Species at Risk Act
Recovery Strategy Series
Adopted under section 44 of SARA

Recovery Strategy for the Mountain Holly Fern (*Polystichum scopulinum*) in Canada

Mountain Holly Fern



2017

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[1].

Cover illustration: Kella Sadler, Environment and Climate Change Canada

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[1] http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

RECOVERY STRATEGY FOR THE MOUNTAIN HOLLY FERN (*Polystichum scopulinum*) IN CANADA

2017

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 British Columbia has given permission to the Government of Canada to adopt the *Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador* (Part 2), under section 44 of the *Species at Risk Act* (SARA). Environment and Climate Change Canada has included a federal addition (Part 1) which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the Mountain Holly Fern in Canada consists of two parts:

Part 1 – Federal Addition to the *Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador*, prepared by Environment and Climate Change Canada.

Part 2 – *Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador*, prepared by the Mountain Holly Fern Advisory Committee for the British Columbia Ministry of Environment.

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Part 2 – *Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador*, prepared by the Mountain Holly Fern Advisory Committee for the British Columbia Ministry of Environment

Part 1 – Federal Addition to the *Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador*, prepared by Environment and Climate Change Canada

Preface

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

The Minister of Environment and Climate Change is the competent minister under SARA for the Mountain Holly Fern and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. To the extent possible, the recovery strategy has been prepared in cooperation with the provinces of British Columbia, Quebec, and Newfoundland and Labrador, as per section 39(1) 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 Province of British Columbia provided the attached recovery strategy for the Mountain Holly Fern (Part 2) as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared in cooperation with Environment and Climate Change 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 and Climate Change Canada or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Mountain Holly Fern and Canadian society as a whole.

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

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

[2] http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6B319869-1%20

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area[3] be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

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

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

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

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

Acknowledgements

The federal addition to the recovery strategy for the Mountain Holly Fern was prepared by Marie-José Ribeyron and Emmanuelle Fay (Environment and Climate Change Canada, Canadian Wildlife Service – Quebec Region) with the assistance of Kella Sadler and Matt Huntley (Environment and Climate Change Canada, Canadian Wildlife Service – Pacific and Yukon Region) and Kathy St. Laurent (Environment and Climate Change Canada, Canadian Wildlife Service – Atlantic Region). Thanks also to Jacques Labrecque of the Quebec Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, to Brenda Costanzo of the British Columbia Ministry of Environment, and to the Newfoundland and Labrador Department of Environment and Conservation for their invaluable contributions.
We would also like to thank Patricia Désilets, private consultant, for her feedback.

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 *Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador* (Part 2 of this document, referred to henceforth as "the provincial recovery strategy") and/or 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 final federal recovery strategy.

1. Socio-economic Considerations

The provincial recovery strategy contains a short statement on socio-economic considerations. As a socio-economic analysis is not required under subsection 41(1) of SARA, the section on socio-economic considerations in the provincial recovery strategy is not considered an integral part of the federal Minister of Environment and Climate Change's recovery strategy for this species.

2. Recovery Feasibility Summary

This section replaces the “Recovery Feasibility” section in the provincial recovery strategy.

Based on the following four criteria that Environment and Climate Change Canada uses to establish recovery feasibility, recovery of the Mountain Holly Fern (*Polystichum scopulinum*) has been deemed technically and biologically feasible.

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

   Yes. There are currently four occurrences of the species in Canada. These include mature individuals capable of vegetative reproduction (and possibly sexual reproduction), which are currently available to sustain or improve population abundance.

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

   Yes. The Mountain Holly Fern grows on montane ultramafic (serpentine) rock outcrops, a type of rock formation that is relatively rare at the landscape scale. However, since the species is uncommon and geographically restricted, it is reasonable to believe that sufficient suitable habitat to support the species is present at each site occupied by the species in Canada.

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

   Yes. The main threat to the species in British Columbia is mineral exploration. This threat can be avoided through conservation measures (e.g., legal measures). There is no serious threat to the occurrence in Quebec. As for the historical occurrence in Newfoundland and Labrador, if it still exists, it is not thought to be threatened by human activities because it is located in an area that is difficult to access.

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

   Yes. Recovery techniques (e.g., habitat management plan) exist for the purpose of avoiding or mitigating known threats. In addition, techniques exist for the artificial propagation of ferns and for their reintroduction into the natural environment. These techniques could be adapted for the Mountain Holly Fern within a reasonable timeframe (Sénécal, pers. comm. 2014).

