduct a thorough, low effort, baseline inventory and abundance survey <ul style="list-style-type: none"> – Ensure consistent methodology for data collection throughout range established – Establish long-term monitoring protocol adaptable to all habitat types – Document habitat characteristics and prey abundance. 	All Threats
Critical	Long Term	Inventory, Monitoring and Assessment	1.2 Continue to compile Ontario Queensnake records via the Natural Heritage Information Centre <ul style="list-style-type: none"> – Continue to develop comprehensive repository for historic and recent Ontario occurrences 	Knowledge Gaps: Current Distribution and Population Trends;
Critical	Short Term	Research	1.3 Address and prioritize significant knowledge gaps in Queensnake ecology at all life stages <ul style="list-style-type: none"> – Direct recovery research and assist in habitat and population protection and enhancement – Enhance knowledge of the species' natural history – Research and identify home range requirements 	All Threats Knowledge Gaps: Habitat Needs, Natural Life History Information
Necessary	Short Term	Research	1.4 Conduct genetic research to determine the extent of isolation between Ontario sub-populations, and to determine gene flow	Knowledge Gaps: Genetic Isolation and its Effect on Populations

Recovery Strategy for the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
			between their entire North American range – determine the extent of isolation	
Critical	Long Term	Research	1.5 Use information gathered to identify and map habitat for extant populations – Research to determine extent of home range and habitat used	Threats: Habitat Destruction, Degradation and Fragmentation Knowledge Gaps: Habitat Needs
Necessary	Short Term	Research	1.6 Identify and map areas of suitable habitat within the current range that are not currently known to support Queensnake populations	Threats: Habitat Destruction, Degradation and Fragmentation
Beneficial	Long Term	Research	1.7 Identify and map areas of suitable habitat within the historic range	Threats: Habitat Destruction, Degradation and Fragmentation
2. Determine population abundance and dynamics				
Critical	Short Term	Inventory, Monitoring and Assessment	2.1 Conduct targeted site surveys to establish current data on distribution and abundance through a long-term monitoring and evaluation program – Monitor presence, distribution, and abundance at extant sites and nearby suitable habitat (e.g., unoccupied sites a reasonable distance up/down stream from extant populations) throughout the current and historic sites – Develop standard monitoring and research protocols – Enable analyses to better understand the cause of current declines – Ensure consistent methodology for data collection throughout range – Conduct extensive and intensive surveys	Threats: Habitat Destruction, Degradation and Fragmentation Knowledge Gaps: Genetic Isolation; Current Distribution and Population Trends; Habitat Needs, Natural Life History Information

Recovery Strategy for the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
			of recently extant and historic occurrences using standardized search methods to better determine the size and extent of Queensnake populations in Ontario	
Critical	Long Term	Monitoring; Research	2.2 Monitor the use of natural and artificial micro-habitat, surveys and inventories to delineate habitat features necessary for all life stages <ul style="list-style-type: none"> – Determine the availability of suitable micro-habitat features at all population sites. – Use data to assist in creation of new habitat and in the protection of existing habitat – Determine significant habitat and significant habitat features for all life stages – Identify and map hibernacula, gestation, and parturition sites – Identify microhabitats used by different life stages 	Threats: Habitat Destruction, Degradation and Fragmentation Knowledge Gaps: Habitat Needs
Critical	Long Term	Research	2.3 Assess Queensnake population structure at sites across the range. Use the information to: <ul style="list-style-type: none"> – Identify populations that are in decline – Prioritize all populations for recovery activities (habitat restoration and threat reduction) and community education/outreach 	All Threats Knowledge Gaps: Current Distribution and Population Trends
Critical	Long Term	Inventory, Monitoring and Assessment; Research	2.4 Conduct surveys and inventories to delineate habitat features necessary for all life stages <ul style="list-style-type: none"> – determine significant habitat and significant habitat features for all life stages 	Threats: Habitat Destruction, Degradation and Fragmentation Knowledge Gaps: Habitat Needs, Natural Life History Information

