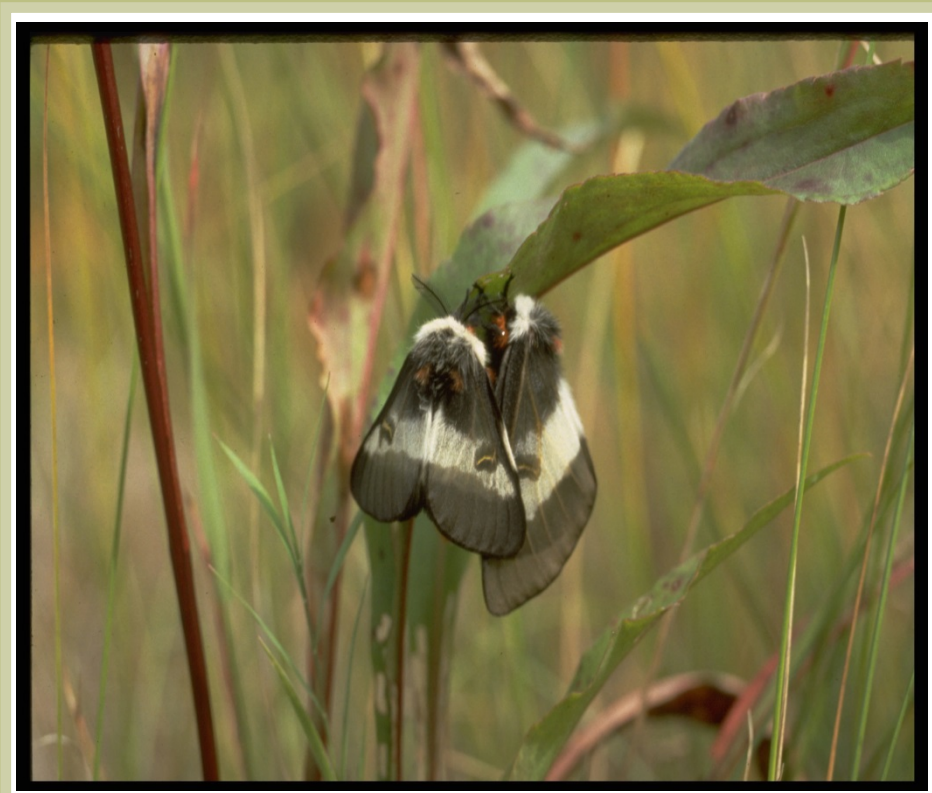


# Recovery Strategy for the Bogbean Buckmoth (*Hemileuca* sp.) in Canada

## Bogbean Buckmoth



2015



Government  
of Canada

Gouvernement  
du Canada

Canada

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

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<sup>1</sup> <http://www.registrelep-sararegistry.gc.ca>

# RECOVERY STRATEGY FOR THE BOGBEAN BUCKMOTH (*Hemileuca* sp.) 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 Bogbean Buckmoth* (*Hemileuca* sp.) in Ontario (Part 2) 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 recovery strategy.

Environment Canada is adopting the provincial recovery strategy with the exception of section 2, Recovery. In place of section 2, Environment Canada has established its own population and distribution objective that is consistent with the provincial recovery goal, is adopting the government-led and government-supported actions of the *Bogbean Buckmoth Government Response Statement*<sup>2</sup> (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 Bogbean Buckmoth.

The federal Recovery Strategy for the Bogbean Buckmoth (*Hemileuca* sp.) in Canada consists of three parts:

Part 1 - Federal Addition to the *Recovery Strategy for the Bogbean Buckmoth* (*Hemileuca* sp.) in Ontario, prepared by Environment Canada.

Part 2 - *Recovery Strategy for the Bogbean Buckmoth* (*Hemileuca* sp.) in Ontario, prepared by A. Gradish and M. Tonge for the Ontario Ministry of Natural Resources<sup>3</sup>.

Part 3 - *Bogbean Buckmoth Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

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<sup>2</sup>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.

<sup>3</sup> On June 26, 2014, the Ontario Ministry of Natural Resources became the Ontario Ministry of Natural Resources and Forestry.

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PART 2 - *Recovery Strategy for the Bogbean Buckmoth* (*Hemileuca sp.*) in Ontario, prepared by A. Gradish and M. Tonge for the Ontario Ministry of Natural Resources.

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

**PART 1 - Federal Addition to the *Recovery Strategy for the Bogbean Buckmoth (Hemileuca sp.) in Ontario*, prepared by Environment Canada**

## Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)<sup>4</sup> agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress five years after the publication of the final document on the SAR Public Registry.

The Minister of the Environment is the competent minister under SARA for the Bogbean Buckmoth and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. 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 Bogbean Buckmoth (Part 2) in cooperation with Environment Canada.

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, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Bogbean Buckmoth 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 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 future regulatory implications, depending on where the critical habitat is identified. SARA requires that critical habitat identified within federal protected areas be described in the *Canada Gazette*, after which prohibitions against its destruction will apply. For critical habitat located on federal lands outside of federal protected areas, the Minister of the Environment must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies. For critical habitat located on non-federal lands, if the Minister of the Environment forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of

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

Parliament, and not effectively protected by the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to extend the prohibition against destruction of critical habitat to that portion. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

## **Acknowledgements**

The federal addition was prepared by Karolyne Pickett (Environment Canada, Canadian Wildlife Service – Ontario). Additional preparation and review of the document was completed by Tianna Burke (formerly of Environment Canada, Canadian Wildlife Service – Ontario), Rachel deCatanzaro, and Lee Voisin (Environment Canada, Canadian Wildlife Service – Ontario). This federal addition benefited from input, review, and suggestions from the following individuals and organizations: Krista Holmes, Madeline Austen, Lesley Dunn, and Elizabeth Rezek (Environment Canada, Canadian Wildlife Service – Ontario); Paul Johanson (Environment Canada – Canadian Wildlife Service - National Capital Region); and Vivian Brownell, Amanda Fracz, Jay Fitzsimmons, Anita Imrie, Eric Snyder, Aileen Wheeldon and Amelia Argue (Ontario Ministry of Natural Resources and Forestry).

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, individual 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 the federal *Species at Risk Act* (SARA) that are not addressed in the Province of Ontario's *Recovery Strategy for Bogbean Buckmoth (Hemileuca sp.) 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 survival/recovery habitat may not directly correspond to federal requirements. Recovery measures dealing with the protection of habitat are adopted; however, whether these measures will result in protection of critical habitat under SARA will be assessed following publication of the federal recovery strategy.

### 1. Species Status Information

The Bogbean Buckmoth is ranked as Critically Imperiled<sup>5</sup> at the global scale (G1Q<sup>6</sup>) and national scale (N1) in both Canada and the United States (NatureServe 2013). At the sub-national level, it is also ranked as Critically Imperiled in Ontario and in the state of New York (NatureServe 2013). The Bogbean Buckmoth is listed as Endangered<sup>7</sup> under the Ontario *Endangered Species Act, 2007* (ESA), and as Endangered on Schedule 1 of the federal SARA.

The species-level classification of the Bogbean Buckmoth remains tentative as the species' taxonomic boundaries in this group are not well defined (NatureServe 2013). Bogbean Buckmoth is a part of the *H. maia* complex, which consists of populations identified as *H. maia*, *H. lucina*, and *H. nevadensis*. Up until recently, the Bogbean Buckmoth was considered to be the only buckmoth (genus *Hemileuca*) in Ontario (COSEWIC 2009). However, in 2005 a new population of the Great Plains taxon (*H. nevadensis latifascia*) was discovered west of Rainy River, Ontario (Gradish and Tonge 2011). In Canada, the Bogbean Buckmoth has been found in only four sites, all within eastern Ontario. Two of the sites are located within the Richmond Fen Wetland location and are separated by 2.2 km of unsuitable habitat, while the other two sites are found within the White Lake Wetland Complex location and are separated by 3.2 km of unsuitable habitat.

The Canadian population of the Bogbean Buckmoth probably constitutes less than five percent of the species' global distribution (COSEWIC 2009; Nature Serve 2013).

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<sup>5</sup> Critically Imperiled (G1/N1/S1): At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.

<sup>6</sup> Questionable taxonomy that may reduce conservation priority. Resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion with another taxon type. The 'Q' modifier is only used at a global level.

<sup>7</sup> A native species that lives in the wild in Ontario but is facing imminent extinction or extirpation.

## 2. Recovery Feasibility

Based on the following four criteria outlined in the draft SARA Policies (Government of Canada 2009), the recovery of the Bogbean Buckmoth, as defined by the population and distribution objective set for the species by Environment Canada, 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. Individuals capable of reproduction are currently present in Ontario, as evidenced by a total of 6,200 larvae found at four sites during a survey conducted in 2008 (COSEWIC 2009). From the larvae found, an estimate of 3,000 adult Bogbean Buckmoths would survive to adulthood, and these could be supported by an area less than three square kilometres in Ontario (COSEWIC 2009).

The abundance of the species appears to fluctuate widely from year to year: the number of larvae documented annually at the Richmond Fen Wetland since 1979, for example, has varied from one larva to several thousands of larvae. Population fluctuations of this order of magnitude therefore cast some uncertainty as to the availability of reproducing individuals in a given year.

Secondly, although the species may be capable of flying for several kilometres and dispersing from one site to another within each location (Pryor 1998, Gradish and Tonge 2011), it is unlikely that natural dispersal between locations is possible: the two Ontario locations are 50 km apart, and all other known locations are even further away in New York State. Extremely limited dispersal capabilities between locations is suggested based on Pryor (1998), who never observed any moths flying above the tree line or migrating between his study sites. Instead, adults of the species remained in their native fens and most adult moths observed by Pryor (1998) flew lower than 1 m above vegetation, and none flew more than 2 m above vegetation. Furthermore, Fernandez-Chacón et al. (2014) found that Lepidoptera classified as having low dispersal ability and specific habitat requirements tended to not colonize new locations. Given the fragmented distribution of the Bogbean Buckmoth, the potential for natural recruitment should one location become extirpated is severely limited.