3. Species Status Information

The Mountain Holly Fern was listed as Threatened in Schedule 1 of SARA (S.C. 2002, c. 29) in 2006. The species is also protected by the Quebec *Act respecting threatened or vulnerable species*, under which it has been listed as threatened since 1995. The species is included on the Red List in British Columbia, but is not listed as a species at risk under the *B.C. Forest and Range Practices Act.* The species is not listed under the Newfoundland and Labrador *Endangered Species Act*.

The following table replaces Table 2 in the provincial recovery strategy.

Table 1. Conservation Status for the Mountain Holly Fern (NatureServe 2015, B.C. Conservation Data Centre 2015, B.C. Conservation Framework 2015, Government of Quebec 2015, Government of Newfoundland and Labrador 2015)

Global (G) Rank*	National (N) Rank	Sub-national (S) Rank	COSEWIC Designation	Provincial Status and Designation
G4	Canada (N2); United States (NNR)	**Canada:** British Columbia (S2), Newfoundland and Labrador (SH), Quebec (S2) **United States:** Arizona (S2), California (SNR), Colorado (S1), Idaho (SNR), Montana (S1), Nevada (SNR), Oregon (SNR), Utah (S2), Washington (SNR), Wyoming (SH)	Threatened (2005)	British Columbia Red List; B.C. Conservation Framework Highest priority: 2 under goal 3** Quebec (LEMV***): Threatened (1995) Newfoundland and Labrador: N/A

* Rank 1-critically imperiled; 2-imperiled, 3-vulnerable to extirpation or extinction; 4-apparently secure; 5-secure; H-possibly extirpated (historical); NR-status not ranked
** The three goals of the B.C. Conservation Framework are: 1. Contribute to global efforts for species and ecosystem conservation; 2. Prevent species and ecosystems from becoming at risk; 3. Maintain the diversity of native species and ecosystems.
*** LEMV: Quebec *Act respecting threatened or vulnerable species* R.S.Q., c. E-12.01

4. Species Population and Distribution

The content of Table 1 of the provincial recovery strategy does not need to be updated except for the year of the last observation of the Mont Albert population (Labrecque pers. comm. 2015). Updated information for that population is presented in Table 2 below.

Table 2. Updated information for the Mont Albert, Quebec population

Population	Location	Land Tenure	Year Last Observed and Status	Number of Plants	Area of Occupancy	Proximity to Other Populations
Mont Albert	South-facing slopes of the Vallée du Diable, eastern flank of Mont Albert, Gaspésie, Quebec	Quebec Crown land in Gaspésie National Park	2014 Existing population	215	8 ha	550 km from the historical Newfoundland population; 3,200 km from the closest population in the United States (Colorado)

Surveys were also carried out in 2009 in an attempt to locate the Newfoundland population. They covered only one small area of potential habitat for the occurrence. No Mountain Holly Fern individuals were located.

5. Threats

The threat assessment for the Mountain Holly Fern was reviewed by a group of Mountain Holly Fern experts in December 2014 using the IUCN–CMP[4] threat classification scheme. This approach differs from that used for the provincial recovery strategy, hence the differences in the assessment results. The description of threats in the provincial recovery strategy remains current and valid. However, an additional threat (recreational activities) has been identified and is described below.

Table 3. Threat classification and assessment table for Mountain Holly Fern

Threat	Description of Threat	Impact[a]	Scope[b]	Severity[c]	Timing[d]	Detailed Threat
3	Production of energy and mining					
3.2	Mining and quarrying	Very High - Medium	Pervasive - Restricted (11-100%)	Extreme (71-100%)	Moderate	Mining and mineral exploration
4	Transportation and service corridors					

[4] This threat classification scheme is based on the unified classification of threats proposed by the International Union for Conservation of Nature and the Conservation Measures Partnership (IUCN–CMP). For a detailed description of the threat classification scheme, consult the website of the Conservation Measures Partnership at http://cmp-openstandards.org/using-os/tools/threats-taxonomy/.

