

COSEWIC
Assessment and Status Report

on the

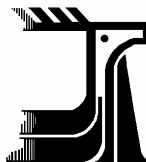
Houghton's Goldenrod
Solidago houghtonii

in Canada



SPECIAL CONCERN
2005

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Production note:

COSEWIC would like to acknowledge Kristina Makkay for writing the status report on the Houghton's goldenrod *Solidago houghtonii* prepared under contract with Environment Canada, overseen and edited by Erich Haber, Co-chair (vascular plants) of the COSEWIC Plants and Lichens Species Specialist Subcommittee.

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Houghton's goldenrod — from Semple and Ringius 1983. with permission.

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COSEWIC Assessment Summary

Assessment Summary – May 2005

Common name

Houghton's goldenrod

Scientific name

Solidago houghtonii

Status

Special Concern

Reason for designation

A Great Lakes endemic present in Ontario at the tip of Bruce Peninsula and on Manitoulin Island. The few populations occupy very small areas of provincially rare alvar habitat that are at potential risk from aggregate extraction, use of recreational vehicles and expansion of invasive weeds.

Occurrence

Ontario

Status history

Designated Special Concern in May 2005. Assessment based on a new status report.



COSEWIC
Executive Summary

Houghton's Goldenrod
Solidago houghtonii

Species information

Houghton's goldenrod (*Solidago houghtonii*) is about 30-60 cm high with slender reddish hairless stems, basal rosettes, linear leaves, and a flat-topped inflorescence consisting of 5 to 30 yellow flowering heads. It is most likely to be mistaken for grass-leaved goldenrod (*Euthamia graminifolia*) or Ohio goldenrod (*Solidago ohioensis*). It is believed to have evolved from a hybrid of either *S. ptarmicoides* and *S. ohioensis* or *S. riddellii* and *S. ohioensis*.

Distribution

Houghton's goldenrod is a Great Lakes endemic found only in Ontario, Michigan and New York. In Ontario, it is found on about 215 km² of Manitoulin Island and on 5 km² of Cabot Head on the Bruce Peninsula.

Habitat

Houghton's goldenrod grows on seasonally wet limestone pavements (alvars), calcareous beach sands, or interdunal wetlands along the Great Lakes shoreline. The Ontario population is primarily found on alvars. There is little information regarding microclimate requirements.

Biology

Solidago houghtonii is similar to other species of *Solidago* in terms of its reproductive biology and floral morphology. Flowering occurs in approximately 6 to 31% of shoots. Flowers are insect pollinated and appear to be incapable of self-pollination. Fruit set and germinability are low. *Solidago houghtonii* can also reproduce vegetatively by means of underground rhizomes.

Population sizes and trends

There are an estimated number of 27,000 mature flowering individuals of Houghton's goldenrod in Canada. Area of occupancy is approximately 7.4 ha. Populations appear to be stable.

Limiting factors and threats

Houghton's goldenrod is restricted to alvars and interdunal wetlands. The main threats to the species are drought, heavy recreational use, and quarry operations. There may also be some threat from floods, invasive species, and residential development.

Special significance of the species

Houghton's goldenrod is a Great Lakes endemic, with a limited distribution globally. There may be little existing public support for its preservation, since goldenrods, in general, are considered weeds.

Existing protection or other status designations

The species is designated threatened in the United States and in the state of Michigan. It has a global rank of G3, and subnational rank of S2 (imperiled) in Ontario. In Canada, only the Cabot's Head population is on protected land.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The Committee meets to consider status reports on candidate species.

DEFINITIONS (NOVEMBER 2004)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and it is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.

** Formerly described as “Not In Any Category”, or “No Designation Required.”

*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Houghton's Goldenrod *Solidago houghtonii*

in Canada

2005

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SPECIES INFORMATION

Name and classification

Scientific name: *Solidago houghtonii* T. & G.
Synonym: *Oligoneuron houghtonii* (T. & G. ex Gray) Nesom
Common names: Houghton's goldenrod, Verge d'or de Houghton
Family: Asteraceae or alternatively Compositae (Aster family)
Major plant group: Dicot flowering plant

Houghton's goldenrod is widely recognized as a distinct species (e.g., Gleason, 1952; Semple and Ringius, 1983); however, there is some debate about its origin. Morton (1979) hypothesizes that *Solidago houghtonii* evolved from a hybrid of *S. ptarmicoides* and *S. ohioensis* that backcrossed with *S. ohioensis* and gained fertility through subsequent chromosome doubling (amphidiploidy), while Semple and Ringius (1992) suggest that *S. riddellii* might have been involved in the origin of Houghton's goldenrod rather than *S. ohioensis*.