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

Yes. The species utilizes fens containing large amounts of Bogbean (*Menyanthes trifoliata*), an herbaceous wetland plant. Although rare, this is a habitat that is available in Ontario and is found in several locations not currently occupied by the species (COSEWIC 2009).

Presently, it is unclear why this moth is only found in four sites in Ontario, despite the presence of suitable habitat in other areas of Ontario (Gradish and Tonge 2011). Searches have been undertaken in over eight other suitable wetland areas in Ontario but no new populations have been located (COSEWIC 2009, Gradish and Tonge 2011).

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

Yes. There is little direct human disturbance at any of the four sites (COSEWIC 2009). The most significant threat to the Bogbean Buckmoth is habitat degradation, and more specifically habitat degradation due to alteration of water regime within the species' habitat and invasion of habitat by non-native plant species (e.g., non-native Common Reed [*Phragmites australis*], Glossy Buckthorn [*Frangula alnus*], and Narrow-leaved Cattail [*Typha angustifolia*]) (COSEWIC 2009). Alteration of the water regime can be mitigated or avoided through appropriate water management policies, actions and land stewardship techniques. While invasive plant species have been found within or near all four sites where the Bogbean Buckmoth is known to occur in Ontario, the risk posed by these invasive plant species can be assessed regularly through targeted monitoring and, to the extent feasible, invasive plant control techniques can be employed as appropriate and necessary to help mitigate this threat. Recreational use of trails is also an activity which can be managed and mitigated should it present a threat to the species' habitat.

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

Yes. In the absence of evidence that the species ever occurred beyond the currently known locations, the population and distribution objective consists of maintaining current populations in Ontario and encouraging the natural expansion of the species into suitable but currently unoccupied habitat. Consequently, the recovery techniques needed to achieve the objective consist of conserving the fen habitat where the species occurs by mitigating threats to the habitat as described above. Although research would be required to better understand the level of impact posed by each potential threat to the species, the techniques required to conduct this research and, if warranted, to mitigate the threats, likely already exist.

Due to its very limited distribution and the low probability of natural range expansion (Gradish and Tonge 2011), the Bogbean Buckmoth will likely always be vulnerable to anthropogenic and natural stressors despite applying available recovery techniques and maintaining existing populations.

### 3. Threats

In general, habitat change is considered to be the most significant threat to the Bogbean Buckmoth, and could result from a number of factors or activities (Gradish and Tonge 2011). Factors contributing to habitat modification that are identified in the *Recovery Strategy for the Bogbean Buckmoth (Hemileuca sp.) in Ontario* (Part 2) include invasive species, hydrological changes, succession, and climate change.

In addition to those listed above, other factors have the potential to cause loss or modification of the habitat used by the Bogbean Buckmoth. The use of motorized recreational vehicles within fen habitat may pose a threat. The existence of a snowmobile trail in Phragmites Fen (part of Richmond Fen Wetland; see section 1.3 in Gradish and Tonge (2011)) and resulting changes in fen vegetation have contributed to habitat degradation at that site (COSEWIC 2009). While development has not significantly impacted the four known populations in Canada, a railway that cuts through Richmond Fen (also part of Richmond Fen Wetland) has caused minor loss of fen habitat and altered the water regime at that site (COSEWIC 2009). In addition, it is possible that past development in or near fen habitat in Ontario could have caused loss of previously undocumented populations of the Bogbean Buckmoth (COSEWIC 2009).

Related to the broad threat of habitat modification, the following activities have been identified as generally not compatible with regulated habitat in the Province of Ontario's *Habitat Protection Summary for Bogbean Buckmoth* (OMNR 2014): use of ATVs or snowmobiles in fen habitat; construction of houses, other structures, or roads; alteration of vegetation or water levels, or the removal of peat; and broad-scale application of road salt, fertilizers and herbicides.

### 4. Population and Distribution Objectives

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

- The recovery goal is to sustain current populations and distributions of Bogbean Buckmoth at extant locations, and to expand populations into suitable, but currently unoccupied habitat within its current range in Ontario.

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

- The government's goal for the recovery of Bogbean Buckmoth is to sustain current population levels and distributions at existing locations, and to encourage

the natural expansion of the species into suitable but currently unoccupied habitat within its current range in Ontario.

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 Bogbean Buckmoth in Canada is to:

- Maintain current population abundance and distribution of the species in Ontario and encourage the natural expansion of the species into suitable but currently unoccupied habitat within its current range in Ontario.

The Bogbean Buckmoth's current range within Ontario covers less than 3 km<sup>2</sup> (COSEWIC 2009; NatureServe 2013). The species has only been documented at four sites and therefore may have always been rare in the province. Activities, such as habitat management in adjacent fen ecosystems, which may encourage expansion of the Bogbean Buckmoth into suitable but currently unoccupied habitats in its current range in Ontario may assist with recovery of the species.

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

The government-led and government-supported actions tables from the *Bogbean Buckmoth 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 Bogbean Buckmoth (Hemileuca sp.) in Ontario* (Part 2).

## **6. Critical Habitat**

### **6.1 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 provincial recovery strategies 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 Bogbean Buckmoth, and came into force January 1, 2014. A habitat

regulation is a legal instrument that prescribes an area that will be protected<sup>8</sup> as the habitat of this 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 conditions described in the regulation are met within a specified geographic area.

Environment Canada adopts the description of the Bogbean Buckmoth habitat under section 24.1.1.1 of Ontario Regulation 242/08<sup>9</sup> 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 Bogbean Buckmoth to carry out its life processes. To meet specific requirements of SARA, the biophysical attributes of critical habitat are further detailed below.

The areas prescribed under **Ontario regulation 242/08 – Bogbean Buckmoth habitat** are described as follows:

*24.1.1.1 (1) For the purposes of clause (a) of the definition of “habitat” in subsection 2 (1) of the Act [ESA], the areas described in subsection (2) that are located in the following geographic townships are prescribed as the habitat of Bogbean Buckmoth:*

- 1. The geographic Townships of Goulbourn and Marlborough, within the City of Ottawa.*
- 2. The geographic Township of McNab, within the County of Renfrew.*
- 3. The geographic Township of Pakenham, within the County of Lanark.*

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

- 1. An area that belongs to a community class identified as a fen under the land classification system for southern Ontario and that,*
  - i. is being used by a Bogbean Buckmoth or is a fen on which a Bogbean Buckmoth depends to carry on its life processes, or*
  - ii. was used by a Bogbean Buckmoth at any time during the previous three years<sup>10</sup> and provides suitable conditions for a Bogbean Buckmoth to carry on its life processes.*
- 2. Any area within 120 metres of an area described in paragraph 1.*

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<sup>8</sup> Under the federal 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.

<sup>9</sup> [http://www.e-laws.gov.on.ca/html/regs/english/elaws\\_regs\\_080242\\_e.htm#BK54](http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_080242_e.htm#BK54)

<sup>10</sup> The habitat regulation may no longer be in effect if no Bogbean Buckmoths are observed during three years of consecutive surveys following appropriate MNRF-approved protocols.

The biophysical attributes of critical habitat include the characteristics described below.

- Fen communities (may include areas of open, shrub, and/or treed fen) which possess the following characteristics:
  - presence of Bogbean (*Menyanthes trifoliata*);
  - presence of peat moss hummocks and shallow pools;
  - water pH that is slightly acidic to neutral;
  - mineralized groundwater discharge to surface; and
  - typical vegetation includes sedges and mosses, grasses, reeds, low shrubs and sometimes a sparse layer of tamarack and white cedar.

Fen habitat is described by the Fen Community Class defined using the Ecological Land Classification (ELC) for Southern Ontario (Lee et al. 1998). The ELC framework provides a standardized approach to the interpretation and delineation of dynamic ecosystem boundaries and as such encompasses the biophysical attributes of the habitat for the Bogbean Buckmoth. The area within 120 m of the fen contributes to maintaining microhabitat conditions and the functional integrity of the fen.