Threat	Description of Threat	Impact[a]	Scope[b]	Severity[c]	Timing[d]	Detailed Threat
4.1	Roads and railroads	Negligible	Negligible (<1%)	Extreme - Serious (31-100%)	Moderate	Road construction
5	Biological resource use					
5.2	Gathering terrestrial plants	Negligible	Negligible (<1%)	Negligible (<1%)	Insignificant / Negligible	Collection of specimens
5.3	Logging and wood harvesting	Not Calculated	Large (31-70%)	Slight (1-10%)	Low	Mainly as part of Mountain Pine Beetle control
6	Human intrusions and disturbance					
6.1	Recreational activities	Negligible	Negligible (<1%)	Negligible (<1%)	Insignificant / Negligible	Off-trail hiking and off-road vehicle use
7	Natural system modifications					
7.1	Fire and fire suppression	Unknown	Large (31-70%)	Unknown	Moderate	Severe fire
10	Geological events					
10.3	Avalanches/ landslides	Negligible	Negligible (<1%)	Unknown	Unknown	Slope failure
11	Climate change and severe weather					
11.2	Droughts	Not Calculated	Large (31-70%)	Unknown	Low	Longer and/or more frequent droughts

[a] **Impact –** The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%) and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

[b] **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest (Pervasive = 71-100%; Large = 31-70%; Restricted = 11-30%; Small = 1-10%; Negligible < 1%).

[c] **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species' population (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

[d] **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

<u>Off-trail hiking and off-road vehicle use</u>

Recreational activities such as hiking and use of all-terrain vehicles may cause direct or indirect loss of individuals due to trampling. Off-trail hiking is more likely to cause damage on Mont Albert (Quebec), where a hiking trail exists close to one subpopulation. The occurrences in British Columbia could potentially be impacted by all-terrain vehicles as some of the sites where the Mountain Holly Fern is present can

be accessed by such vehicles. This threat does not apply to the Labrador occurrence because access to the site is difficult for recreational activities of any type. Overall, the impact of this threat is negligible.

6. Population and Distribution Objectives

This section replaces the “Recovery Goal” section in the provincial recovery strategy.

Environment and Climate Change Canada has determined the population and distribution objectives for the Mountain Holly Fern to be:

> To maintain the distribution of the Mountain Holly Fern and to maintain or, if necessary, increase the abundance of each of the currently known[5] occurrences[6] in Canada as well as any other occurrence that may be identified in the future.

The Mountain Holly Fern is a rare plant that grows only on montane ultramafic[7] (serpentine) rock outcrops. Since this habitat type has a very limited distribution in Canada, there is no reason to believe that the species was more widespread in the past. Consequently, maintaining the current distribution of the species is deemed to be an appropriate objective.

The population objective is to maintain the current number of individuals within each of the known occurrences in Canada. In Canada, Mountain Holly Fern is at the northern edge of its range. Biological factors limit its potential to be more abundant (see limiting factors in the provincial document), and there are no data to indicate that the number of occurrences or the number of individuals has been higher in the past. Furthermore, the Canadian population of Mountain Holly Fern is fragmented (due to the nature of its suitable habitat), and its occurrences are very isolated from one another. In order to conserve the species' genetic diversity and to ensure a minimum degree of redundancy[8] to withstand catastrophic events, it is important to maintain all known occurrences. This includes the occurrence in Newfoundland and Labrador until future survey efforts show that it no longer exists.

The small numbers of individuals in the extant occurrences, particularly those in British Columbia, raise doubts as to their ability to persist over the long term. Estimates of viability for these and other occurrences will be necessary to determine whether efforts to increase the abundance of one or more of these occurrences are required. The approaches described in the provincial recovery strategy (see Table 4) include conducting the research necessary to estimate the viability of the occurrences, as well

[5] This includes the Newfoundland and Labrador occurrence until future survey efforts demonstrate that it no longer exists.
[6] The term “occurrence” corresponds to the term “population” used in the provincial recovery strategy.
[7] Igneous rock containing high levels of iron and magnesium.
[8] Redundancy refers to the presence of multiple populations of a species to guard against catastrophic losses.

as adapting existing techniques for artificially propagating and transplanting ferns into natural environments to the Mountain Holly Fern.

The population objective includes occurrences that may be discovered in the future, since it is highly likely that other occurrences of the species exist, particularly in British Columbia, where the Mountain Holly Fern can easily be confused in the field with other holly fern species that grow in the same areas (COSEWIC 2005). The inclusion of occurrences that may be identified in the future in the objective is particularly important in this case, given the extremely small number of currently known occurrences.

These objectives will be reviewed during preparation of the report that is required every five years to evaluate the implementation of this recovery strategy and to measure the progress made toward meeting its population and distribution objectives (section 46, SARA).

