

# Recovery Strategy for the Incurved Grizzled Moss (*Ptychomitrium incurvum*) in Canada

## Incurved Grizzled Moss



July 2007



## About the *Species at Risk Act* Recovery Strategy Series

### What is the *Species at Risk Act* (SARA)?

SARA is the Act developed by the federal government as a key contribution to the common national effort to protect and conserve species at risk in Canada. SARA came into force in 2003, and one of its purposes is “*to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity.*”

### What is recovery?

In the context of species at risk conservation, **recovery** 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 the species’ persistence in the wild. A species will be considered **recovered** when its long-term persistence in the wild has been secured.

### What is a recovery strategy?

A recovery strategy is a planning document that identifies what needs to be done to arrest or reverse the decline of a species. It sets goals and objectives and identifies the main areas of activities to be undertaken. Detailed planning is done at the action plan stage.

Recovery strategy development is a commitment of all provinces and territories and of three federal agencies — Environment Canada, Parks Canada Agency, and Fisheries and Oceans Canada — under the Accord for the Protection of Species at Risk. Sections 37–46 of SARA ([www.sararegistry.gc.ca/the\\_act/default\\_e.cfm](http://www.sararegistry.gc.ca/the_act/default_e.cfm)) outline both the required content and the process for developing recovery strategies published in this series.

Depending on the status of the species and when it was assessed, a recovery strategy has to be developed within one to two years after the species is added to the List of Wildlife Species at Risk. Three to four years is allowed for those species that were automatically listed when SARA came into force.

### What’s next?

In most cases, one or more action plans will be developed to define and guide implementation of the recovery strategy. Nevertheless, directions set in the recovery strategy are sufficient to begin involving communities, land users, and conservationists in recovery implementation. Cost-effective measures to prevent the reduction or loss of the species should not be postponed for lack of full scientific certainty.

### The series

This series presents the recovery strategies prepared or adopted by the federal government under SARA. New documents will be added regularly as species get listed and as strategies are updated.

### To learn more

To learn more about the *Species at Risk Act* and recovery initiatives, please consult the SARA Public Registry ([www.sararegistry.gc.ca/](http://www.sararegistry.gc.ca/)) and the Web site of the Recovery Secretariat ([www.speciesatrisk.gc.ca/recovery/default\\_e.cfm](http://www.speciesatrisk.gc.ca/recovery/default_e.cfm)).

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Additional copies can be downloaded from the SARA Public Registry ([www.sararegistry.gc.ca/](http://www.sararegistry.gc.ca/)).

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## DECLARATION

This recovery strategy has been prepared in cooperation with the jurisdictions responsible for the incurved grizzled moss. Environment Canada has reviewed and accepts this document as its recovery strategy for the incurved grizzled moss, as required under the *Species at Risk Act*. This recovery strategy also constitutes advice to other jurisdictions and organizations that may be involved in recovering the species.

It was determined that the recovery of the incurved grizzled moss in Canada is not technically or biologically feasible at this time. The species still may benefit from general conservation programs in the same geographic area, and will receive protection through SARA and other federal, and provincial or territorial, legislation, policies, and programs.

The feasibility determination will be re-evaluated at a minimum, every five years as part of the report on implementation of the recovery strategy, or as warranted in response to changing conditions and/or knowledge.

In the spirit of the Accord for the Protection of Species at Risk, the Minister of the Environment invites all responsible jurisdictions and Canadians to join Environment Canada in supporting and implementing this strategy for the benefit of the incurved grizzled moss and Canadian society as a whole.

## RESPONSIBLE JURISDICTIONS

Canadian Wildlife Service – Ontario Region, Environment Canada  
Ontario Ministry of Natural Resources

## AUTHORS

This recovery strategy was developed by Angela McConnell, Canadian Wildlife Service – Ontario Region, Environment Canada.

## ACKNOWLEDGMENTS

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## STRATEGIC ENVIRONMENTAL ASSESSMENT

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*. 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 recovery strategy indicates that recovery of the incurved grizzled moss is not considered feasible at this time. The SEA concluded that this strategy will have no impact on the environment and will not entail any significant adverse effects, as no recovery efforts will be undertaken.