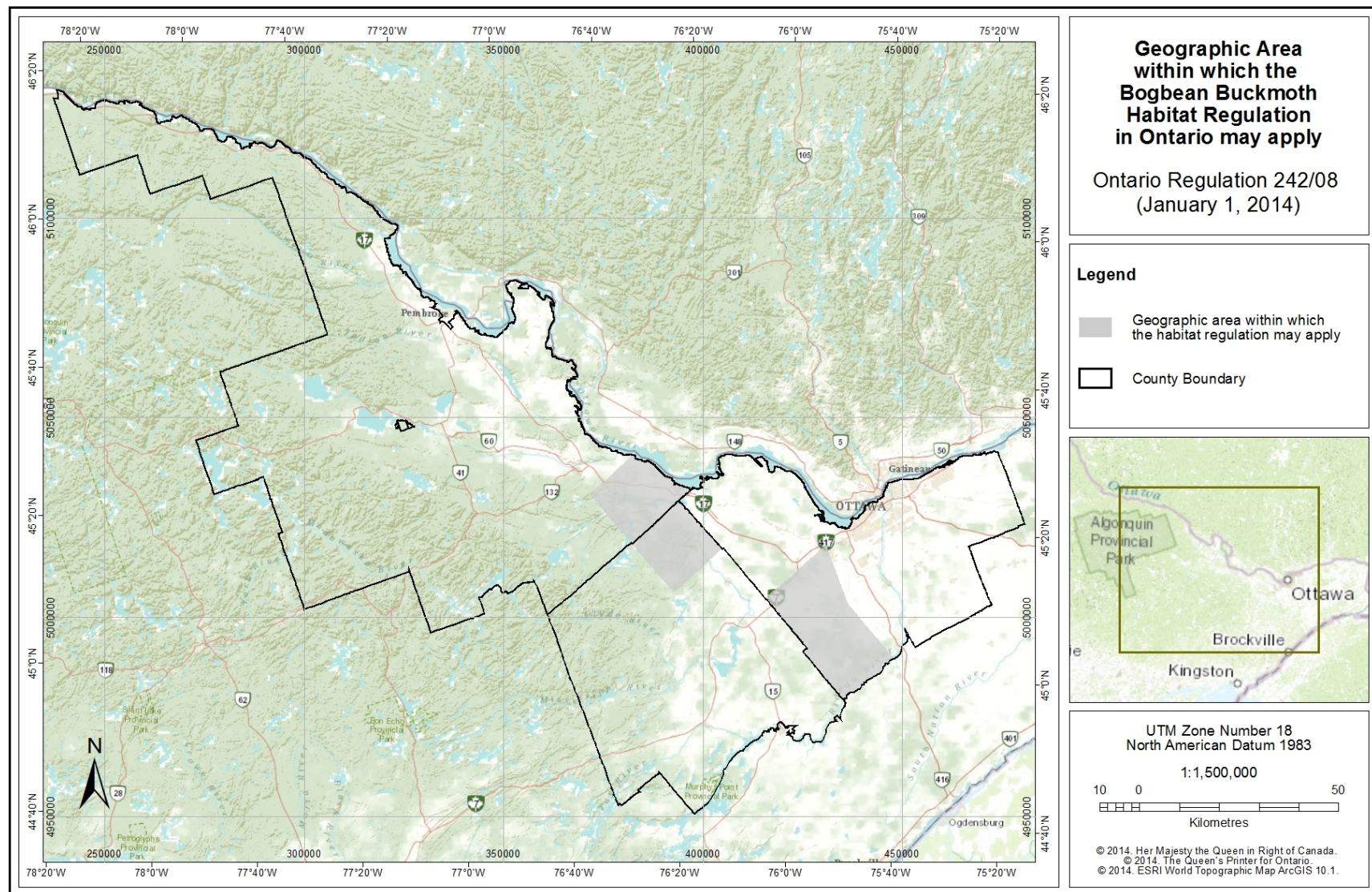
Through this recovery strategy, the areas prescribed as habitat for the Bogbean Buckmoth under section 24.1.1.1 of Ontario Regulation 242/08 become critical habitat identified under SARA. Since the regulation is dynamic and automatically in effect whenever the conditions described in the regulation are met, if any new locations of the Bogbean Buckmoth 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 Bogbean Buckmoth* (OMNR 2014) for further details on the provincial habitat regulation and its application. Should new occurrences of Bogbean Buckmoth be identified that meet the criteria above, the additional critical habitat will be identified in an updated recovery strategy or a subsequent action plan.

Application of the critical habitat criteria above to the best available data (as of April 2014), identifies critical habitat at four sites for the two known local populations of the Bogbean Buckmoth in Canada (Figure 2, See also Table 1), totalling approximately 551 ha. The critical habitat identified is considered sufficient to meet the population and distribution objective for the Bogbean Buckmoth.

Critical habitat for the Bogbean Buckmoth is presented using 10 x 10 km UTM grid squares. The UTM grid squares presented in Figure 2 are 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 any risks to the ecologically sensitive fens and associated fen species. The areas of critical habitat within each grid square occur where the description of critical habitat is met. More detailed information on 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

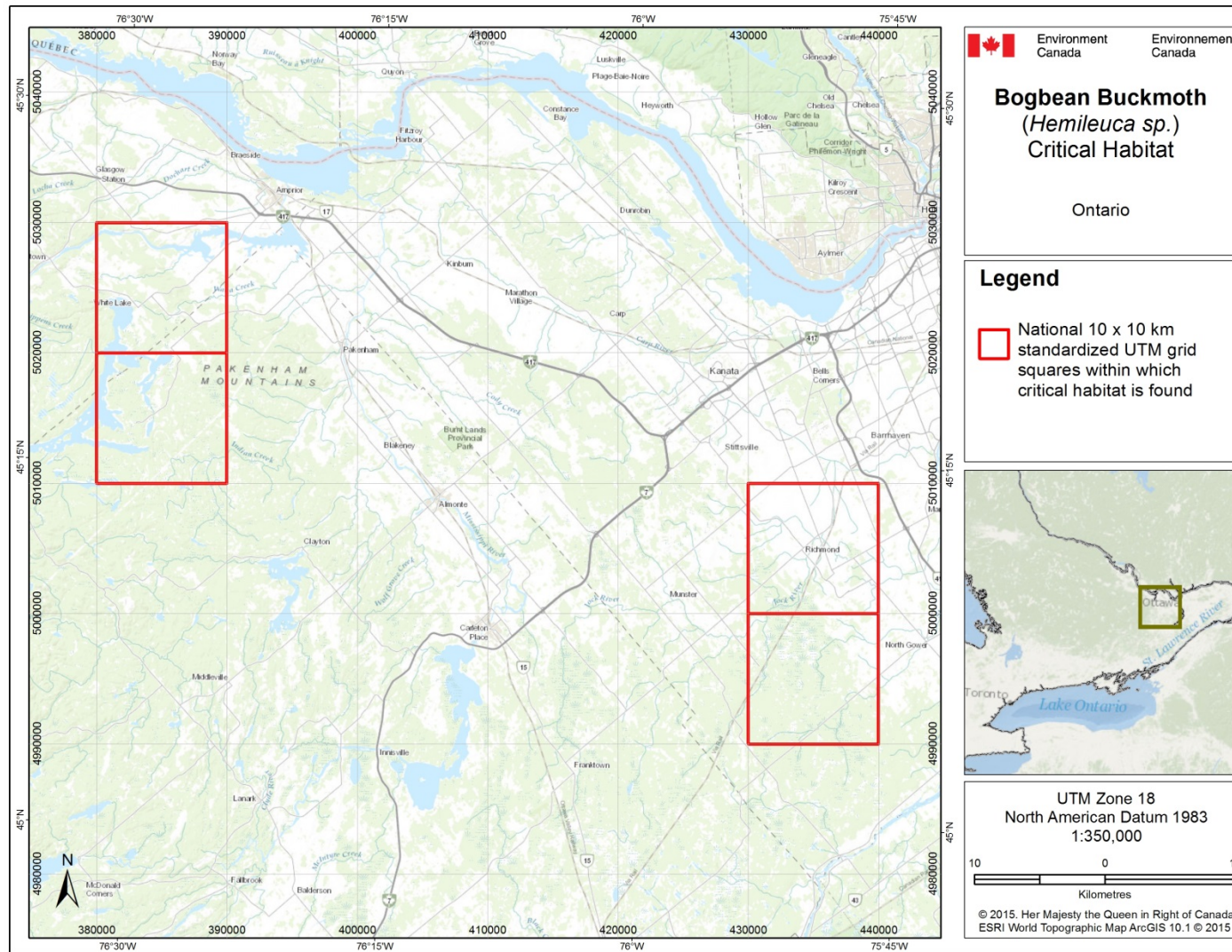
Environment Canada – Canadian Wildlife Service at  
[ec.planificationduretablissement-recoveryplanning.ec@canada.ca](mailto:ec.planificationduretablissement-recoveryplanning.ec@canada.ca).





**Figure 1. The geographic area within which the habitat regulation for the Bogbean Buckmoth may apply if the habitat meets the conditions described in section 24.1.1.1 of Ontario Regulation 242/08 under the provincial ESA.**





**Figure 2. Grid squares that contain critical habitat for the Bogbean Buckmoth in Canada.** Critical habitat for the Bogbean Buckmoth occurs within these 10 x 10 km standardized UTM grid squares (red squares), where the description of critical habitat is met. The grid squares contain approximately 551 ha of critical habitat.

**Table 1. Grid squares that contain critical habitat for the Bogbean Buckmoth in Canada.**

Critical habitat for the Bogbean Buckmoth occurs within these 10 x 10 km standardized UTM grid squares where the description of critical habitat is met.

Local population/Location	10 x 10 km standardized UTM Grid Square ID <sup>1</sup>	UTM Grid Square Coordinates <sup>2</sup>		Critical habitat unit area (ha) <sup>3</sup>	Land Tenure <sup>4</sup>
		Easting	Northing		
Richmond Fen Wetland: Phragmites Fen	18TVQ39	430000	4990000	147	Non-federal Land
Richmond Fen Wetland: Richmond Fen	18TVQ39 18TVR30	430000 430000	4990000 5000000	253	Non-federal Land
White Lake Wetland Complex: Hayes Bay Fen	18TUR81	380000	5010000	86	Non-federal Land
White Lake Wetland Complex: White Lake Fen	18TUR82	380000	5020000	66	Non-federal Land
<b>Total of 551 ha in 4 critical habitat units</b>					

<sup>1</sup>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 and letter 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).

<sup>2</sup>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.

<sup>3</sup>The area presented is an approximation of the area of critical habitat (rounded up to the nearest 1 ha); the exact area of critical habitat would require field verification.

<sup>4</sup>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.

## 6.2 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 or multiple activities at one point in time or from the cumulative effects of one or more activities over time (Government of Canada 2009). It should be noted that not all activities that occur in or near critical habitat are likely to cause its destruction.