7. Broad Strategies and General Approaches to Meet Objectives

The approaches recommended in the provincial recovery strategy (Table 4) are still appropriate. However, the content of the first broad strategy under Objective 1 must be modified to include strategies to address the threat added to the Threats section, i.e., “Off-trail hiking and off-road vehicle use.” The modified content is presented in Table 4.

Table 4. Modified content for the first strategy under Objective 1 in Table 4 of the provincial recovery strategy

Priority	Threat or concern addressed	Broad strategy to address threat	Recommended approaches to meet recovery objectives
Objective 1: To secure long-term protection for extant populations and their habitats (areas of occupancy plus appropriate essential habitat)			

High	Mining and mineral exploration, mountain pine beetle control, road construction, slope failure, severe fire, off-trail hiking and off-road vehicle use	Protection of habitat and species, management of habitat and species, stewardship, research, enforcement, coordination, communication and outreach	• Designate the Crown land on which B.C. populations grow for the conservation of natural resources under section 17 of the B.C. *Land Act* to make land users aware of the location of the species.
			• List the Mountain Holly Fern as a species at risk under the *B.C. Forest and Range Practices Act* and establish wildlife habitat areas.
			• Determine the amount of habitat required to adequately protect the populations (including those that occur in unstable, sloping habitats).
			• Communicate with and facilitate the development of an appropriate road construction plan with B.C. Ministry of Forests and Range and Ministry of Energy, Mines and Petroleum Resources.
			• Assist the B.C. Ministry of Forests and Range in developing a site management plan for the area.
			• Develop management plans in B.C. that include guidelines on:
			  • Mitigating the effects of mountain pine beetle control on Mountain Holly Fern populations, and
			  • Managing the risk of severe fires extirpating populations.
			• Develop and implement ways to reduce off-trail hiking and off-road vehicle traffic (e.g., awareness activities, signage).

8. Critical Habitat

8.1 Identification of the Species' Critical Habitat

This section replaces the "Identification of the species' critical habitat" section in the provincial recovery strategy.

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. The provincial recovery strategy for the Mountain Holly Fern determined that critical habitat[9] could not be identified at that time owing to gaps in the data on the species' distribution and on its specific habitat requirements. Environment and Climate Change Canada has reviewed the available information and concluded that it is now sufficient to partially identify critical habitat. This federal recovery strategy thus identifies critical habitat for the Mountain Holly Fern to the extent possible, based on the best available information for the species. More precise boundaries may be mapped and additional critical habitat may be added in the future if additional research supports the inclusion of areas beyond those currently identified.

The biophysical features associated with the presence of the Mountain Holly Fern are described in detail in the provincial recovery strategy as well as in the COSEWIC status report (2005), and are as follows:

- Ultramafic (serpentine) rock outcrops.
- Outcrops of ferromagnesian rocks with low concentrations of calcium, nitrogen, phosphorus and molybdenum, and high levels of magnesium, chromium and nickel.
- Found at elevations from 978 m to 1,768 m in British Columbia and from 800 m to 900 m in Quebec, primarily on south-facing slopes.
- Shallow soils on which herbaceous plants and shrubs typical of ultramafic environments grow.
- Sparse groundcover that creates dry microclimates, thus excluding many nearby species adapted to slightly more humid microclimates.

The biophysical features of the location of the Newfoundland occurrence cannot be described beyond "the southerly slopes of a dry serpentine ridge," as it was only ever known from a general location reference and has never been re-located. If the occurrence is determined to be extant, the description of biophysical features may be updated.

The presence of a Mountain Holly Fern occurrence and its persistence in a given area requires a larger area than that occupied by individuals:

[9] Critical habitat identification is not required in the provincial recovery process in British Columbia.

– The area immediately adjacent to the occurrence is required for its persistence, as it plays an essential role in maintaining the properties characterizing the microhabitat. This area is referred to as the critical function zone.[10]
– Features distinguishable at the landscape scale (through use of detailed ecosystem mapping or aerial photos) and which, at that scale, appear as contiguous ecological features with relatively distinct boundaries (e.g., cliffs, banks, or slopes, drainage basins, seepage plateaus, or distinct vegetation assemblages) are also necessary, as they are involved in the production and maintenance of suitable habitat conditions. They represent the ecological context for the occupied microhabitats and are known as distinct ecological features (Sadler 2010).

The critical function zone and the distinct ecological features are therefore necessary for the maintenance and persistence of occurrences of Mountain Holly Fern and must be part of the critical habitat identified for the species.