Recovery Strategy for the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
3. Maintain/enhance the quantity and quality of Queensnake habitat				
Critical	Short Term	Stewardship; Management	3.1 Prepare a habitat restoration and protection manual (a document to be available for use by planners, researchers and other interested groups to restore and protect significant habitat) <ul style="list-style-type: none"> – Use the best available science and habitat restoration methodology, to develop a summary of best Queensnake management techniques in a living document – Distribute the document based on the locations of known Queensnake populations to the overseeing Conservation Authority, municipality and/or relevant government or conservation group offices. 	Threats: Habitat Destruction, Degradation and Fragmentation, Unintentional Human-caused Death or Disturbance
Critical	Long Term	Research; Management	3.2 Define Queensnake habitat in a habitat regulation. <ul style="list-style-type: none"> – Evaluate the effectiveness of habitat protection 	Threats: Habitat Destruction, Degradation and Fragmentation
Necessary	Long Term	Research; Management	3.3 Initiate experimental habitat restoration using both natural and artificial techniques/materials and monitor results <ul style="list-style-type: none"> – determine effectiveness of various restoration techniques 	Threats: Habitat Destruction, Degradation and Fragmentation
Necessary	Long Term	Research; Management	3.4 Initiate experimental habitat maintenance techniques <ul style="list-style-type: none"> – Identify extant populations where intervention is required to maintain habitat quality (e.g., to prevent natural succession) – Implement various habitat maintenance techniques and evaluate effectiveness. 	Threats: Habitat Destruction, Degradation and Fragmentation (succession)

Recovery Strategy for the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
4. Inventory crayfish diversity at each extant and historic Queensnake location, investigate diversity, relative abundance, habitat needs and the presence of the exotic Rusty Crayfish.				
Critical	Short Term	Research	4.1 Conduct crayfish surveys and research, including investigation into the presence and threat of Rusty Crayfish <ul style="list-style-type: none"> – Determine primary crayfish prey species and their relative abundance and limiting factors in riverine and wet meadow habitats – Target sites with extant Queensnake populations initially, expand to include historic sites for comparison – Determine significance of crayfish burrow (e.g., <i>Procambarus</i> spp) use in both riverine and wet meadow habitats – Provide information on movement and effects of Rusty Crayfish invasion – If decline of native crayfish is noted, study cause and potential mitigation measures 	Threats: Invasive Wildlife, Habitat Destruction, Degradation and Fragmentation Knowledge Gaps: Habitat Needs, Natural Life History Information (Diet Specialization), Effects of Invasive Species
Necessary	Short Term	Research	4.2 Investigate the impacts of Rusty Crayfish on native crayfish and Queensnake <ul style="list-style-type: none"> – Investigate rate of decline, if any, on native crayfish – Investigate effects of non-native crayfish on Queensnake populations 	Threats: Invasive Wildlife, Habitat Destruction, Degradation and Fragmentation Knowledge Gaps: Effects of Invasive Species
5. Investigate the feasibility for supplementation or reintroduction of Queensnake to parts of its current and historic range.				
Beneficial	Long Term	Research	5.1 Investigate feasibility of population supplementation or reintroduction with individuals from other Queensnake populations in Canada or the United States <ul style="list-style-type: none"> – Using genetic data investigate closely related sub-populations and potential for 	Threats: Habitat Destruction, Degradation and Fragmentation Knowledge Gaps: Genetic Isolation and its Effect on

Recovery Strategy for the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
			<ul style="list-style-type: none"> relocation of closely related animals – Evaluate potential reintroduction sites (including assessment of habitat and threats); – Evaluate the feasibility of restoring Queensnake to its historic range (e.g., individuals from other populations available to use); and – Develop and implement a reintroduction program if restoration is deemed feasible. 	Populations
6. Reduce or mitigate threats to the Queensnake and its habitat where feasible.				
Necessary	Long Term	Stewardship; Management; Protection	6.1 Establish effective means of habitat protection on private lands through landowner agreements, easements or purchase of land <ul style="list-style-type: none"> – Facilitate landowner relations through visits, educational materials, and community partnerships – Provide long-term habitat protection on private lands through landowner partnerships 	Threats: Habitat Destruction, Degradation and Fragmentation, Unintentional Human-caused Death or Disturbance, Pollution
Critical	Long Term	Protection; Management	6.2 Limit foot traffic and motorized vehicles from known Queensnake habitat to prevent inadvertent injury, mortality and habitat destruction	Threats: Human-caused Death or Disturbance (Intentional and Unintentional), Habitat Destruction, Degradation and Fragmentation
Necessary	Long Term	Research	6.3 Evaluate the significance of current anthropogenic threats and natural limiting factors to Queensnake populations and habitat <ul style="list-style-type: none"> – determine which habitats are under the most significant stress and take mitigation approaches to reduce immediate threats, where feasible 	Threats: Habitat Destruction, Degradation and Fragmentation, Human-caused Death or Disturbance (Intentional and Unintentional)