Activities described in Table 2 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 2.** Activities likely to destroy the critical habitat of the Bogbean Buckmoth

Description of Activity	Description of effect in relation to function loss	Details of effect (including related threat, scope, and thresholds)
Activities (e.g., digging, clearing, or gathering) that cause vegetation removal	<p>If it occurs within the fen, can result in the direct physical removal of individuals of the species' primary larval host, Bogbean and other plant species used by the Bogbean Buckmoth during its lifecycle (e.g., for feeding or egg laying).</p> <p>Done at a large scale within the fen, it could alter the plant community (abundance of plant material and species composition) such that the habitat is no longer suitable for Bogbean and/or other plant species used by the Bogbean Buckmoth during its lifecycle (e.g., for feeding or egg laying).</p> <p>If it occurs on a large scale either within or outside critical habitat, it could also alter the fen's water regime- see below.</p>	<p>Bogbean Buckmoths are dependent on the vegetation communities found in fens; removal or alteration of the vegetation community could therefore result in destruction of critical habitat. The activity could cause destruction of critical habitat at any time throughout the year, because the species' entire lifecycle, from egg to moth, occurs in the fen.</p> <p>The activity could cause destruction of critical habitat if it occurs within or outside the bounds of critical habitat. Vegetation removal within the fen would directly result in the destruction of critical habitat. Effects of vegetation removal within the 120m zone surrounding the fen boundary or outside of critical habitat would be predominantly cumulative; the activity could gradually lead to the destruction of critical habitat and would be more likely to cause destruction if it occurs within the 120m zone than if it occurs outside of critical habitat. The information available at this time is insufficient to develop a threshold for the amount of vegetation that could be removed without causing the destruction of critical habitat.</p>
Peat removal	<p>If it occurs within the fen, can result in the direct physical removal of the species' pupation sites as well as primary larval host, Bogbean, and other plant species used by the Bogbean Buckmoth during its lifecycle (e.g., for feeding or egg laying).</p> <p>If it occurs within or outside of critical habitat, it can also alter the fen's water regime- see below. This activity may also require vegetation removal- see above.</p>	<p>Because the Bogbean Buckmoth uses specific fen vegetation communities for the entirety of its lifecycle, peat removal that causes changes in the hydrological cycle, that in turn alters the vegetation community, can result in the destruction of critical habitat at any time throughout the year. The activity does not have to occur within the bounds of critical habitat to cause its destruction; for example, in the event that peat is removed in a location that is hydrologically linked to the water table supporting the critical habitat.</p> <p>Peat removal within the fen would directly result in the destruction of critical habitat. Effects of peat removal within or beyond the 120m zone surrounding the fen boundary would be predominantly cumulative; the activity would gradually lead to the destruction of critical habitat. The information available at this time is insufficient to develop a threshold for the amount of peat that could be removed without causing the destruction of critical</p>

		habitat.
New construction of houses, other structures, roads and recreational trails	<p>If it occurs within the fen, this activity can result in the direct physical removal of the species' primary larval host plant, Bogbean, as well as other plants which may be used during the lifecycle of the Bogbean Buckmoth (e.g., for feeding or egg laying).</p> <p>If significant construction occurs either within or outside of critical habitat, it can also alter the fen's water regime - see below.</p>	<p>The activity could cause destruction of critical habitat at any time throughout the year, because the species spends its entire lifecycle in the fen.</p> <p>The activity could cause destruction of critical habitat if it occurs within or outside the bounds of critical habitat. Constructing structures and roads within the fen will directly result in the destruction of critical habitat. Effects of new construction projects within the 120m zone surrounding the fen boundary or outside of critical habitat are predominantly cumulative; the activity could gradually lead to the destruction of critical habitat and would be more likely to cause destruction if it occurs within the 120m zone than if it occurs outside of critical habitat. The information available at this time is insufficient to develop a threshold for the amount of new structures or roads that could occur without causing the destruction of critical habitat.</p>
Activities (e.g., draining or dam construction) which alter the fen's water regime	<p>Because critical habitat for the Bogbean Buckmoth consists of a type of wetland community, changes to the fen's water regime can lead to habitat conditions that will no longer be suitable for survival of the species' primary larval host, Bogbean, as well as other plants which may be used during the lifecycle of the Bogbean Buckmoth (e.g., for feeding or egg laying).</p>	<p>The activity does not have to occur within the bounds of critical habitat to cause its destruction; for example, a fen's water level can be affected if water is being drained from a point located outside of the critical habitat but that is hydrologically linked to the fen. It could cause destruction of critical habitat at any time throughout the year.</p> <p>Draining or flooding of wetlands could have direct and cumulative effects; depending on the extent of area affected by altered water levels, a single occurrence of the activity could cause destruction of critical habitat. However, its effects are most likely to be cumulative, with changes over time to the water regime leading to unsuitable habitat conditions. The information available at this time is insufficient to develop a threshold for this activity.</p>
Use of motorized vehicles (e.g., ATVs and snowmobiles)	<p>If it occurs within the fen, this activity can kill the species' primary larval host, Bogbean, as well as other plants which may be used during the life cycle of the Bogbean Buckmoth (e.g., for feeding or egg laying) through direct trampling.</p>	<p>Driving motorized vehicles would directly result in the destruction of critical habitat if the activity occurs within the fen. It could cause destruction of critical habitat at any time throughout the year; for example, trampling could destroy plants on which eggs have been deposited and on which they overwinter. Thresholds are not applicable to this activity.</p>

Introduction of exotic invasive species (e.g., non-native Common Reed, Glossy Buckthorn, or Narrow-leaved Cattail)	Invasive species may deteriorate the fen habitat and render it unsuitable for the Bogbean Buckmoth by out-competing its primary larval host plant, Bogbean, as well as other native plant species which may be used during the life cycle of the Bogbean Buckmoth (e.g., for feeding or egg-laying).	Effects are direct and cumulative and may occur at any time of the year. This activity would likely cause destruction if it occurs within the fen, but could also cause destruction of critical habitat for Bogbean Buckmoth if it occurs within 120m of the fen or adjacent to critical habitat (due to the likelihood that invasive species could spread into the fen from nearby locations). Thresholds are not applicable to this activity, as introduction of even a single individual could lead to further spread of the species.
Broad scale application of road salt, fertilizers or herbicides	If it occurs within critical habitat, this activity can have toxic effects that kill the species' primary larval host, Bogbean, as well as other plants which may be used during the life cycle of the Bogbean Buckmoth (e.g., for feeding or egg laying).	Effects are direct and cumulative and may have an effect at any time of the year. This activity must occur within the bounds of critical habitat for the Bogbean Buckmoth to cause its destruction. The information available at this time is insufficient to develop a threshold for this activity; however, generally, broad-scale and repeated application of road salt, fertilizers or herbicides would be more likely to result in destruction of critical habitat than would localized application.

## 7. 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 indicators:

1. Population abundance and distribution at existing locations in Ontario has been maintained.
2. Steps have been taken to encourage natural expansion of the species into suitable but currently unoccupied habitat within the species' current range in Ontario.

## 8. Statement on Action Plans

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

## 9. Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the [Cabinet Directive on the Environmental](#)



[Assessment of Policy, Plan and Program Proposals<sup>11</sup>](#). 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.

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 on non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below.

This federal recovery strategy will clearly benefit the environment by promoting the recovery of the Bogbean Buckmoth. Since the species is restricted to open, calcareous, low shrub fens, any efforts to protect the species' habitat will also help preserve a very rare habitat type in Ontario. Actions set out in this recovery strategy may impact the host plant for the Bogbean Buckmoth, the Bogbean, which is ranked as secure provincially, nationally and globally (NatureServe 2013); while an increase in numbers of the Bogbean Buckmoth may increase predation on the plant, measures aimed at protecting or improving habitat may benefit both species. Recovery efforts could also have positive impacts on Eastern Prairie Fringed-orchid (*Platanthera leucophaea*), a globally rare species listed as endangered under the ESA and SARA, and found at three of the four Bogbean Buckmoth sites known in Ontario (COSEWIC 2009). Other species that may benefit from protection of these habitats include Yellow Rail (*Coturnicops noveboracensis*; listed as special concern under SARA and the ESA), a rare horsefly (Tabanidae: *Atylotus woodi*), two rare spiders (*Clubiona angulata* and *Goneatara nasutus*), as well as several rare fly species in the family Tachinidae. Some fen species, such as Eastern Prairie-fringed Orchid, may serve as an indicator species for the Bogbean Buckmoth (COSEWIC 2009), but this requires further study and confirmation. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. No other buckmoth species are known to occur in the same habitat as the Bogbean Buckmoth therefore congeneric<sup>12</sup> competition pressure from an increase in the species' abundance or distribution is not anticipated.

Potential effects on highly restricted fen species such as Eastern Prairie-fringed Orchid and the jumping spider *Paradamoetas fontanus* will need to be considered should removal of invasive species be undertaken in suitable habitats to recover the Bogbean Buckmoth (Gradish and Tonge 2011).

The SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects.

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<sup>11</sup> <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

<sup>12</sup> Animal or plant species which belong to the same genus.

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**PART 2 - *Recovery Strategy for the Bogbean Buckmoth*  
(*Hemileuca sp.*) in Ontario, prepared by A. Gradish and  
M. Tonge for the Ontario Ministry of Natural Resources**

# Bogbean Buckmoth

(*Hemileuca sp.*) in Ontario

## Ontario Recovery Strategy Series

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

*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](http://www.ontario.ca/speciesatrisk)

## RECOMMENDED CITATION

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## **DECLARATION**

This recovery strategy for the Bogbean Buckmoth has been developed in accordance with the requirements of the *Endangered Species Act, 2007* (ESA). It 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

## EXECUTIVE SUMMARY

The Bogbean Buckmoth (*Hemileuca* sp.) is a rare moth known to occur only in North America in New York State and near Ottawa in Ontario. In Ontario, it is classified as endangered by the Committee on the Status of Species at Risk in Ontario (COSSARO) due to its habitat specificity and extremely limited geographic range. It is currently found at two sites in southeast Ontario: Richmond Fen Wetland and White Lake Fen Wetland Complex. The actual area occupied by the species in Ontario is less than 3 square kilometers and is thought to support approximately 3,000 adult Bogbean Buckmoths.

Adults are medium to large black moths, with wide, white wing bands with wavy or scalloped outer edges, each containing a small discal (circular) spot. There is marked sexual dimorphism with females being larger than males. The species is restricted to open, calcareous, low shrub fens containing large amounts of Bogbean (*Menyanthes trifoliata*). This habitat requirement is unique to this species as most buckmoths are found in very dry habitats (Legge et al. 1996).