Description

Houghton's goldenrod is a slender perennial whose shoots grow from an underground stem (caudex) arising from a fibrous root system; plants have slender reddish hairless stems that grow to 30-60 cm high and finely hairy flower stalks (Semple & Ringius, 1992; Gleason, 1952). Basal rosettes are comprised of ovate hairless leaves up to 2 cm wide. Lower stem leaves are linear, slightly clasping, up to 18 cm long and 2 cm wide, sometimes folded along the midrib. Leaves become smaller and less clasping further up the stem. The inflorescence is flat-topped, usually consisting of 5 to 30 flowering heads, sometimes up to 200 (Voss, 1996). The flower head consists of an involucre of bracts about 6-8 mm high surrounding about 20-30 flowers, including 6-12 bright yellow ray flowers (Semple & Ringius, 1992; Gleason, 1952; see Figure 1).

Houghton's goldenrod is most likely to be mistaken for grass-leaved goldenrod (*Euthamia graminifolia*) or Ohio goldenrod (*Solidago ohioensis*). Grass-leaved goldenrod can be distinguished by the absence of basal leaves during flowering time, smaller ray flowers, and considerably more leaves on the stem. Ohio goldenrod is more robust, has smooth flower stalks and broader leaves. The actual hybrid between *S. ohioensis* and *S. ptarmicoides*, from which *S. houghtonii* is thought to have evolved, can be distinguished when fresh by its pale lemon coloured flowers (Morton & Venn, 1984).

Good line drawings are available in Gleason (1952) and in Semple and Ringius (1992).

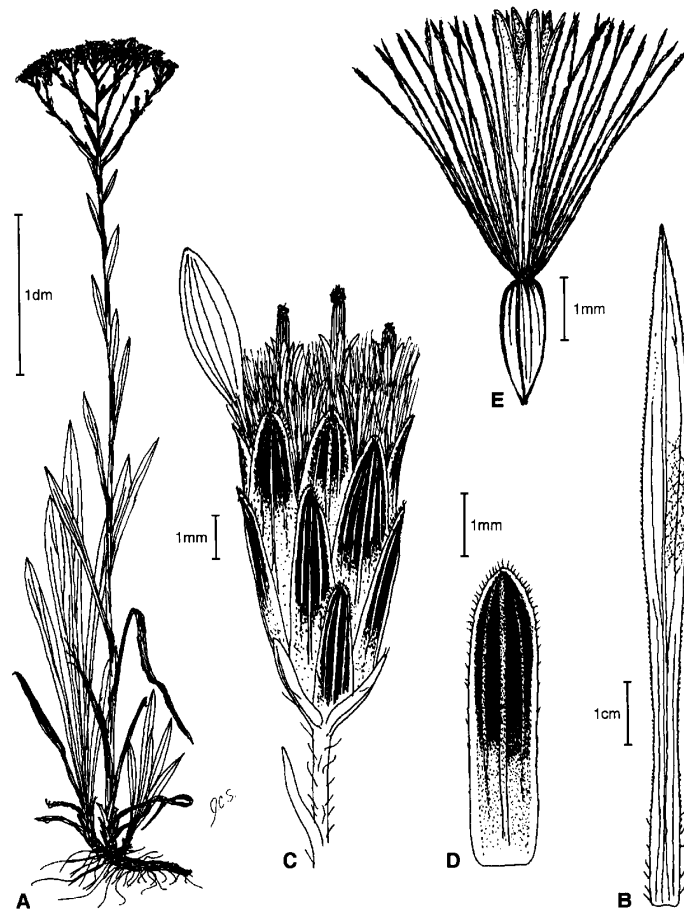


Figure 1. Houghton's goldenrod: A) plant habit; B) lower stem leaf; C) flowering head with only one ray flower illustrated; D) involucre bract; E) mature fruit with corolla still attached in the centre (from Semple and Ringius 1983, with permission).