Recovery Strategy for the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Beneficial	Short Term	Research	6.4 Conduct contaminant investigations (e.g., water quality analysis, necropsy of snakes found dead) <ul style="list-style-type: none"> – determine contaminant levels in Queensnake and/or local crayfish populations as well as general water quality 	Threats: Pollution
Necessary	Short Term	Research	6.5 Investigate effects of invasive species on Queensnake and crayfish <ul style="list-style-type: none"> – Where an invasive species is identified as a threat, develop and implement measures to mitigate impacts 	Threats: Habitat Destruction, Degradation and Fragmentation; Pollution; Invasive Wildlife Knowledge Gaps: Effects of Invasive Species
7. Coordinate recovery efforts with appropriate conservation groups to protect individuals, and to maintain or recover populations and habitat.				
Necessary	Long Term	Stewardship; Management	7.1 Contact land managers/planners about maintenance or restoration of important Queensnake habitat <ul style="list-style-type: none"> – Provide guidance for management of significant sites 	Threats: Habitat Destruction, Degradation and Fragmentation
Necessary	Short Term	Communications, Education and Outreach; Management	7.2 Provide relevant ecological information for inclusion in Municipal Official Plan reviews, relevant ecosystem-based recovery strategies, etc. <ul style="list-style-type: none"> – Encourage municipal planners to include Queensnake habitat in Official Plans 	All Threats
Necessary	Long Term	Communications, Education and Outreach	7.3 Establish communications with relevant single-species, multi-species and ecosystem-based recovery teams and other conservation groups and initiatives. Coordinate recovery efforts <ul style="list-style-type: none"> – Facilitate a coordinated approach to 	All Threats

Recovery Strategy for the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
			Queensnake recovery and combine efficiencies	
Critical	Short Term	Inventory, Monitoring and Assessment	7.4 Coordinate efforts of various agencies and departments participating in Queensnake population monitoring <ul style="list-style-type: none"> – Combine efficiencies and facilitate information sharing 	All Threats
Critical	Short Term	Stewardship	7.5 Create a database of landowners that own or are adjacent to Queensnake habitat <ul style="list-style-type: none"> – Develop a contact list of landowners adjacent to significant Queensnake populations 	Threats: Habitat Destruction, Degradation and Fragmentation
8. Provide awareness and educational resources to individuals and communities living near extant Queensnake populations or using extant Queensnake locales for recreation.				
Critical	Short Term	Communications, Education and Outreach	8.1 Create a communication strategy <ul style="list-style-type: none"> – Use communication strategy to guide education and awareness programs, including stewardship initiatives for landowners and land managers 	All Threats
Critical	Long Term	Communications, Education and Outreach	8.2 Where available, incorporate community education initiatives into existing programs (e.g., Thames River Aquatic Ecosystem Recovery)	All Threats
Necessary	Long Term	Communications, Education and Outreach; Stewardship	8.3 Develop and distribute educational materials as part of ongoing public awareness (e.g., fact sheets, identification posters) <ul style="list-style-type: none"> – Solicit community support – Increase awareness of the importance of snakes – Involve community in recovery efforts – Raise awareness of species at risk 	All Threats

Recovery Strategy for the Queensnake in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Critical	Long Term	Communications, Education and Outreach; Stewardship	8.4 Provide site-specific landowner education and awareness <ul style="list-style-type: none"> – Establish or maintain good relations with landowners – Increase awareness of species and habitat when appropriate – Increase interest in preserving natural habitat 	All Threats
Necessary	Long Term	Communications, Education and Outreach; Stewardship	8.5 Encourage use of relevant best management practices and other appropriate habitat protection guidelines for landowners and municipal planners	Threats: Human-caused Death or Disturbance (Intentional and Unintentional), Pollution, Habitat Destruction, Degradation and Fragmentation
Critical	Long Term	Communications, Education and Outreach	8.6 Continue to evaluate and improve effectiveness of education and awareness program <ul style="list-style-type: none"> – Provide data on effectiveness of program – Assist in determining next steps 	All Threats