## RESIDENCE

SARA defines residence as: *a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating* [Subsection 2(1)].

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry: [www.sararegistry.gc.ca/plans/residence\\_e.cfm](http://www.sararegistry.gc.ca/plans/residence_e.cfm)

## PREFACE

Incurved grizzled moss is under the management jurisdiction of the Ontario provincial government. The *Species at Risk Act* (SARA, Section 37) requires the competent minister to prepare recovery strategies for listed extirpated, endangered or threatened species. Incurved grizzled moss was listed as Extirpated under SARA in June 2003. The Canadian Wildlife Service – Ontario Region, Environment Canada, developed this recovery strategy. The Province of Ontario reviewed and acknowledged receipt of the strategy. The proposed strategy meets SARA requirements in terms of content and process (Sections 39–41).

## **EXECUTIVE SUMMARY**

Incurved grizzled moss is a small, inconspicuous moss that grows in tufts on rocky substrate. Known historically from one location in southern Ontario, where it was reportedly found growing on a rock, the species is now considered to be extirpated from Canada. The first and only observation of the moss was recorded in 1828 by Drummond (COSEWIC 2002).

Reasons for the species' extirpation are not known. The associated threats are not understood and therefore, cannot be addressed by a recovery strategy. The recovery of incurved grizzled moss is deemed to be "not feasible" at this time. However, the feasibility of recovery will be revisited if new populations are discovered in Canada.

## TABLE OF CONTENTS

DECLARATION.....	i
RESPONSIBLE JURISDICTIONS .....	i
AUTHORS.....	i
ACKNOWLEDGMENTS.....	i
STRATEGIC ENVIRONMENTAL ASSESSMENT .....	ii
RÉSIDENCE .....	ii
PREFACE .....	ii
EXECUTIVE SUMMARY.....	iii
1. BACKGROUND.....	1
1.1 Species Assessment Information from COSEWIC.....	1
1.2 Description .....	1
1.3 Populations and Distribution .....	2
1.4 Needs of incurved grizzled moss .....	3
1.4.1 Habitat and biological needs.....	3
1.4.2 Limiting factors.....	4
1.5 Threats.....	4
1.6 Actions Already Completed or Under Way.....	4
1.7 Knowledge Gaps.....	4
2. RECOVERY .....	5
2.1 Rationale for Recovery Feasibility.....	5
2.2 Recovery Actions .....	5
3. REFERENCES.....	6
Literature consulted.....	6
Authorities consulted .....	6
4. CONTACTS.....	7
4.1 Responsible Jurisdictions .....	8
4.2 Recovery Contact .....	7
Appendix 1: Subnational Ranks of Incurved grizzled moss (NatureServe 2006).....	8

### List of Figures

Figure 1: Approximate location of Canada's single historic occurrence of incurved grizzled moss ( <i>Ptychomitrium incurvum</i> ).....	3
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# 1. BACKGROUND

## 1.1 Species Assessment Information from COSEWIC

**Date of Assessment:** November 2002

**Common Name:** Incurved Grizzled Moss

**Scientific Name:** *Ptychomitrium incurvum*

**COSEWIC Status:** Extirpated

**Reason for Designation:** A small moss that is widely distributed in the eastern deciduous forests of eastern North America, and whose frequency of occurrence alternates towards the northern portion of its range. In Canada, the only known location for the species is a single record from a boulder in southern Ontario in 1828. Despite many years of collection made in the region, the species has never been rediscovered.

**Canadian Occurrence:** Ontario

**COSEWIC Status History:** Designated Extirpated in November 2002. Assessment based on a new status report.

## 1.2 Description

Incurved grizzled moss is a small, inconspicuous moss that grows in tufts on rocky substrate. This acrocarpous<sup>1</sup> moss typically grows 2–6 mm in height (COSEWIC 2002). The blackish green leaves are curled when dry but erect-spreading and incurved when moist (COSEWIC 2002). The leaves are narrow and concave and are approximately 2 mm in length. The leaf margins are erect and untoothed, with a midrib that runs the length of the leaf (COSEWIC 2002). Capsules are ovoid and smooth. The peristome<sup>2</sup> is made up of 16 unpaired, sharply papillose,<sup>3</sup> narrow teeth that are fused at their bases (COSEWIC 2002).