For each known occurrence of the Mountain Holly Fern, critical habitat is identified by three components:

(1) the area occupied by individual plants or patches of plants (observation points), including the inaccuracy associated with GPS units (5 m to 25 m);

(2) an additional adjacent area of 50 m[11] corresponding to the critical function zone. When the critical function zones surrounding areas occupied by individual plants or patches of plants overlap, they are merged into a single polygon containing the critical habitat; and

(3) all of the distinct ecological features that contribute to the maintenance and persistence of occurrences of the Mountain Holly Fern.

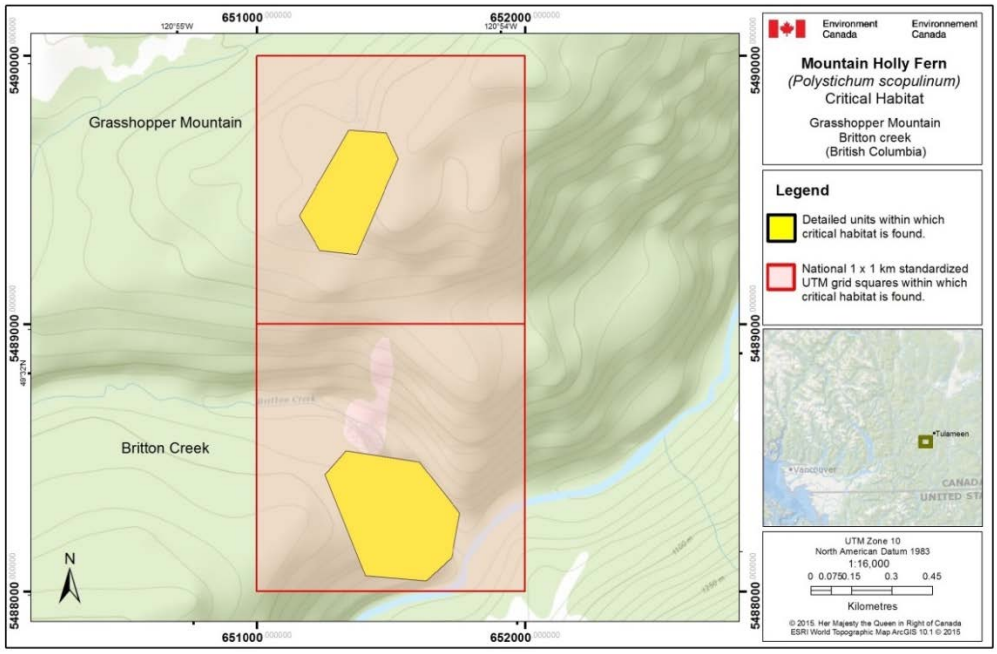
The polygons containing critical habitat for the Mountain Holly Fern are shown in Figures 1 and 2. Critical habitat for the Mountain Holly Fern in Canada occurs within the 1 x 1 km standardized UTM grid squares, where the critical habitat identification criteria and method described in this section are met. Tables 5 and 6 show the coordinates of the grid squares containing critical habitat. The UTM grid squares are part of a standardized national grid system that indicates the general geographic area containing critical habitat, which can be used for land use planning and/or environmental assessment purposes.

[10] The critical function zone refers to the area within which the properties or functions (light, moisture, and humidity levels necessary for survival) directly associated with maintaining the species' microhabitat are present (Sadler 2010).
[11] Existing research provides a logical basis for including a minimum critical function zone of 50 m as part of critical habitat for rare plant species occurrences (Sadler 2010).

Existing anthropogenic features (e.g., permanent trails, roads) that are present within the polygons containing critical habitat do not support the survival and recovery of the Mountain Holly Fern, and are not identified as critical habitat.

In British Columbia (Figure 1), there are three polygons containing critical habitat for the Mountain Holly Fern, all of them located in the Tulameen River valley. The Mount Britton polygon covers 17.2 ha, the Grasshopper Mountain polygon, 10.4 ha, and the Olivine Mountain polygon, 15.8 ha, for a total of 43.4 ha. The distinct ecological feature identified as critical habitat for these occurrences is the band of ultramafic rock found on Mount Britton, Grasshopper Mountain and Olivine Mountain.