DISTRIBUTION

Global range

Houghton's goldenrod is a Great Lakes endemic with most of its global range limited to the northern shores of Lake Michigan and Lake Huron (Figure 2). It is especially abundant in Michigan, occurring in continuous or semi-continuous populations along the Great Lakes shoreline. (U.S. Fish and Wildlife Service, 1988). A disjunct population is found inland in Crawford and Kalkaska counties of Michigan, and another in Bergen Swamp, Genesee County, western New York (Michigan Natural Features Inventory, 1996). A recent manuscript in preparation on *Solidago* by Semple

and Cook (in prep.) for the Flora North America project indicates that the specimens in New York state formerly thought to be of *S. houghtonii* have been misidentified; the species does not occur in the state.



Figure 2. Global distribution of Houghton's goldenrod (*Solidago houghtonii*). Areas of occurrence determined from various publications (e.g., Morton 1979; Penskar 1997; Voss, 1996).

Canadian range

Houghton's goldenrod has been found at Cabot Head on the Bruce Peninsula (as early as 1935), and at several sites on Manitoulin Island (Figure 3). Most of these are on the alvars of the La Cloche Peninsula and Great and Little La Cloche Islands, but there is also one population on Cockburn Island, over 100 km west of the La Cloche area (Ontario Natural Heritage Information Centre database). There are no known occurrences between Cockburn Island and La Cloche. The species has also been reported on the Wikwemikong First Nation at Tamarack Bay.

The La Cloche area encompasses about 200 km². The Cabot Head area would add about another 5 km² to the overall habitat, and Cockburn Island is estimated to have another 5 km². Wikwemikong might have another 5 to 10 km², giving an overall extent of occurrence of about 220 km².

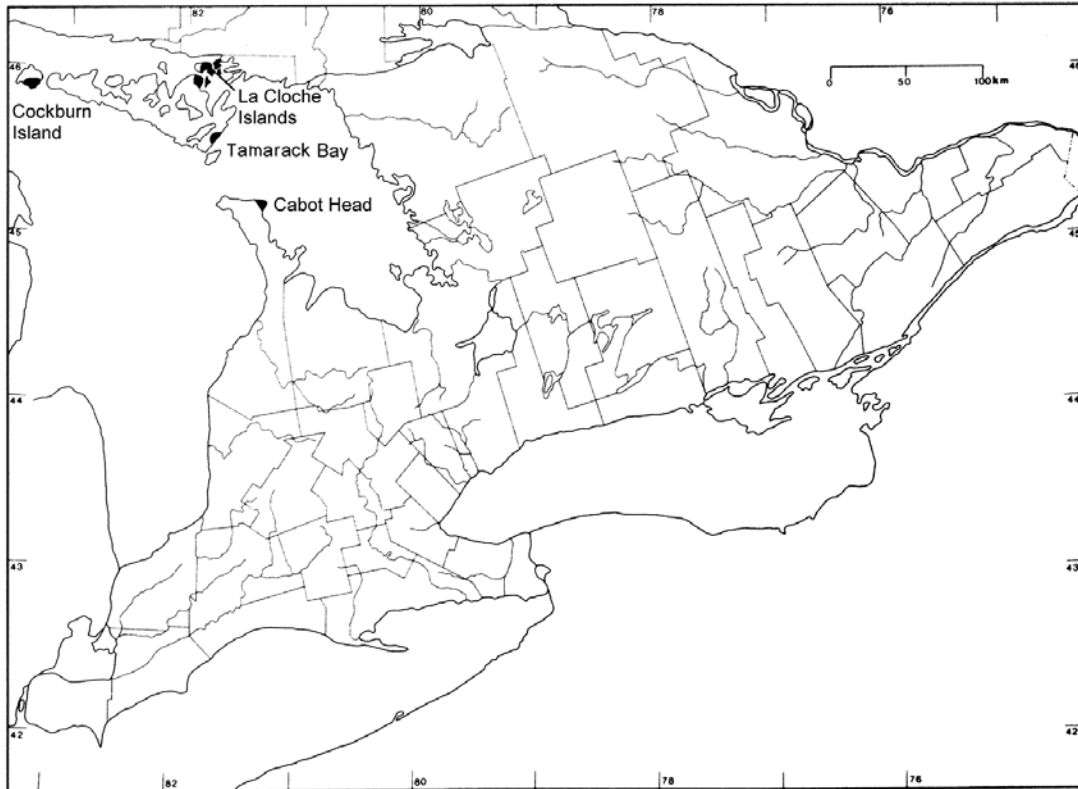


Figure 3. Canadian distribution of Houghton's goldenrod (*Solidago houghtonii*).