Ontario populations of Bogbean Buckmoth may be threatened by habitat changes including water level fluctuations, land development, invasive plant species, insecticide applications and long-term loss of wetland habitat from climate change. Plant species, such as European Common Reed (*Phragmites australis* spp. *australis*), Glossy Buckthorn (*Frangula alnus*) and Narrow-leaved Cattail (*Typha angustifolia*) can invade and crowd open fens and outcompete Bogbean Buckmoth host plants. Human induced water level fluctuations may threaten populations at White Lake. In addition, insecticide applications for Gypsy Moth (*Lymantria dispar*) are considered a potential threat depending on spray timing and concentration (NatureServe 2010).

The recovery goal is to sustain current populations and distributions of Bogbean Buckmoth at extant locations and to expand populations into suitable, but currently unoccupied habitat within its current range in Ontario. To accomplish this, several recovery objectives have been identified.

1. Conduct a quantitative assessment to determine what constitutes a sustainable and secure population in Ontario.
2. Fill knowledge gaps on taxonomy, ecology, distribution, behaviour, population dynamics, mortality factors and habitat use in the species' Ontario range.
3. Reduce or mitigate threats on Bogbean Buckmoth populations.
4. Increase public awareness and understanding of Bogbean Buckmoth populations.
5. If it is determined that the species was historically widespread, then consider the introduction of Bogbean Buckmoth populations into areas of continuous, unoccupied but otherwise suitable habitat, where feasible.

Considering the Bogbean Buckmoth's limited geographic range, it is recommended that the area prescribed as regulated habitat for this species include all occupied sites. In

## Recovery Strategy for the Bogbean Buckmoth in Ontario

Ontario, this includes the Richmond Fen Wetland and White Lake Fen Wetland Complex. Both of these sites are calcareous fens that support large populations of the Bogbean (*Menyanthes trifoliata*).

The area prescribed as habitat at each of these sites should include the extent of the fen vegetation, adjoining wetland complexes and 120 metres beyond them to protect the structure and function of the fen. The 120-metre distance is a historically used set-back for resource protection in Ontario (Ontario 1992) and was chosen because developments within 120 metres of a wetland have a reasonable probability of affecting the ecological functions of the wetlands which they surround (OMNR 2010). In addition, if new locations for the Bogbean Buckmoth are discovered or the species is re-introduced, then these areas should also be prescribed as habitat in the regulation.



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## 1. BACKGROUND INFORMATION

### 1.1 Species Assessment and Classification

COMMON NAME: Bogbean Buckmoth
SCIENTIFIC NAME: <i>Hemileuca</i> sp.
SARO List Classification: Endangered
SARO List History: Endangered (2010)
COSEWIC Assessment History: Endangered (2009)
SARA Schedule 1: No Schedule, No Status
CONSERVATION STATUS RANKINGS:
GRANK: G1Q NRANK: N1 SRANK: S1

The glossary provides definitions for the abbreviations above.

### 1.2 Species Description and Biology

#### Species Description

In North America, there are approximately 20 species of buckmoths (*Hemileuca*), a well-studied group of silk moths (Saturniidae) (Tuskes et al. 1996, Rubinoff and Sperling 2004). Populations of buckmoth in the Great Lakes region vary to some extent in morphology, ecology and behaviour, and these different populations have been identified as *H. maia*, *H. lucina*, or *H. nevadensis*. Collectively, these species are referred to as the *H. maia* complex, *maia* being the oldest name in the group. The Great Lakes populations comprise a sub-set of this complex (Tuskes et al. 1996). Bogbean Buckmoth (also known as Cryan's Buckmoth – see Legge et al. 1996 and Pryor 1998), is part of the *H. maia* species complex. Until recently, it was considered the only buckmoth in eastern Canada (COSEWIC 2009); however, in 2005, a population of the Great Plains taxon currently classified as *H. nevadensis latifascia* was discovered west of Rainy River, Ontario (C. Schmidt pers. comm. 2010). As the species boundaries in this group are not well defined, the species-level classification of Bogbean Buckmoth remains tentative (NatureServe 2010). Because Bogbean Buckmoth differs from *H. lucina* and *H. maia* (the only other northeastern North American species of the *maia* complex) in mating biology, morphology, primary host plant and geographic range, some experts feel that it is a valid subspecies of *H. nevadensis* (NatureServe 2010). Genetic studies have confirmed that it belongs to the *H. maia* complex, but molecular data could not distinguish it clearly from other named species of this group (Legge et al. 1996, Rubinoff and Sperling 2004). Similarly, Legge et al. (1996) could not find molecular evidence to delineate the species in the Great Lakes populations. However,

## Recovery Strategy for the Bogbean Buckmoth in Ontario

based on ecological characteristics, they concluded that the Bogbean Buckmoth represents an evolutionary significant unit, having unique diagnostic characteristics that distinguish it from the rest of the group [e.g., Bogbean (*Menyanthes trifoliata*), also known as Buckbean or Common Buckbean, as the primary larval host plant], but could not assign it a specific taxonomic rank. Others speculated that the entire group may represent one widespread species with regional variability in host plant and habitat (Scholtens and Wagner 1994, Rubinoff and Sperling 2004). Scholtens and Wagner (1997) concluded that the Great Lakes populations likely represent one species showing clinal variation (i.e., gradual phenotypic or genetic variation of a species over a geographical area) in wing morphology from north to south. However, their findings cannot rule out the possibility that this morphological differentiation results from a hybrid zone between distinct species. Similarly, Rubinoff and Sperling (2004) maintain that further sampling and molecular study may reveal a monophyletic, DNA-based difference between the Bogbean Buckmoth and *H. maia*.

Adult Bogbean Buckmoths are medium to large black moths, with wide, white wing bands, each containing a small discal (circular) spot (COSEWIC 2009, NatureServe 2010). The sexes are dimorphic, with females larger than males. Forewings measure 26 to 32 mm long for males and 32 to 36 mm for females (COSEWIC 2009). The abdomen is red-tipped in males (NatureServe 2010). Morphologically, Bogbean Buckmoths are extremely similar to other species within this group (Legge et al. 1996). Compared to other eastern buckmoths, the Ontario and New York adults are larger, very translucent, have wider wing bands with wavy or scalloped outer edges, and they demonstrate a moderate degree of maculation (i.e., spottiness) in comparison to all other species in this complex (COSEWIC 2009, NatureServe 2010).

Earlier larval instars (developmental stage between each moult until sexual maturity) of Bogbean Buckmoth larvae are similar to those of others in this complex, having a predominantly black body and spines (COSEWIC 2009). However, final instar larvae are very distinct in that the yellow spiracular (lateral) stripe characteristic of the Great Lakes *Hemileuca* (i.e., all maia-complex species other than Bogbean Buckmoth occurring in wetlands in the Great Lakes region, including Ohio, Indiana, Illinois, Michigan, and Minnesota) is greatly reduced or entirely absent (COSEWIC 2009, NatureServe 2010). Larval maculation also is reduced compared to others in this group (NatureServe 2010). Larvae have branched dorsal spines that most closely resemble those of *H. lucina* larvae in colour (reddish-orange) (COSEWIC 2009). The head capsule and prolegs are reddish-brown (COSEWIC 2009). Late-instar Bogbean Buckmoth larvae measure 40 to 65 mm long and 8 mm in diameter (Pryor 1998, COSEWIC 2009).

### Species Biology

Bogbean Buckmoth is a day-flying moth with a one year life cycle consisting of nine stages: egg, six larval instars, pupa and adult (Pryor 1998). Adults emerge in mid- to late September, with a flight period lasting approximately three weeks (Layberry 1980, Pryor 1998, COSEWIC 2009). Bogbean Buckmoths typically fly on warm, sunny days, and they are generally inactive on cloudy, cool (less than 12°C), windy days

## Recovery Strategy for the Bogbean Buckmoth in Ontario

(Pryor 1998). Adults are capable of flying for several kilometers, but rarely leave their preferred fen habitat (Pryor 1998, NatureServe 2010). Adults typically fly within a height of one metre from the ground; thus, tall shrubs and forest present potential barriers to movement (COSEWIC 2009).

Females use pheromonal cues to attract males, mate once, and deposit all of their eggs in one day (Tuskes et al. 1996). Females have short, frequent flights and males fly for longer periods and distances and mate multiple times (Pryor 1998, COSEWIC 2009). Females generally only survive for one day, whereas males live for several days (Tuskes et al. 1996, COSEWIC 2009); however, Stanton (1998) managed to recapture a female and a male after 9 and 12 days, respectively. Females lay clusters of egg rings containing 100 to 180 eggs on the stems of a variety of woody and some herbaceous plants [e.g., Red Maple (*Acer rubrum*), Speckled Alder (*Alnus incana* sp. *rugosa*), Virginia Chain Fern (*Woodwardia virginica*), sedges (*Carex* sp.), Leatherleaf (*Chamaedaphne calyculata*), Sweet Gale (*Myrica gale*), Bog Willow (*Salix pedicellaris*), Narrow-leaved Meadow-sweet (*Spiraea alba*) and Red Osier Dogwood (*Cornus sericea*)] 10 to 40 cm above the ground (Pryor 1998). Bogbean is not used as a site for egg laying because it senesces with declining light levels and water temperatures and subsequently the leafstalks die off with the frost (D. Sutherland pers. comm. 2010). Instead, eggs are laid on the stems of nearby plants and upon hatching, the larvae move to the Bogbean (Legge et al. 1996). Where a female chooses to lay her eggs appears to be dependent on structural attributes of the plant (e.g., stem diameter of typically 2.7 to 3.8 mm, but as narrow as 1.8 mm, host height of 35 to 47 cm, low foliage density), as opposed to a plant species preference (Pryor 1998). Pryor (1998) reported that egg rings increased in length as stem diameter decreased; thus, the number of eggs remains relatively constant regardless of plant type used. In Ontario at the White Lake fen, egg masses also have been observed on American Common Reed (*Phragmites australis* ssp. *americanus*), which measures at least seven millimetres in diameter and 183 to 244 cm in height (R. A. Layberry pers. comm. 2010). Adults do not feed (COSEWIC 2009).