Incurved grizzled moss is sometimes confused with similar species, such as *Ptychomitrium leibergii*, which has longer, broader and bistratose<sup>4</sup> leaves and longer setae<sup>5</sup> and capsules (COSEWIC 2002).

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<sup>1</sup> with gametophyte producing sporophyte at apex of a stem or main branch. Acrocarpous mosses generally grow erect in tufts (rather than mats) and are sparsely or not branched (Missouri Botanical Gardens 2006).

<sup>2</sup> A ring of teeth that surround the mouth of the sporophyte capsule (Missouri Botanical Gardens 2006).

<sup>3</sup> Bearing papillae; a papilla is a cell ornamentation or solid microscopic protuberance (Missouri Botanical Gardens 2006).

<sup>4</sup> Composed of two cell layers (Missouri Botanical Gardens 2006).

<sup>5</sup> Elongated portion of the sporophyte between the capsule and foot (the stalk) (Missouri Botanical Gardens 2006).

### 1.3 Populations and Distribution

Considered “apparently secure” globally (G4), incurved grizzled moss has a temperate global distribution, with populations centered largely in eastern North America. However, the species is also found in some mountainous regions of Europe (COSEWIC 2002). Although incurved grizzled moss is relatively widespread in the eastern portions of the United States, its distribution is more concentrated within the southern states. The former Canadian occurrence was at the northernmost limit of the species’ range. Range limits seem to have changed over the past century, shifting south out of New York State (COSEWIC 2002). The status list for rare New York mosses indicates that the species is known to have occurred historically in that state (COSEWIC 2002). In the United States, incurved grizzled moss is currently listed as historical (SH) in New York State and as critically imperilled, imperilled and vulnerable (S1S2 to S3) in Delaware and Tennessee, and it is not ranked in four other states (Georgia, Indiana, Michigan and Virginia) (NatureServe 2006; Appendix 1).

There is only one known record of incurved grizzled moss in Canada (Ireland and Ley 1992; COSEWIC 2002). This occurrence is based on a specimen collected by Drummond in 1828 from a rock near Niagara Falls, Ontario (COSEWIC 2002; Figure 1). There is some uncertainty regarding the precise collection location, and it is therefore not known whether the specimen was actually collected within Canadian borders (COSEWIC 2002). However, a Niagara Falls locality is plausible due to the proximity of historical sites for the species in New York, Ohio, Pennsylvania, Vermont and Michigan (COSEWIC 2002).

This species has not been observed in Canada since the time of the original collection. Owing to the fact that southern Ontario has been relatively well explored, it seems unlikely that the species would have gone unreported for almost 200 years (COSEWIC 2002). A reconnaissance survey conducted in 2001 by J. Doubt, a bryologist with the Canadian Museum of Nature, did not relocate the species (COSEWIC 2002).

There have been reports of the species occurring in Quebec (NatureServe 2006); however, experts have determined that the species in these reports were misidentified (A. Branchaud, pers. comm., 2006).

Incurved grizzled moss has not been assigned a national N rank in Canada and is ranked as SX (extirpated) in Ontario.