HABITAT

Habitat requirements

Houghton's goldenrod is closely associated with the Great Lakes shorelines, particularly Lake Huron and Lake Michigan. The continental climate of the area is moderated by the effect of Lake Huron. Both Manitoulin Island and the Bruce Peninsula have milder winters and cooler summers than areas of similar latitude in Ontario. Average January temperature is -10.0°C, average July temperature is 19.1°C, and the area receives 808.9 mm of precipitation each year (Environment Canada climate data for Gore Bay).

Houghton's goldenrod is found on calcareous beach sands, interdunal wetlands, or seasonally wet limestone pavements (Morton, 1979). The latter kind of habitat, also

known as alvar, is by far the most common habitat for Houghton's goldenrod growing in Ontario. Over 86% of Ontario's known populations of Houghton's goldenrod occur on alvars (Catling, 1995). This is in contrast to Michigan, where the species is mostly associated with dunes (Morton, pers. comm.) but perhaps more specifically in interdunal wet meadows (Penskar, 1997).

Alvars are distinct ecosystems characterized by thin soil over level limestone bedrock, a sparse but unique vegetation community made up of shrubs and herbs, and the absence of trees (Catling and Brownell, 1995). The poor drainage on the level limestone results in spring flooding due to snowmelt, or periodic flooding in the case of shoreline alvars, but standing water quickly evaporates from the thin soils, and drought conditions are common during the summertime. These growing conditions give rise to an unusual community of plants and animals adapted to drought and alkaline soils that would be excluded by competition in other habitats (Figure 4).

Little else is known about particular microclimate requirements, but the persistence of Houghton's goldenrod in alvars indicates it is likely to be drought-resistant (Penskar, 1997). It is also limited to calcareous areas, suggesting that the species may have a high calcium requirement.



Figure 4. Houghton's goldenrod (*Solidago houghtonii*) habitat at Cabot's Head.

Trends

The original alvar habitat is estimated to have once occupied 50 km² on the Bruce Peninsula and 400 km² on Manitoulin Island (Catling and Brownell, 1995). Much of this habitat still exists, though some may have been degraded due to livestock grazing. There are currently estimated to be 25 alvar sites on the Bruce Peninsula, and 75-100 on Manitoulin Island, although it appears that only a limited proportion of these contain Houghton's goldenrod.

Protection/ownership

Most of the Houghton's goldenrod occurrences on record with the Ontario Natural Heritage Information Centre (NHIC) are privately owned by individuals or are part of First Nations' territories. Much of the alvar habitat on the La Cloche Islands is owned by one family. The Strawberry Island site is owned by the Canadian Coast Guard, and the Cabot Head site is part of the Cabot Head Provincial Nature Reserve. As such, the Cabot Head site is the only site on protected land.

In the United States, about nineteen populations in Michigan grow on state, federal or private protected land, including 4 populations that are believed to be the largest in existence (Michigan Natural Features Inventory, 1996).

BIOLOGY

General

Houghton's goldenrod is a perennial herb that reproduces asexually by rhizomes and sexually. It grows on alvar substrates where plants are subjected to flooding and dessication. Plants are pollinated by a variety of insects.

Reproduction

Solidago houghtonii is a perennial that flowers in August and early September. It is similar to other species of *Solidago* in terms of its reproductive biology and floral morphology (Jolls *et al.*, in review). It has an outer whorl of pistillate ray flowers and inner bisexual disc flowers with outer flowers maturing earliest. Flowering appears to be related to plant size, and is less likely to occur in plants that had flowered the previous year (Jolls *et al.* in review). This indicates there is a metabolic cost for flowering, and is therefore most likely to occur in older larger robust plants. Flowering occurs in approximately 6 to 31% of shoots (Jolls *et al.*, in review; Penskar, 1997). Flowers are insect pollinated, with a large range of potential pollinators including bees, moths and beetles. Experiments show that self-pollination is largely unsuccessful, and that reproduction is likely pollen-limited. Fruit set for open pollination was low (17%) (Jolls *et al.*, in review).

Growth chamber experiments by Jolls *et al.* showed low germinability (56%). Germination does not appear to be affected by substrate type or moisture (Jolls *et al.*, in review), though this does not exclude the possibility that other stages of the reproductive cycle might be affected. Seeds buried 1 cm did not germinate at all, indicating there is a light requirement as in other species of *Solidago*. Seeds also required a chilling period in order to germinate.