Bogbean Buckmoth overwinters as an egg and the larvae emerge the following spring in late May or early June (Legge et al. 1996, COSEWIC 2009). In New York, newly emerged larvae feed primarily on Bog Cranberry (*Vaccinium macrocarpon*) for the first 12 days, at which point the Bogbean leafs out and the larvae move to this species as their primary host plant (Pryor 1998, COSEWIC 2009). In contrast, Stanton (1998) observed newly emerged larval feeding predominantly on Bogbean, with only five egg masses feeding on Bog Willow or Leatherleaf. Generally, Bogbean appears to be the preferred host plant by earlier larval instars and this host-plant association is unique to this species (Legge et al. 1996). However, populations of early instar larvae feeding on Bogbean have been observed to concurrently feed on Bog Birch (*Betula pumila*), Narrow-leaved Meadow-sweet, willow species (*Salix* sp.), and Sage-leaved Willow (*Salix candida*) in Ontario and/or Wisconsin. In New York, later instars have been observed to feed more heavily on other plant species including: Speckled Alder, Black Chokeberry (*Aronia melanocarpa*), various sedges, Leatherleaf, Common Winterberry (*Ilex verticillata*), oak species (*Quercus* sp.) and Bog Willow (Pryor 1998). Ontario

populations of Bogbean Buckmoth larvae feed primarily on Bogbean until late July, but like New York populations, it is not the first host plant for newly emerged larvae (COSEWIC 2009). In Ontario, later instar larvae also have been observed feeding on Bog Birch, Narrow-leaved Meadow-sweet, Slender Willow (*Salix petiolaris*) and Bebb's Willow (*Salix bebbiana*). It is thought that larvae may switch to these alternate host plants once Bogbean has been exhausted (COSEWIC 2009). Early instar larvae tend to feed in clusters throughout the day, whereas later instars are typically seen in isolation, feeding during the day and possibly at night (Pryor 1998, COSEWIC 2009). In late July, the larvae leave the plant and burrow into peat moss (*Sphagnum* sp.) to pupate (Pryor 1998, COSEWIC 2009).

### 1.3 Distribution, Abundance and Population Trends

The rounded global status of Bogbean Buckmoth is critically imperiled (G1Q) (NatureServe 2010). Less than ten populations exist and these have been documented as occurring only in Ontario and New York (Legge et al. 1996, Tuskes 1996, Pryor 1998, NatureServe 2010, C. Schmidt pers. comm. 2010). However, Tuskes (1996), Kruse (1998), and C. Schmidt (pers. comm. 2010) also note Bogbean-feeding populations of buckmoths in Wisconsin. It is unclear whether these populations represent the same species as those found in Ontario and New York. Presumably, glacial retreat left these Great Lakes populations in disjointed habitats (Pryor 1998). Globally, the total area occupied by this species is less than 100 to 250 km<sup>2</sup>, and in Canada, it occupies less than 3 km<sup>2</sup> (COSEWIC 2009, NatureServe 2010). It was first discovered in eastern Ontario in 1977 (Layberry 1980) and currently only occurs at four sites in this region: two fens near Richmond south of Ottawa (the Richmond and Phragmites fens), herein referred to as the Richmond Fen Wetland, and two fens 50 km west of Richmond (the White Lake and Hayes Bay fens), herein referred to as the White Lake Wetland Complex (COSEWIC 2009, Figure 1). Criteria have been developed for mapping buckmoth occurrences (NatureServe 2010): a separation distance of 2 km is required for populations with unsuitable intervening habitat and a distance of 10 km between populations with suitable intervening habitat for occurrences to be considered independent. Based on these criteria, the Ontario sites can be considered four distinct populations: the two fens at the Richmond Fen Wetland, and two fens at the White Lake Wetland Complex which are separated by 2.2 and 3.2 km of unsuitable habitat, respectively (COSEWIC 2009). However, according to COSEWIC (2009) definitions, the four sites represent two locations that may function as two metapopulations. As the two locations are 50 km apart and thus too great a distance for the Bogbean Buckmoth to be able to recolonize from one pair of fens to the other, this species is considered severely fragmented (COSEWIC 2009). Extensive searches have taken place at some other locations of suitable habitat in Ontario (Stoco Fen, Long Swamp Fen, Mer Bleue, Alfred Bog, Minesing Swamp, three fens on Lowney Lake and other road-accessible fens near White Lake), but no new populations have been found since the original discovery of the four sites (COSEWIC 2009, C. Schmidt pers. comm. 2010).

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The most recent survey conducted in 2008 at the four sites in Ontario estimated the presence of approximately 6,200 larvae. Taking into account natural mortality during pupation and losses due to predation or parasitism [based on data collected from *H. Maia* populations in Massachusetts (Selfridge et al. 2007)], approximately 3,000 of these would be expected to survive to adulthood (COSEWIC 2009). Since 1979 however, the number of Bogbean Buckmoth larvae documented at Richmond Fen alone has ranged from as low as one larva to thousands. Due to significant annual variation in population numbers and the intermittency of monitoring, determining long-term population trends in Ontario has been difficult (COSEWIC 2009). Over its entire range, Bogbean Buckmoth appears to have experienced a moderate to large long term decline of 25 to 90 percent due to habitat loss (COSEWIC 2009, NatureServe 2010). However, to date, habitat loss does not appear to have significantly impacted Ontario populations (COSEWIC 2009).

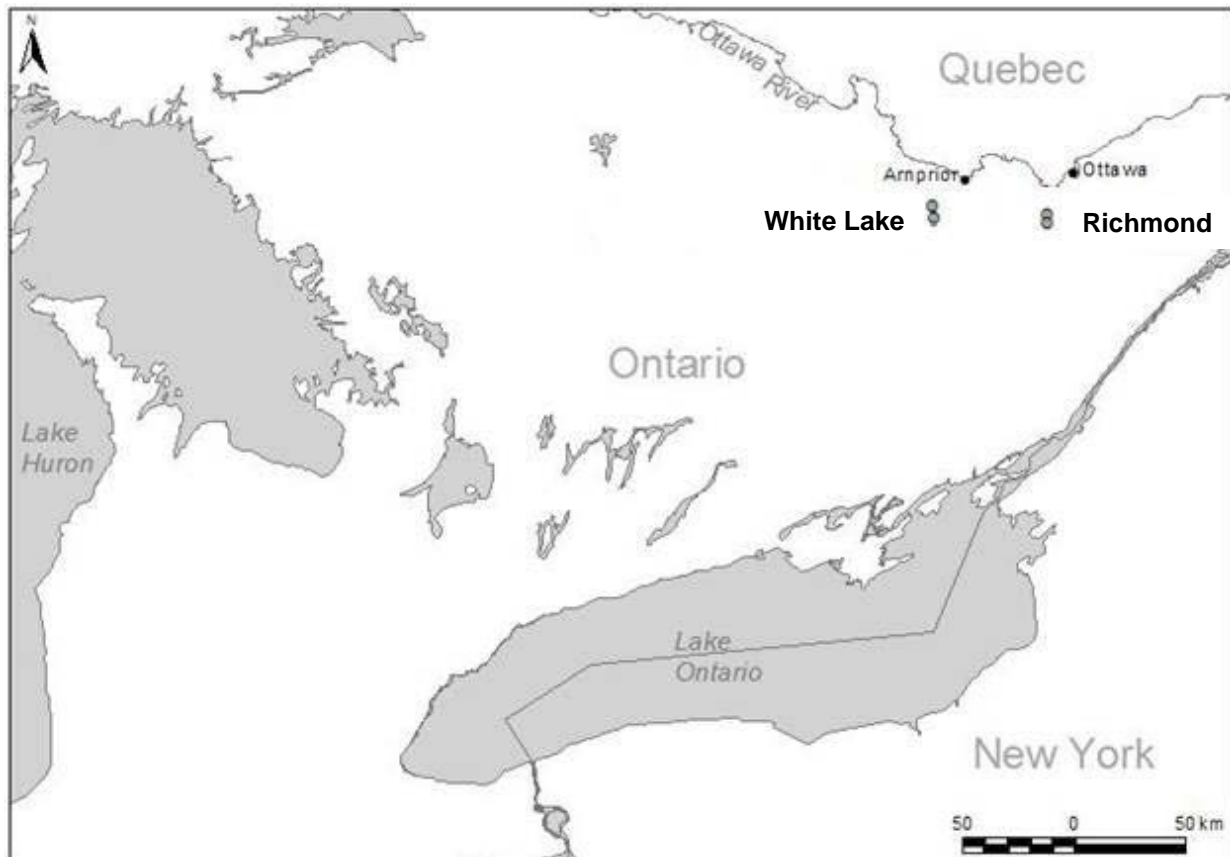


Figure 1. Ontario distribution of Bogbean Buckmoth (COSEWIC 2009).

### 1.4 Habitat Needs

Bogbean Buckmoth is restricted to open, calcareous, low shrub fens containing large amounts of Bogbean (Pryor 1998, COSEWIC 2009, NatureServe 2010). This habitat requirement is unique to this species as most buckmoths are found in very dry habitats (Legge et al. 1996). The Richmond Fen Wetland site consists of palustrine fens on a

limestone plain and peat landform, and the fens at the White Lake Wetland Complex site sit atop lime-rich marble (COSEWIC 2009).