2.4 Area for Consideration in Developing a Habitat Regulation

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

It is recommended that the area from the centre of the occupied water course to 30 m inland from the high water mark on each side of the water course be prescribed as habitat in a habitat regulation for each known Queensnake occurrence. A distance of 30 m is recommended to protect subterranean habitat, especially near hibernacula. It should also compensate for fluctuating water levels and subsequent loss of wet meadow habitat. For all meadow or wetland areas used by Queensnakes where a defined shoreline is not immediately apparent, it is recommended that the prescribed area encompass the extent of the meadow/wetland area within 250 m in all directions for each Queensnake observation. This should incorporate all features that the species depends on for hibernation, gestation, parturition, shedding, thermoregulation and foraging, as well as areas for movement (i.e., corridors) between sites.

The prescribed area should extend 250 m upstream and downstream (i.e., 500 m total) from each known Queensnake occurrence. Branson and Baker (1974) observed that Queensnakes in Kentucky had relatively small home ranges with movements ranging from under 30 m to 122 m from their original point of capture over a two week period. In Ontario, most movements appear to be within 100 m over the active season (Gillingwater 2009), but observations of 250 m have been recorded (Gillingwater unpub. data). Without the ability to safely use radio-telemetry to quantify extent of movement and home range size, a cautionary approach should be taken to ensure seasonal movements will not place the species in harm's way. Thus, a 500 metre area of shoreline habitat is recommended for each Queensnake occurrence.

Occurrences should include recently confirmed records (within the past 20 years) as well as sites without a confirmed observation within the past 20 years. Provided the necessary tests are met (e.g., suitable habitat and conditions to ensure a viable population, and ability to be re-colonized or concrete plans to re-introduce the species to historic sites or previously unoccupied sites within the historic range or suitable areas for translocation), it is recommended that such recovery habitat receive protection through habitat regulation.

It is recommended that terrestrial and aquatic habitat within 50 m of all Queensnake foraging sites, hibernacula, thermoregulation sites, gestation sites, parturition sites and shedding sites be prescribed as habitat in a habitat regulation, where it does not already fall within 30 m of the high water mark of a water body. This area is important for retaining the biological composition, structure and function of the surrounding and subterranean environment. For example, it could maintain connectivity between hibernacula and the shoreline of the adjacent water body.

Foraging, parturition, gestation, hibernation, shedding and thermoregulation areas, both natural and anthropogenic, should be included in the area prescribed as habitat for the extent of the feature's life. Both natural and artificial habitat may be used by the species, especially for thermoregulation and gestation (Gillingwater and Piraino 2002, Gillingwater 2009). The gestation site must provide a sufficient microclimate to ensure proper embryonic development while still offering some protection for the female. A nearby, secure parturition site, if the gestation site is not used for parturition, is also necessary for birthing. Based on recent findings, parturition sites provide cover, are adjacent to the water's edge, maintain high humidity and appear to provide protection from excessive heat and predators (Gillingwater 2009). Geological features used for these processes may remain indefinitely (e.g., fissures in bed rock), while anthropogenic (e.g., foundations) or organic features (e.g., rotting tree roots) may naturally decompose over a shorter span of time.

Only a single hibernation site has been described in Canada for this species (Gillingwater 2008, Gillingwater 2009), and thus the prescribed area is necessary to safeguard additional hibernacula and other significant habitat features that lie within the areas currently occupied by the species. Hibernacula are the most important habitat feature for the species' survival (Bauchot 1994, Mattison 1995), though they are difficult to identify due to: the small hibernacula entrance points; the subterranean nature of hibernacula; a limited ability to effectively use radio telemetry on this species; a strong likelihood that such habitat features exist on private lands; and the rarity and cryptic habits of the snake during ingress and egress to and from hibernacula.

As a prey specialist, losses in crayfish will likely result in snake declines. The above recommendation would encompass some crayfish habitat, both along various water courses, and within meadow and wetland habitats.

GLOSSARY

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee responsible for assessing and classifying species at risk in Canada.