Solidago houghtonii can also reproduce vegetatively by means of underground rhizomes. Plants have between 2 to 12 ramets that rapidly disarticulate and become established as independent plants (Penskar, 1997).

Basal rosettes live 1-6 years without flowering and often persist vegetatively after successfully flowering and fruiting (Penskar, 1997).

Survival

Predation by aphids and other insects has been noted (Penskar, 1997, Jolls *et al.*, in review). No information was found regarding offspring survival, population age structure and reproductive/recruitment rate.

Physiology

Houghton's goldenrod is a perennial that dies back to its rhizomes and goes dormant in winter.

Movements/dispersal

Pollen is insect dispersed. Plants can spread locally by rhizomes and seeds are windborn. Some 50 – 60 sites occur in 9 counties of northern Michigan (NatureServe 2005; map of range in Michigan in DNR, 2005, web site); seeds from some of the closest populations in Michigan could potentially reach Cockburn Island, the site of the westernmost population in Ontario.

Nutrition and interspecific interactions

An arthropod survey by Jolls *et al.* (in review) found a number of insect species inhabiting flowers and plants. Flowers were visited by beetles (Phalacriidae), bees (Halictidae) and moths (Phalacridae). Residents on seed heads included thrips, herbivorous mites, mould feeders (*Melanophthalma sp.*), and detritivores (Psocopera). Spiders that predate on these insects also occupied flowers.

Behaviour/adaptability

There is little information about the adaptability of this species to stress or disturbance. Its presence in alvar habitat indicates that it is likely to be tolerant of droughts and floods, and a poor competitor, though no studies have been published that test these.

Houghton's goldenrod has been successfully transplanted from the wild and raised at the W.J. Beal Botanical Garden in Michigan (Chittenden, 1995). Transplants both flowered and produced rhizomes.

POPULATION SIZES AND TRENDS

Field visits were conducted at seven of thirteen sites for Houghton's goldenrod reported in the NHIC database (Appendix 1). Sites were visited from August 18 to 20, 2003, comprising two and a half field days. Five sites were relatively inaccessible by road and could not be searched due to time constraints. One site was believed to be an erroneous report, since it was described as being on the north shore of Macgregor Point (which appears to be unsuitable habitat), and the UTM provided is in the waters of Frazer Bay.

Houghton's goldenrod was found at five of the seven sites searched. Where plants were too numerous to count, population estimates were made by counting the number of plants in a transect one metre wide in order to establish plant density in m^2 , and then multiplying this amount by the estimated area of the patch in m^2 (area of occupancy).

One additional site was found near the swing bridge between the La Cloche Peninsula and Great La Cloche Island (Appendix 1). Pam Laureto, who was also conducting field survey's in late August, 2003, reported three additional sites: one on the tip of White Point near the site reported by Morton in 1976, one on the south end of La Cloche Peninsula, and one at Stoney Point (Appendix 1). There are likely to be other occurrences in the La Cloche area. Laureto also provided a population estimate for the Strawberry Island site (pers. comm.).

Combining population estimates from the field visits with estimates from Laureto and those already reported in the NHIC database, there are approximately 27,000 mature flowering individuals of Houghton's goldenrod in Canada. Area of occupancy is estimated to be approximately 7.4 ha, based on a density of 3,660 plants per hectare that was calculated from observed field data.

A comparison between observed numbers with previously reported numbers showed that while some sites experienced a decline, others experienced an increase. Overall numbers appear to be stable. Apparent declines and increases might also result if the observed site was not exactly the same one as previously reported, especially if location descriptions were vague. Matthews and Mosely (1990) state that 20% of historically known populations globally have disappeared since 1975, but how much of this decline has taken place in Canada is uncertain.

There is some degree of isolation between populations, particularly Cabot Head, Cockburn Island, and to a lesser extent, Tamarack Bay.

LIMITING FACTORS AND THREATS

There do not appear to be any imminent threats to the Houghton's goldenrod populations observed, although there are some potential threats. Houghton's goldenrod is primarily found in alvars and interdunal wetlands. Alvars, as a habitat are often

threatened by heavy recreational use, ATV traffic, and grazing. Alvars also tend to occur over high-grade limestone, and quarrying presents a potential threat. They are also vulnerable to natural disturbances such as droughts, floods, encroachment of trees, and invasive species (Catling and Brownell, 1995; Belcher and Keddy, 1992). Active quarries were observed on the La Cloche Peninsula and on La Cloche Island about one to three km from the patches of Houghton's goldenrod. Vehicle tracks were observed in the MacGregor Bay Alvar (site 005) but did not appear to be recent. Tracks were also observed on La Cloche Island, particularly near the road, although none were actually in the Houghton's goldenrod patches.