(a)



(b)

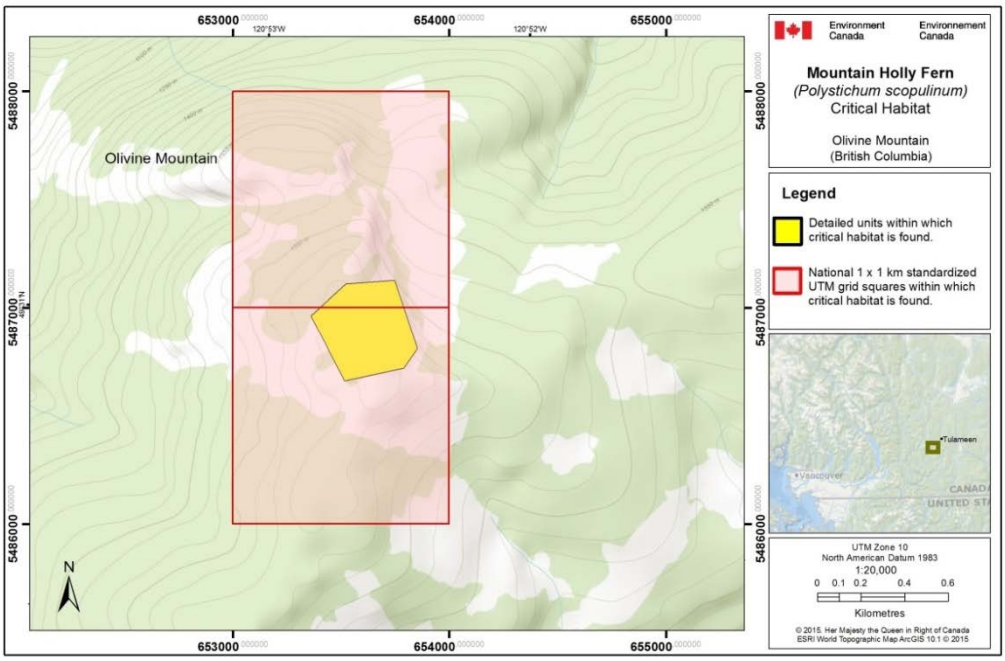


Figure 1(a)(b). Grid squares identified as containing critical habitat for the Mountain Holly Fern in British Columbia. The units at Grasshopper Mountain and Britton Creek (Figure 1[a], north) and on Olivine Mountain (Figure 1[b], south) within which critical habitat is found are represented by the yellow-shaded polygons where the description of habitat criteria and the method set out in section 8.1 are met. The 1 x 1 km standardized UTM grid squares (red outline) surrounding these units are part of a standardized national grid system that indicates the general geographic area containing critical habitat. Areas outside the yellow-shaded polygons do not contain critical habitat.

Table 5. Grid squares identified as containing critical habitat for the Mountain Holly Fern in British Columbia. Critical habitat for the Mountain Holly Fern occurs within these 1 x 1 km standardized UTM grid squares (red outline), where the description of habitat criteria set out in section 8.1 are met.

1 x 1 km Square ID Code[a]	UTM Grid Square Coordinates[b]		Occurrence	Land Tenure[c]
	Easting	Northing		
10FV5836	653000	5486000	Olivine Mountain (BC)	Non-federal lands
10FV5837	653000	5487000	Olivine Mountain (BC)	Non-federal lands
10FV5818	651000	5488000	Grasshopper Mountain (BC)	Non-federal lands
10FV5819	651000	5489000	Britton Creek (BC)	Non-federal lands

[a] Square ID is based on the standardized UTM Military Grid Reference System (see http://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/maps/9789), where the first two digits represent the UTM Zone, the following two letters indicate the 100 km x 100 km standardized UTM grid, and the final two digits represent the 1 km x 1 km standardized UTM grid containing all or a portion of the critical habitat unit. This unique alphanumeric code is based on the methodology used for the Breeding Bird Atlases of Canada (see http://www.bsc-eoc.org/ for more information on breeding bird atlases).

[b] The listed coordinates represent the southwest corner of the 1 km x 1 km standardized UTM grid containing all or a portion of the critical habitat unit. The coordinates may not fall within critical habitat and are provided as a general location only.

[c] Land tenure is provided as an approximation of the types of land ownership that exist within the critical habitat units and should be used for guidance purposes only. Accurate determination of land tenure will require cross-referencing critical habitat boundaries with surveyed land parcel information.

In Quebec (Figure 2), there is only one area containing critical habitat for the Mountain Holly Fern; it consists of escarpments and scree slopes on serpentine rock outcrops on Mont Albert. The distinct ecological feature identified as critical habitat for this occurrence is the band of ultramafic serpentine rock outcrop at the summit of Mont Albert. This includes the alpine tundra plateau at the summit as well as the associated escarpments and scree slopes. This rock outcrop covers a total area of approximately 2,730 ha and is located at an elevation between 653 m and 1,007 m; the Mountain Holly Fern occupies only portions located at an elevation between 800 m and 900 m.