The most densely populated area at the Richmond Fen Wetland is a low shrub fen dominated by Sweet Gale, Bog Birch, Bog Willow and other willow species, with patches of open fens containing sedges and Water Horsetail (*Equisetum fluviatile*). The other site at the Richmond Fen Wetland is an open fen surrounded by conifer swamp and dominated by sedges including Wire Sedge (*Carex lasiocarpa*), Twig-rush (*Cladium mariscoides*) and American Common Reed. Fens at White Lake have similar dominant species (COSEWIC 2009). Eastern Prairie Fringed-orchid (*Platanthera leucophaea*), a globally rare species, is found at three of the four fen sites (COSEWIC 2009). At all four sites, larvae are most abundant in patches of graminoid fen with shallow pools containing Bogbean and adjacent peat moss hummocks. These patches are dominated by Twig Rush or Wire Sedge, with Stunted Tamarack (*Larix laricina*) and Eastern White Cedar (*Thuja occidentalis*) in proximity (COSEWIC 2009). Bogbean Buckmoth does not appear to occur in areas lacking peat moss hummocks nearby, presumably due to the lack of suitable pupation sites (COSEWIC 2009).

### 1.5 Limiting Factors

Bogbean Buckmoth is a specialist with relatively scarce environmental requirements (NatureServe 2010). It occurs only in fens and unlike other buckmoths, it is dependent on Bogbean for early stage larval feeding. Glacial retreat left suitable habitat for the Bogbean Buckmoth in disjointed patches. Due to its limited dispersal capacity and behaviour, it is unlikely that the Bogbean Buckmoth will move from its current fen locations to additional suitable areas naturally. Similarly, it is unlikely that adults from New York would recolonize any Ontario site extirpations (COSEWIC 2009). Adults do not migrate (Pryor 1998, NatureServe 2010). Although they are probably capable of flying several kilometers, the sites within Ontario and between Ontario and New York are approximately 50 to many times the maximum dispersal distance documented for the species. A general consequence of habitat specialization and limited dispersal capacity, either in isolation or combined with these threats, is the potential loss of genetic diversity within populations of the species.

### 1.6 Threats to Survival and Recovery

Bogbean Buckmoth populations are considered under immediate or substantial threat from a variety of factors (NatureServe 2010). The biggest threat posed to this species is habitat change. In Canada, Bogbean Buckmoth occurs in provincially recognized areas affording them some protection from on-site developments and habitat modification (i.e., Areas of Natural and Scientific Interest and Provincially Significant Wetlands) (COSEWIC 2009). However, habitat degradation can still occur through factors originating off-site such as alien invasive plants and hydrological changes. In particular, species, such as European Common Reed, Glossy Buckthorn and

## Recovery Strategy for the Bogbean Buckmoth in Ontario

Narrow-leaved Cattail, can invade and crowd open fens and outcompete Bogbean Buckmoth host plants. These plant species occur in or adjacent to all Ontario sites. European Common Reed has been observed to invade and out compete native plants in a number of fens and/or prairies and wetlands in New York, along the Ontario shores of Lake Erie and Lake Hudson and in the St. Lawrence River Valley (COSEWIC 2009). Due to a lack of research, it is unclear what, if any, risk these plant species pose to Ontario populations of Bogbean Buckmoth. In New York, fen succession to denser, taller native shrubs (e.g., Sweet Gale and Leatherleaf) also is apparently degrading the habitat by shading out Bogbean. The specific reasons for this succession are unclear, but may include nitrogen enrichment due to acid precipitation and phosphorus enrichment from cottagers' septic systems (S. Bonnano pers. comm. 2010).

Human-induced water level fluctuations may threaten populations at the White Lake Wetland Complex. Large fluctuations causing excessive flooding or drying may cause mortality in any given year (COSEWIC 2009). However, this does not appear to be an issue at the northernmost White Lake fen (R. A. Layberry pers. comm. 2010).

In New York, large-scale insecticide applications for mosquito control are considered a potential threat to Bogbean Buckmoth depending on spray timing and concentration (NatureServe 2010). Similarly, it is thought that sprays for Gypsy Moth (*Lymantria dispar*) applied by cottagers may affect Ontario populations (COSEWIC 2009).

Finally, general long-term loss of wetland habitat from climate change poses a potential threat (COSEWIC 2009). A significant change in temperature could result in loss of host plants or directly in the mortality of larvae or adults.

### 1.7 Knowledge Gaps

There is a general lack of scientific studies on the biology and ecology of Bogbean Buckmoth, particularly for Ontario populations. A detailed study of the life history and reproduction of the New York populations was conducted by Pryor in 1998, and remains the only published biological study on this species. Further study of the Ontario populations would provide much needed information on their specific biology, population ecology, viability and dynamics, host preferences and habitat requirements at different spatial and temporal scales.

Long-term population trend data also are absent for Ontario populations because the four sites have only been monitored intermittently. Ongoing monitoring of these areas should occur to determine potential causes for yearly variation in the number of larvae and adults.

Due to a lack of surveys for Bogbean Buckmoth eggs, larvae and/or adults in areas of suitable habitat, many questions remain unanswered with respect to the species' distribution in Ontario. Furthermore, it is unclear why it is currently only found in the Richmond Fen Wetland and White Lake Fen Complex, despite the presence of suitable



habitat in other areas. It is thought that plants such as Eastern Prairie Fringe-orchid may serve as an indicator species for Bogbean Buckmoth (COSEWIC 2009). However, this needs to be confirmed.

The taxonomy of the Bogbean Buckmoth remains unresolved. Although it exhibits unique morphological and ecological characteristics, there remains a lack of evidence and agreement regarding its taxonomic position and repeated molecular analyses have yielded inconclusive results. Additionally, of the molecular studies conducted on the *H. maia* complex, only Legge et al. (1996) included Canadian specimens. Clarifying the taxonomy would give a better understanding of the populations in a biogeographical and evolutionary context, and may help to determine the global gene pool of the species as a whole, and provide information on this species' evolutionary history, which can be used to further define its conservation status.

### 1.8 Recovery Actions Completed or Underway

- A Draft Recovery Plan for New York Bogbean Buckmoth populations is targeted for publication in March, 2011.
- The Richmond Fen Wetland is prescribed as habitat for Eastern Prairie Fringed-orchid in a regulation under the *Endangered Species Act, 2007* and as such indirectly supports the habitat protection of the Bogbean Buckmoth. Richmond Fen has been classified as a Provincially Significant Wetland (PSW) as well as an Area of Natural and Scientific Interest (ANSI).
- The White Lake Fen Wetland Complex has also been classified as a PSW and an ANSI. The Crown land portion is a conservation reserve and is protected through Ontario's Living Legacy – a land use strategy developed to ensure long-term health and protection of Ontario's natural resources (OMNR 2001).
- A survey for larvae was conducted at the Ontario sites in 2008 (COSEWIC 2009).
- The Central and Western New York Chapter of the Nature Conservancy has published: Development of a Population Monitoring Program for the Bog Buckmoth (Saturniidae: *Hemileuca* sp.) (2003).

## **2. RECOVERY**

### **2.1 Recovery Goal**

The recovery goal is to sustain current populations and distributions of Bogbean Buckmoth at extant locations, and to expand populations into suitable, but currently unoccupied habitat within its current range in Ontario.

### **2.2 Protection and Recovery Objectives**

Table 1. Protection and recovery objectives

No.	Protection or Recovery Objective
1	Conduct a quantitative assessment to determine what constitutes a sustainable and secure population in Ontario.
2	Fill knowledge gaps on taxonomy, ecology, distribution, behaviour, population dynamics, mortality factors and habitat use in the species' Ontario range.
3	Reduce or mitigate threats on Bogbean Buckmoth populations.
4	Increase public awareness and understanding of Bogbean Buckmoth populations.
5	If it is determined that the species was historically widespread, then consider the introduction of Bogbean Buckmoth populations into areas of continuous unoccupied but otherwise suitable habitat, where feasible.

## Recovery Strategy for the Bogbean Buckmoth in Ontario

### 2.3 Approaches to Recovery

Table 2. Approaches to recovery of the Bogbean Buckmoth in Ontario.

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1. Conduct a quantitative assessment to determine what constitutes a sustainable and secure population in Ontario.				
Necessary	Long-term	Research	<b>1.1</b> Compile and map entomological records for Bogbean Buckmoth in Ontario. <ul style="list-style-type: none"> <li>- Work with archived specimens (e.g., University of Guelph, Queens University, Natural History Museums and the Canadian National Collection of Insects, Arachnids and Nematodes in Ottawa).</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge Gap: Historic Population Range</li> </ul>
Critical	Short-term	Inventory and Monitoring	<b>1.2</b> Determine current population numbers, trends and fluctuation in populations based on standardized inventory and monitoring protocols. <ul style="list-style-type: none"> <li>- Monitor populations on a yearly basis.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge Gap: Population Trend data</li> </ul>
Necessary	Short-term	Research	<b>1.3</b> Based on current population numbers, conduct population modeling and population viability analysis to determine what constitutes a sustainable population of Bogbean Buckmoth in Ontario.	<ul style="list-style-type: none"> <li>• Knowledge Gap: Population Viability</li> </ul>

## Recovery Strategy for the Bogbean Buckmoth in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
<b>2.</b> Fill knowledge gaps on taxonomy, ecology, distribution, behaviour, population dynamics, mortality factors and habitat use in the species' Ontario range.				
Necessary	Short-term	Research	<b>2.1</b> Develop a habitat suitability model for Ontario populations of Bogbean Buckmoth. <ul style="list-style-type: none"> <li>- Create spatial habitat suitability layer using Geographical Information Systems (GIS).</li> <li>- Verify model accuracy by groundtruthing.</li> <li>- Determine if Eastern Prairie Fringe-orchid is an indicator species for the presence of Bogbean Buckmoth<sup>1</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge Gap: Suitable habitat</li> </ul>
Necessary	Short-term	Research	<b>2.2</b> Based on suitability model results, estimate potential densities of Bogbean Buckmoth in suitable, but currently unoccupied habitat. <ul style="list-style-type: none"> <li>- Develop and prioritize a list of sites where suitable habitat exists.</li> <li>- Revisit already identified sites of potentially suitable habitat [i.e., Champlain Sea Bed (COSEWIC 2009)] for larvae and/or adults.</li> <li>- Explore potentially new sites (White Cedar-Tamarack fens) for the presence of larvae and/or adults.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge Gap: Suitable habitat</li> </ul>
Necessary	On-going	Research	<b>2.3</b> Determine potential biological and/or ecological differences between the Ontario and New York populations. <ul style="list-style-type: none"> <li>- Research other <i>H. maia</i> complex populations (e.g., Massachusetts) that have been studied to better understand various aspects of their ecology.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge Gap: Ontario population biology and ecology</li> </ul>
Necessary	Short-term	Research	<b>2.4</b> Determine taxonomic position and rank of Bogbean Buckmoth.	<ul style="list-style-type: none"> <li>• Knowledge Gap: Taxonomy</li> </ul>

<sup>1</sup> Eastern Prairie Fringed Orchids may serve as an indicator species for the presence of Bogbean Buckmoth (COSEWIC 2009).