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

Conservation status rank: A rank assigned to a species or ecological community that primarily conveys the degree of rarity of the species or community at the global (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate geographic scale of the assessment. The numbers mean the following:

- 1 = critically imperilled
- 2 = imperilled
- 3 = vulnerable
- 4 = apparently secure
- 5 = secure

Element Occurrence (EO): The Natural Heritage Information Centre defines an EO as a term used by Conservation Data Centres (CDCs) and NatureServe that refers to an occurrence of an element of biodiversity on the landscape; an area of land and/or water on/in which an element (e.g. species or ecological community) is or was present. An EO has conservation value for the element: it is a location important to the conservation of the species or community. For a species, an EO is generally the habitat occupied by a local population. What constitutes an occurrence varies among species. Breeding colonies, breeding ponds, denning sites and hibernacula are general examples of different types of animal EOs. For an ecological community, an EO may be the area containing a patch of that community type.

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

Gestation: development of young within the female.

Keeled: having a raised midline or longitudinal ridge.

Parturition: bearing young.

Species at Risk Act (SARA): The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk to which the SARA provisions apply. Schedules 2 and 3 contain lists of

species that at the time the act came into force needed to be reassessed. After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

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

Viviparous: bearing live young rather than eggs.

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PART 3 - *Queensnake Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources

Queensnake

Ontario Government Response Statement



PROTECTING AND RECOVERING SPECIES AT RISK IN ONTARIO

Species at risk recovery is a key part of protecting Ontario's biodiversity. Biodiversity – the variety of living organisms on Earth – provides us with clean air and water, food, fibre, medicine and other resources that we need to survive.

The *Endangered Species Act, 2007* (ESA) is the Government of Ontario's legislative commitment to protecting and recovering species at risk and their habitats. As soon as a species is listed as extirpated, endangered or threatened under the ESA, it is automatically protected from harm or harassment. Also, immediately upon listing, the habitats of endangered and threatened species are protected from damage or destruction.

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

GOVERNMENT RESPONSE STATEMENTS

Within nine months after a recovery strategy is prepared, the ESA requires the Ministry to publish a statement summarizing the government's intended actions and priorities in response to the recovery strategy. The recovery strategy for Queensnake was completed on February 18, 2011 (http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/STDPROD_075653.html).

The response statement is the government's policy response to the scientific advice provided in the recovery strategy. In addition to the strategy, input on the response statement was requested from stakeholders, other jurisdictions, Aboriginal communities and members of the public. The statement reflects the best available traditional, local and scientific knowledge at this time and may be adapted if new information becomes available. In implementing the actions in the response statement, the ESA allows the Ministry to determine what is feasible, taking into account social and economic factors.

The Queensnake is a non-venomous, slender snake that can reach up to 60 cm in length. It is an aquatic species and prefers smaller streams and rivers with good water quality where it can hunt for crayfish (their primary food source).

MOVING FORWARD TO PROTECT AND RECOVER QUEENSSNAKE

The Queensnake is listed as an endangered species under the ESA, which protects both the animal and its habitat. The ESA prohibits harm or harassment of the species and damage or destruction of its habitat without authorization. Such authorization would require that conditions established by the Ministry be met.

The Queensnake occurs discontinuously west of the Niagara Escarpment, from northern Bruce Peninsula south to Lake Erie and west to Essex County and has always been relatively uncommon throughout these areas. The Queensnake feeds almost exclusively on crayfish, especially freshly-moulted individuals that are softer and easier to swallow, making it sensitive to changes in crayfish populations. Threats affecting Queensnakes include habitat loss and degradation, intentional and unintentional human-caused mortality, genetic isolation, pollution and invasive species.

The government's goal for the recovery of Queensnake is to halt further decline and to achieve stable or increasing populations of Queensnake in Ontario throughout the current distribution. The government supports investigating the feasibility of reintroducing populations at historic locations within the Ontario range.

Protecting and recovering species at risk is a shared responsibility. No single agency or organization has the knowledge, authority or financial resources to protect and recover all of Ontario's species at risk. Successful recovery requires inter-governmental co-operation and the involvement of many individuals, organizations and communities.

In developing the government response statement, the Ministry considered what actions are feasible for the government to lead directly and what actions are feasible for the government to support its conservation partners to undertake.