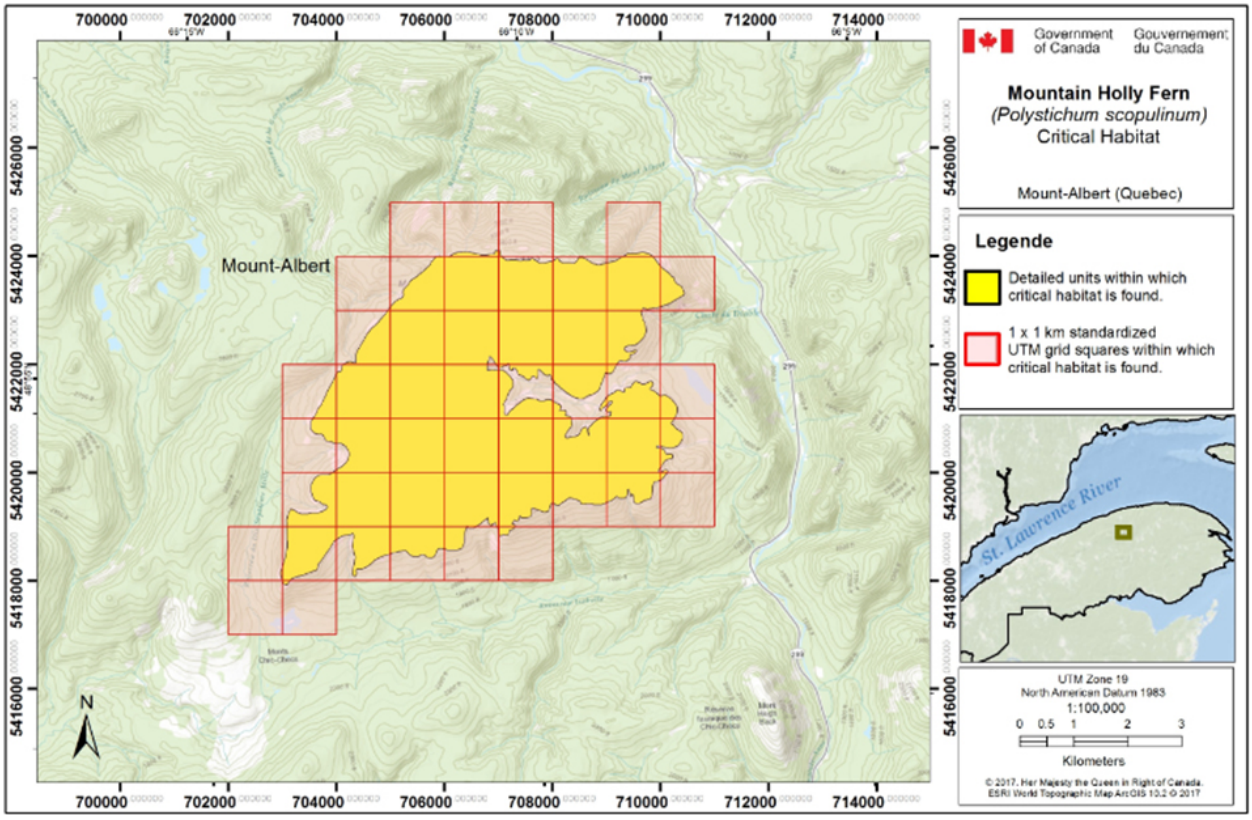


Figure 2. Grid squares identified as containing critical habitat for the Mountain Holly Fern in Quebec. The units on Mont Albert within which critical habitat is found are represented by a yellow-shaded polygon where the description of habitat criteria and the method set out in section 8.1 are met. The 1 x 1 km standardized UTM grid squares (red outline) surrounding these units are part of a standardized national grid system that indicates the general geographic area containing critical habitat. Areas outside the yellow-shaded polygons do not contain critical habitat.

Table 6. Grid Squares identified as containing critical habitat for the Mountain Holly Fern in Quebec. Critical habitat for the Mountain Holly Fern occurs within these 1 x 1 km standardized UTM grid squares (red outline), where the description of habitat criteria (section 8.1) applies.