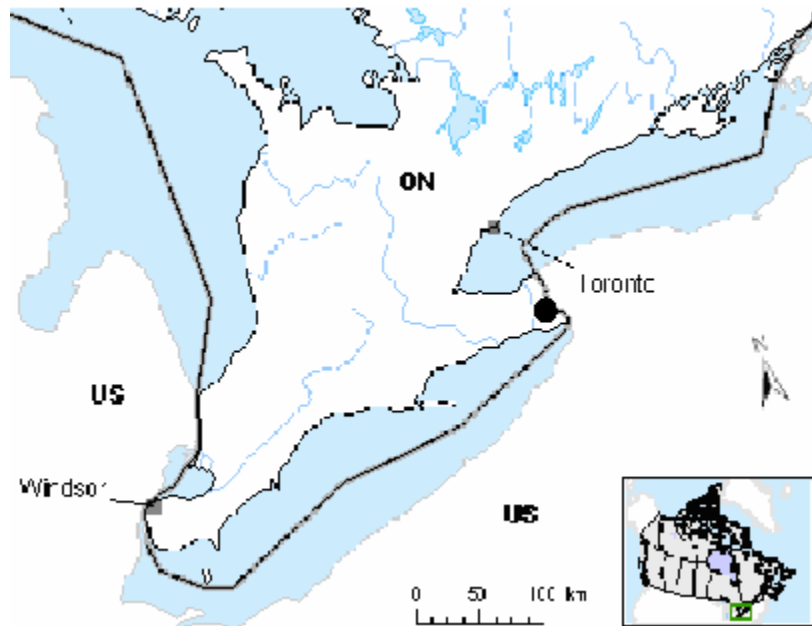


Figure 1: Approximate location of Canada's single historic occurrence of incurved grizzled moss (*Ptychomitrium incurvum*)

## 1.4 Needs of incurved grizzled moss

### 1.4.1 Habitat and biological needs

Incurved grizzled moss tends to inhabit temperate regions of the world (COSEWIC 2002). In Canada, it typically inhabits the deciduous Carolinian Forest Region. It typically grows on the surfaces and in the crevices of boulders of variable chemistry in open hardwood forests. It rarely grows at the base of trees or on logs, and it has also been observed on anthropogenic surfaces, such as rock walls and gravestones (COSEWIC 2002).

Very little is known about the specific biological needs of this species. The moss is autoecious<sup>6</sup> and, therefore, is able to self-pollinate (COSEWIC 2002). It is believed to be largely spore-dispersed, as asexual propagules are relatively rare.

Incurved grizzled moss displays considerable adaptability when compared with other bryophyte species (COSEWIC 2002). It has flexibility with respect to the substrates on which it can grow and has two different means of reproduction — sporophytes and asexual propagules (COSEWIC 2002).

<sup>6</sup> Completes all life stages on a single host (Raven et al. 1992).

### **1.4.2 Limiting factors**

The major limiting factor for the survival of this species is likely to be climate (COSEWIC 2002). “It seems unlikely that reproductive features limit the species’ range to a greater degree than climatic factors” (COSEWIC 2002). There has been an unexplained distributional shift over the past century, which could have led to the extirpation of the species from the northern portions of its range, including New York State (COSEWIC 2002).

### **1.5 Threats**

Threats to incurved grizzled moss are not known for Canada. As the only occurrence has not been relocated since its discovery in 1828, it is impossible to determine the threats that the population faced and what ultimately led to its extirpation.

Human activity could be a threat, as it is with many other rare Carolinian forest plant species; however, incurved grizzled moss remains common in the southeastern United States, within highly populated areas. Acid precipitation and deforestation in southern Ontario also have the potential to affect the survival of this species if it is reintroduced (COSEWIC 2002).

### **1.6 Actions Already Completed or Under Way**

To date, no recovery actions have been taken for this species. A one-day reconnaissance survey was completed in the historical occurrence area in 2001 as part of information gathering for the COSEWIC status report.

### **1.7 Knowledge Gaps**

Little is known about incurved grizzled moss within its North American range, and even less is known about the single historic Canadian record. Research on its biological and ecological needs, habitat requirements and threats to its survival would be required if recovery were to proceed in order to understand the species and its ecological niche in the Niagara Falls area.

As well, research into reintroduction techniques would be necessary for recovery to take place.