GOVERNMENT-LED ACTIONS

To help protect and recover the Queensnake, the government will directly undertake the following actions:

- Develop a survey protocol to be used by proponents and partners to detect the presence or absence of Queensnake.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Queensnake observation data to the Ministry's central repository at the Natural Heritage Information Centre or to the Ontario Reptile and Amphibian Atlas.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Protect the Queensnake and its habitat through the ESA. Develop and enforce a regulation identifying the specific habitat of the species.

- Support conservation, agency, municipal and industry partners to undertake activities to protect and recover the Queensnake. Support will be provided through funding, agreements, permits (including conditions) and advisory services.
- Establish and communicate annual priority actions for government support across multiple species in order to encourage collaboration and reduce duplication of efforts.

GOVERNMENT-SUPPORTED ACTIONS

The government endorses the following actions as being necessary for the protection and recovery of the Queensnake. Actions identified as “high” will be given priority consideration for funding or for authorizations under the ESA. The government will focus its support on these high-priority actions over the next five years.

Focus Area:	Monitoring and Research
Objective:	Increase knowledge of distribution, abundance, life history, threats, and habitat needs of Queensnake and their prey species in Ontario.
	<p>Actions:</p> <ol style="list-style-type: none"> 1. (HIGH) Develop and implement a long-term monitoring and survey program in extant and historic locations as well as within nearby suitable habitat to: <ul style="list-style-type: none"> ■ determine the distribution and abundance of Queensnake, ■ identify the primary crayfish prey species and their distribution and abundance, and ■ track any invasions of Rusty Crayfish. 2. (HIGH) Investigate the impacts Rusty Crayfish and other invasive species may have on Queensnake and native crayfish populations. 3. (HIGH) Identify the location of key habitat features such as hibernacula, gestation, and birthing sites. 4. Conduct research to address priority knowledge gaps related to Queensnake including the determination of: <ul style="list-style-type: none"> ■ home range sizes, ■ habitat needs and use for all life stages, ■ the extent of genetic isolation and gene flow between sub-populations of the species, and ■ the level of chemical contaminant within Queensnakes, their prey, and the water they occur in. 5. Investigate the feasibility and appropriateness of reintroducing the species into historic habitat areas.
Focus Area:	Protection and Management
Objective:	Develop and implement measures to maintain and enhance the quantity and quality of Queensnake habitat and reduce or mitigate threats to the Queensnake.
	<p>Actions:</p> <ol style="list-style-type: none"> 6. (HIGH) Develop and field test a manual for landowners, planners and conservation partners that provides a summary of the best management practices to restore, maintain and protect Queensnake habitat.

7. Develop, implement and evaluate mitigation measures for priority threats to Queensnake and its prey species.
8. As opportunities arise, support the securement of lands that contain Queensnake populations through existing land securement and stewardship programs.

Focus Area: Awareness

Objective: Increase public awareness about the distribution, habitat and stewardship opportunities related to Queensnake.

Actions:

9. Evaluate existing communications and outreach approaches and develop new strategies that will have a positive impact on people's behaviours.
10. Deliver effective communications and outreach to key stakeholders, including landowners and land managers within the range of Queensnake to increase awareness on the species, its habitat, and stewardship options.
11. Work with broader recovery efforts, conservation groups and initiatives to implement recovery actions on a watershed basis.

IMPLEMENTING ACTIONS

Financial support for the implementation of actions may be available through the Species at Risk Stewardship Fund, Species at Risk Farm Incentive Program or Community Fisheries and Wildlife Involvement Program. Conservation partners are encouraged to discuss project proposals related to the actions in this response statement with the Ministry. The Ministry can also advise if any authorizations under the ESA or other legislation may be required to undertake the project.

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

REVIEWING PROGRESS

The ESA requires the Ministry to conduct a review of progress towards protecting and recovering a species not later than five years from the publication of this response statement. The review will help identify if adjustments are needed to achieve the protection and recovery of the Queensnake.

ACKNOWLEDGEMENT

We would like to thank all those who participated in the development of the "Recovery Strategy for the Queensnake in Ontario" for their dedication to protecting and recovering species at risk.

For additional information:

Visit the species at risk website at

ontario.ca/speciesatrisk

Contact your MNR district office

Contact the Natural Resources Information Centre

1-800-667-1940

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