Heavy recreational use and residential development can also threaten dune ecosystems.

SPECIAL SIGNIFICANCE OF THE SPECIES

Houghton's goldenrod is a Great Lakes endemic, and has a very limited distribution globally, and a limited habitat therein. It is considered to be at risk throughout its range.

No published information on traditional Aboriginal uses for Houghton's goldenrod was found.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Houghton's goldenrod has been given a subnational rank in Ontario of S2 (imperiled) and a national rank of N2 (imperiled) by NatureServe (2005). In the United States, it is designated vulnerable (G3) federally and in the state of Michigan (S3). The species is not listed in the 2004 IUCN Red List of Threatened Species database (<http://www.iucnredlist.org/>).

Of the 58 occurrences in Michigan, where the majority of the global population exists, 32 are at least partially on protected lands (Penskar, 1997). By contrast, only the Cabot Head population in Ontario is on protected land.

TECHNICAL SUMMARY

Solidago houghtonii

Houghton's goldenrod

Range of Occurrence in Canada: Ontario

verge d'or de Houghton

Extent and Area Information	
<ul style="list-style-type: none"> • <i>Extent of occurrence (EO)(km²)</i> [sum of the alvar areas occupied by the populations] 	220 km ²
<ul style="list-style-type: none"> • <i>Specify trend in EO</i> 	unknown but likely stable
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in EO?</i> 	no
<ul style="list-style-type: none"> • <i>Area of occupancy (AO) (km²)</i> [sum of the occupied areas] 	0.075 km ² (7.5 ha)
<ul style="list-style-type: none"> • <i>Specify trend in AO</i> 	unknown but possibly stable (lack of specific monitoring for this species)
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in AO?</i> 	unlikely
<ul style="list-style-type: none"> • <i>Number of known or inferred current locations</i> 	13
<ul style="list-style-type: none"> • <i>Specify trend in #</i> 	stable
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in number of locations?</i> 	no
<ul style="list-style-type: none"> • <i>Specify trend in area, extent or quality of habitat</i> 	unknown for these sites but alvars in Ontario are a very rare habitat that have been impacted by development and exotics plants
Population Information	
<ul style="list-style-type: none"> • <i>Generation time (average age of parents in the population)</i> 	several years
<ul style="list-style-type: none"> • <i>Number of mature individuals</i> 	est. 27,000 flowering, but due to asexual reproduction there are likely fewer distinct genets present than the estimated total number of mature plants
<ul style="list-style-type: none"> • <i>Total population trend:</i> 	likely stable
<ul style="list-style-type: none"> • <i>% decline over the last/next 10 years or 3 generations.</i> 	N/A
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in number of mature individuals?</i> 	no
<ul style="list-style-type: none"> • <i>Is the total population severely fragmented?</i> 	no but somewhat fragmented
<ul style="list-style-type: none"> • <i>Specify trend in number of populations</i> 	likely stable
<ul style="list-style-type: none"> • <i>Are there extreme fluctuations in number of populations?</i> 	no
<ul style="list-style-type: none"> • List populations with number of mature individuals in each: La Cloche area ~ 9080 Cockburn Is. "hundreds" Tamarack Bay ~ 4500 Cabot Head ~ 12,520 	
Threats (actual or imminent threats to populations or habitats)	
<ul style="list-style-type: none"> - recreational activities (particularly ATV's) - quarrying activities may become a threat but presently do not seem to impact the populations 	

Rescue Effect (immigration from an outside source)	
<ul style="list-style-type: none"> • <i>Status of outside population(s)?</i> USA: Mich S3; NY S1 (20% of historical populations lost in USA) 	
<ul style="list-style-type: none"> • <i>Is immigration known or possible?</i> 	unknown
<ul style="list-style-type: none"> • <i>Would immigrants be adapted to survive in Canada?</i> 	unknown
<ul style="list-style-type: none"> • <i>Is there sufficient habitat for immigrants in Canada?</i> 	yes
<ul style="list-style-type: none"> • <i>Is rescue from outside populations likely?</i> 	seeds might be able to reach Cockburn Island (the westernmost area of occurrence in Ontario) from sites in northern Michigan
Quantitative Analysis [provide details on calculation, source(s) of data, models, etc]	N/A
Current Status	
COSEWIC: Special Concern (May 2005)	