## **2. RECOVERY**

### **2.1 Rationale for Recovery Feasibility**

The recovery of incurved grizzled moss is deemed not to be technically and biologically feasible for the following reasons:

1. There are no known extant populations of incurved grizzled moss in Canada. The species is, however, relatively widespread in eastern North America, and populations there could be used as source material to reintroduce the species to Canada. Furthermore, there has been a documented, although unexplained, shift south in this species' range (COSEWIC 2002). This shift may make it impractical to reintroduce the species to the northern limit of its original range.
2. It is unknown whether there is sufficient habitat for the species remaining in Ontario at the present time. "Without extant populations or a clear understanding of the habitat from which the only Canadian specimen was collected, it is not possible to assess habitat trends specific to the Canadian population" (COSEWIC 2002). However, as incurved grizzled moss is able to colonize several types of substrate that are abundant in Canada, including anthropogenic surfaces, it is unlikely that substrate availability is a limiting factor for this species. It is unknown where the nearest extant population is — the species is considered historic in New York but may still occur in southern Michigan (COSEWIC 2002).
3. The threats to the species and its habitat and what led to its extirpation are not understood and, therefore, cannot be avoided or mitigated at this time. It seems likely that incurved grizzled moss is limited by climatic factors; however, this has not been confirmed. There has also been an unexplained shift of the species' distribution to the south over the past century, which may have led to the extirpation of the species in Canada as well as New York State.
4. It is unknown whether the necessary recovery techniques exist to reintroduce this species to Canada. Reintroduction techniques have not been developed or tested specifically for this species; however, recovery techniques for other mosses may exist and could possibly be used to assist in reestablishing a Canadian population.

The one and only record of incurved grizzled moss in Canada is only suspected, as it was found near the Canada–U.S. border almost 200 years ago, and the only possible recovery technique is reintroduction. Recovery is not recommended unless:

- 1) the species is found in Canada,
- 2) information becomes available on the species' biology in its northern range, and/or
- 3) appropriate reintroduction techniques become available.

### **2.2 Recovery Actions**

The recovery of this species is considered "not feasible" at this time and will not be pursued. This decision will be reexamined if the species is rediscovered in Canada.

However, it would be appropriate to monitor and conduct follow-up work (e.g. confirmation) on observations reported by individuals during surveys done for other species in southern Ontario.

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- Alain Branchaud, Canadian Wildlife Service – Quebec Region, Environment Canada  
Jennifer Doubt, Bryologist, Canadian Museum of Nature  
Aissa L. Feldmann, Ecologist, New York Natural Heritage Program  
Mike Oldham, Botanist/Herpetologist, Natural Heritage Information Centre, Ontario Ministry of Natural Resources  
Carolyn Seburn, Species at Risk, Canadian Wildlife Service, Environment Canada

## **4. CONTACTS**

### **4.1 Responsible Jurisdictions**

Ontario Ministry of Natural Resources  
Canadian Wildlife Service – Ontario Region, Environment Canada

### **4.2 Recovery Contact**

Angela McConnell  
Species at Risk Biologist  
Canadian Wildlife Service  
Environment Canada  
4905 Dufferin Street  
Toronto, Ontario  
M3H 5T4  
Tel.: 416-739-7517  
Fax: 416-739-4560  
Email: [angela.mcconnell@ec.gc.ca](mailto:angela.mcconnell@ec.gc.ca)

## APPENDIX 1: SUBNATIONAL RANKS OF INCURVED GRIZZLED MOSS (NATURESERVE 2006)

State/Province	S-Rank*
Delaware	S1S2
Georgia	SNR
Indiana	SNR
Michigan	SNR
New York	SH
Tennessee	S3
Virginia	SNR
Ontario	SX

\* Subnational ranks are assigned by each state or province's Conservation Data Centre. They are not legal designations, but reflect the relative rarity of the species within that jurisdiction.

- S1** Extremely rare; usually 5 or fewer occurrences in the state/province or very few remaining individuals; often especially vulnerable to extirpation.
- S2** Very rare; usually between 5 and 20 occurrences in the state/province or with many individuals in fewer occurrences; often susceptible to extirpation.
- S3** Rare; usually between 20 and 100 occurrences in the province; may have fewer occurrences, but large number of individuals in some populations; may be susceptible to large-scale disturbances.
- SH** Historically known from the state/province, but not verified recently (typically not recorded in the state/province in the last 20 years).
- SX** Apparently extirpated, with little likelihood of rediscovery. Typically not seen in the state/province for many decades, despite searches at known historic sites.
- SNR** Not ranked.