## Recovery Strategy for the Bogbean Buckmoth in Ontario

3. Reduce or mitigate threats on Bogbean Buckmoth populations.				
Critical	On-going	Research	<b>3.1</b> Understand the specific hydrology of Richmond Fen Wetlands and the White Lake Fen Complex. <ul style="list-style-type: none"> <li>- Determine groundwater sources that feed the wetland complexes.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge Gap: Site hydrology</li> </ul>
Critical	On-going	Research	<b>3.2</b> Determine long-term impacts of invasive species (e.g., Narrow-leaved Cattail, European Common Reed) on the sustainability of occupied fen ecosystems and Bogbean Buckmoth host plant species. <ul style="list-style-type: none"> <li>- Explore options for removal of identified invasive plant species within and adjacent to occupied fens<sup>2</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>• Threat: Invasive plants</li> </ul>
Critical	On-going	Research	<b>3.3</b> Understand the thresholds for Bogbean Buckmoth with respect to fluctuations in water level, especially at White Lake <sup>3</sup> .	<ul style="list-style-type: none"> <li>• Threat: Water fluctuations</li> </ul>
Necessary	On-going	Research	<b>3.4</b> Determine what/if any insecticide applications are affecting Ontario Bogbean Buckmoth populations. <ul style="list-style-type: none"> <li>- Ensure the industry and landowners are aware of the species, legal implications and the potential threats caused by aerial spraying.</li> <li>- Establish spray buffer areas around extant sites.</li> </ul>	<ul style="list-style-type: none"> <li>• Threat: Insecticide Impacts</li> </ul>
Necessary	Long-term	Research	<b>3.5</b> Monitor long-term impacts of climate change on occupied fen ecosystems. <ul style="list-style-type: none"> <li>- Monitor ground water levels and changes in species assemblages.</li> </ul>	<ul style="list-style-type: none"> <li>• Threat: Climate Change</li> </ul>

<sup>2</sup> Effects on highly restricted fen species such as Eastern Prairie Fringed-orchid, Spotted Turtle (*Clemmys guttata*) and the Jumping Spider (*Paradamoetas fontanus*) should be considered before the removal of invasive species takes place.

<sup>3</sup> Thresholds for restricted fen species (listed above) should also be considered with respect to water-level fluctuations.

## Recovery Strategy for the Bogbean Buckmoth in Ontario

4. Increase public awareness and understanding of Bogbean Buckmoth populations.				
Necessary	Long-term	Stewardship, Education and Outreach	<p><b>4.1</b> Work with local partners, such as municipalities, field naturalists, provincial governments, wetland conservation groups (e.g., Ducks Unlimited, Wetland Habitat Canada), cottage associations and private landowners to mitigate negative impacts at known locations.</p> <ul style="list-style-type: none"> <li>- Work with stakeholders to mitigate impacts from land use change, particularly water level manipulation at White Lake.</li> <li>- Increase awareness to aid in the identification and removal of invasive plant species, especially in southeastern Ontario.</li> <li>- Compile outreach materials outlining what steps are being taken to ensure the recovery of Bogbean Buckmoth in Ontario.</li> </ul>	<ul style="list-style-type: none"> <li>• Threat: all threats</li> </ul>
Necessary	Long-term	Protection, Stewardship	<p><b>4.2</b> Protect habitat through land acquisition, stewardship agreements, conservation easements, and pertinent legislation, policies and guidelines.</p> <ul style="list-style-type: none"> <li>- Develop habitat regulation for Bogbean Buckmoth under the ESA.</li> </ul>	<ul style="list-style-type: none"> <li>• Threat: all threats</li> </ul>
5. If it is determined that the species was historically widespread, then consider the introduction of Bogbean Buckmoth populations into areas of suitable habitat, where feasible.				
Necessary	Long-term	Research	<p><b>5.1</b> Explore the feasibility of introducing larvae and adult Bogbean Buckmoths into identified areas of suitable habitat.</p>	<ul style="list-style-type: none"> <li>• Knowledge Gap: Historic Population Range</li> </ul>

## 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 authors will be one of many sources considered by the Minister when developing the habitat regulation for this species.*

It is recommended that the area prescribed as habitat for this species include all occupied sites. In Ontario, this includes the Richmond Fen Wetland and White Lake Fen Complex. Both sites are calcareous fens supporting large populations of Bogbean. If it is found that Bogbean Buckmoth was more widespread than its current distribution in Ontario, then areas of continuous unoccupied but otherwise suitable habitat should be prescribed as recovery habitat. Recovery habitat for this species should be calcareous fens where Bogbean is present.

The Richmond Fen Wetland hosts palustrine fens on a limestone plain and organic (peat) landform (Chapman and Putnam 1984, NHIC 2008a as cited in COSEWIC). The fens at Richmond are characterized as low shrub fens dominated by Sweet Gale, Bog Birch, Bog Willow and other willows, with open areas dominated by Water Horsetail and various graminoids, including Wire Sedge, Twig-rush and the native grass, American Common Reed. The White Lake Fen Complex overlays lime-rich marble and has similar dominant plant species to Richmond Fen Wetland (NHIC 2008b-taken from COSEWIC 2009). Area boundaries of both fens should be described using the Ontario Wetland Evaluation System (OMNR 1993).

At each of the known locations, the area prescribed as habitat should include the extent of the fen vegetation<sup>4</sup>, adjoining wetland complexes and 120 m beyond them to protect the structure and function of the fen. The 120 m distance is a historically used set-back for resource protection in Ontario (Ontario 1992) and was chosen because developments within 120 m of a wetland have a reasonable probability of affecting the ecological functions of the wetlands which they surround (OMNR 2010). In addition, if new locations for the Bogbean Buckmoth are discovered or the species is introduced, then these areas should also be prescribed as habitat in the regulation.

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<sup>4</sup> Extent of fen vegetation will be determined using appropriate Ecological Land Classification (ELC) classes.

## GLOSSARY

Calcareous soils: soils containing a lot of calcium carbonate from underlying chalk or limestone rock.

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

Q indicates questionable taxonomy where taxonomic distinctiveness of the entity is questionable.

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

Fen: Wetlands with unique hydrology that provides mineralized water to the soil's surface.

Larva (pl: larvae): The immature, free-living form of any animal that develops into a structurally dissimilar adult through the process of metamorphosis

Metapopulation: A population belonging to a group of populations of the same species that exchange individuals through migration and recolonise sites in which other metapopulations have become extinct.

Palustrine: Non-tidal wetlands that are substantially covered with emergent vegetation such as trees, shrubs, moss, etc.

Senesce: To reach maturity.



## Recovery Strategy for the Bogbean Buckmoth in Ontario

*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.

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**PART 3 - *Bogbean Buckmoth Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resource**

# Bogbean Buckmoth

## Ontario Government Response Statement



Photo: Don Cuddy

### 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 the Bogbean Buckmoth was published on December 7, 2011 ([http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/STDPROD\\_086038.html](http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/STDPROD_086038.html)).

The response statement is the government's policy response to the scientific advice provided in the recovery strategy. In addition to the strategy, the response statement is based on input from stakeholders, other jurisdictions, Aboriginal communities and members of the public. It 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 Bogbean Buckmoth is a rare moth known to occur only in New York State and near Ottawa in Ontario. Adult Bogbean Buckmoths are medium to large in size with forewings measuring 26 to 36 mm in length. Wings are wide and black with white wing bands and wavy or scalloped outer edges. Each wing has a small circular spot.

## MOVING FORWARD TO PROTECT AND RECOVER BOGBEAN BUCKMOTH

The Bogbean Buckmoth 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 Bogbean Buckmoth has an extremely limited geographic range in Ontario, occupying an area that amounts to less than three square kilometres. The species is found in two wetlands near Ottawa, the Richmond Fen Wetland and White Lake Fen Wetland Complex. The Bogbean Buckmoth occurs only in fen habitats and is dependent on Bogbean, a wetland plant found in low shrub fens, for early stage larval feeding. The dominant threats to Bogbean Buckmoth include habitat loss and degradation caused by water level fluctuations, land development, invasive plants outcompeting the species' host plants, and insecticides.

**The government's goal for the recovery of Bogbean Buckmoth is to sustain current population levels and distributions at existing locations, and to encourage the natural expansion of the species into suitable but currently unoccupied habitat within its current range in Ontario.**

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 Bogbean Buckmoth, the government will directly undertake the following actions:

- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Bogbean Buckmoth data to the Ministry's central repository at the Natural Heritage Information Centre.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Protect the Bogbean Buckmoth 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 and Aboriginal communities to undertake activities to protect and recover the Bogbean Buckmoth. Support will be provided where appropriate through funding, agreements, permits (including conditions) and advisory services.

## 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 Bogbean Buckmoth.

## ACKNOWLEDGEMENT

We would like to thank all those who participated in the development of the "Recovery Strategy for the Bogbean Buckmoth 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](http://ontario.ca/speciesatrisk)

Contact your MNR district office

Contact the Natural Resources Information Centre

1-800-667-1940

TTY 1-866-686-6072

[mnr.nric.mnr@ontario.ca](mailto:mnr.nric.mnr@ontario.ca)

[ontario.ca/mnr](http://ontario.ca/mnr)