Status and Reasons for Designation

Status: Special Concern	Alpha-numeric code: Met criterion for Threatened, D2, but designated Special Concern because many of the plants are in inaccessible areas and in a provincial nature reserve.
Reasons for Designation: A Great Lakes endemic present in Ontario primarily within alvar habitats at the tip of Bruce Peninsula and on Manitoulin Island. The few populations occupy very small areas of provincially rare alvar habitat that are at potential risk from aggregate extraction, use of recreational vehicles and expansion of invasive weeds.	
Applicability of Criteria	
Criterion A (Declining Total Population): Insufficient information for declines	
Criterion B (Small Distribution, and Decline or Fluctuation): Not met although extent of occurrence and area of occupancy are well below critical criterion limits for endangered and threatened and a decline in quality of habitat may occur in future; however, the species is presumably not highly fragmented in spite of the discontinuous alvar habitats because wind dispersal of fruitlets may enable recolonization. Also, the populations of this perennial species are not likely to undergo extreme fluctuations.	
Criterion C (Small Total Population Size and Decline): Population size is estimated to exceed considerably the maximum limit of 10,000 mature individuals.	
Criterion D (Very Small Population or Restricted Distribution): Meets threatened D2 based on a very small area of occupancy <1 km ² and presence of ongoing threats from habitat loss from quarry activities in adjacent alvar sites, the likelihood of increased recreational use by ATVs and continued competition from exotic invasives on alvar sites. However, the species may be best regarded as of special concern at present since the risks are limited and about 2/3 of the total population is protected due to the presence of nearly one half of the total population in Cabot Head Provincial Nature Reserve and a sizable number are present at relatively inaccessible locations.	
Criterion E (Quantitative Analysis): Insufficient information.	

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED

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COLLECTIONS EXAMINED

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Appendix 1. Results of *Solidago houghtonii* field surveys.

EO num	Location	EO Rank, Last seen	Population	Area of occupancy	Notes
001	Lewis Lake	AB - Aug. 2003	8	0.01 ha	SW end of Lewis Lake, 100 M. NW from road. Former EO Rank of AB indicates there may be more plants in the area that were not found.
004	White Point (Long Point)	H – 1976			No plants found at Bay where sample was taken by Morton in 1976.
005	East of McGregor Bay	A - Aug. 2003	~6140	1.83 ha	Plants found in two main patches, with some scattered individuals. Population estimate by Makkay.
006	Shallow Bay	C - 1996			Site not found.
007	Mary's Point	C - 2003	~420	09 ha	Population estimate by Makkay.
008	SW Little La Cloche	C - 1996			Plants not found.
009	La Cloche Area alvar	B - Aug. 2003	~100	125 ha	Scattered North of road, east of UTM reported by Jones. Population estimate by Makkay.
010	English Point	C - 1996			Site not found.
011	N tip of Strawberry Island	A - 2003	~ 1000	~ 0.3 ha	Not accessible by road. Population estimate by Laureto, 2003.
012	Tamarack Harbour	A - 1995	~4500	~1.2 ha	Not easily accessible. Estimate given by Jones, 1995, likely still accurate.
013	Sand Bay, Cockburn Island	B - 2001	several hundred		Site not especially accessible. Population estimate from Jones 2001, likely still accurate.
23	North Shore MacGregor Point				Site not found. UTM given for the site is in water.
003	Cabot Head	B - Aug. 2003	~12,520	3.2 ha	Population estimate by Makkay. Probably not an exhaustive survey.
new site	NE of swing bridge between La Cloche I. and Swift Current	Aug. 2003	14	01 ha	Observed by Kristina Makkay.
new site	Stoney Point	2003	~ 400	~0.1 ha	As observed by Laureto.
new site	South end of La Cloche Peninsula	2003	~ 1000	~ 0.3 ha	Site on the south end of La Cloche Peninsula between Hwy 6 and La Cloche Channel, observed by Laureto.
near 004	Tip of Long Point	2003	19		As observed by Laureto.

1EO (element occurrence) ranks are as follows:

A – Excellent predicted viability, B – Good predicted viability, C – Fair predicted viability, H - Historical