1 x 1 km Square ID Code[a]	UTM Grid Square Coordinates[b]		Occurrence	Land Tenure[c]
	Easting	Northing		
19GQ0138	703000	5418000	Mont Albert (QC)	Non-federal lands
19GQ0148	704000	5418000	Mont Albert (QC)	Non-federal lands
19GQ0158	705000	5418000	Mont Albert (QC)	Non-federal lands
19GQ0168	706000	5418000	Mont Albert (QC)	Non-federal lands
19GQ0178	707000	5418000	Mont Albert (QC)	Non-federal lands

19GQ0139	703000	5419000	Mont Albert (QC)	Non-federal lands
19GQ0149	704000	5419000	Mont Albert (QC)	Non-federal lands
19GQ0159	705000	5419000	Mont Albert (QC)	Non-federal lands
19GQ0169	706000	5419000	Mont Albert (QC)	Non-federal lands
19GQ0179	707000	5419000	Mont Albert (QC)	Non-federal lands
19GQ0189	708000	5419000	Mont Albert (QC)	Non-federal lands
19GQ0199	709000	5419000	Mont Albert (QC)	Non-federal lands
19GQ1109	710000	5419000	Mont Albert (QC)	Non-federal lands
19GQ0230	703000	5420000	Mont Albert (QC)	Non-federal lands
19GQ0240	704000	5420000	Mont Albert (QC)	Non-federal lands
19GQ0250	705000	5420000	Mont Albert (QC)	Non-federal lands
19GQ0260	706000	5420000	Mont Albert (QC)	Non-federal lands
19GQ0270	707000	5420000	Mont Albert (QC)	Non-federal lands
19GQ0280	708000	5420000	Mont Albert (QC)	Non-federal lands
19GQ0290	709000	5420000	Mont Albert (QC)	Non-federal lands
19GQ1200	710000	5420000	Mont Albert (QC)	Non-federal lands
19GQ0231	703000	5421000	Mont Albert (QC)	Non-federal lands
19GQ0241	704000	5421000	Mont Albert (QC)	Non-federal lands
19GQ0251	705000	5421000	Mont Albert (QC)	Non-federal lands
19GQ0261	706000	5421000	Mont Albert (QC)	Non-federal lands
19GQ0271	707000	5421000	Mont Albert (QC)	Non-federal lands
19GQ0281	708000	5421000	Mont Albert (QC)	Non-federal lands
19GQ0291	709000	5421000	Mont Albert (QC)	Non-federal lands
19GQ1201	710000	5421000	Mont Albert (QC)	Non-federal lands
19GQ0242	704000	5422000	Mont Albert (QC)	Non-federal lands
19GQ0252	705000	5422000	Mont Albert (QC)	Non-federal lands
19GQ0262	706000	5422000	Mont Albert (QC)	Non-federal lands
19GQ0272	707000	5422000	Mont Albert (QC)	Non-federal lands
19GQ0282	708000	5422000	Mont Albert (QC)	Non-federal lands
19GQ0292	709000	5422000	Mont Albert (QC)	Non-federal lands
19GQ0243	704000	5423000	Mont Albert (QC)	Non-federal lands
19GQ0253	705000	5423000	Mont Albert (QC)	Non-federal lands
19GQ0263	706000	5423000	Mont Albert (QC)	Non-federal lands
19GQ0273	707000	5423000	Mont Albert (QC)	Non-federal lands
19GQ0283	708000	5423000	Mont Albert (QC)	Non-federal lands
19GQ0293	709000	5423000	Mont Albert (QC)	Non-federal lands
19GQ1203	710000	5423000	Mont Albert (QC)	Non-federal lands
19GQ0264	706000	5424000	Mont Albert (QC)	Non-federal lands
19GQ0274	707000	5424000	Mont Albert (QC)	Non-federal lands
19GQ0294	709000	5424000	Mont Albert (QC)	Non-federal lands

[a] Square ID is based on the standardized UTM Military Grid Reference System (see http://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/maps/9789), where the

first two digits represent the UTM Zone, the following two letters indicate the 100 km x 100 km standardized UTM grid, and the final two digits represent the 1 km x 1 km standardized UTM grid containing all or a portion of the critical habitat unit. This unique alphanumeric code is based on the methodology used for the Breeding Bird Atlases of Canada (see http://www.bsc-eoc.org/ for more information on breeding bird atlases).

[b] The listed coordinates represent the southwest corner of the 1 km x 1 km standardized UTM grid containing all or a portion of the critical habitat unit. The coordinates may not fall within critical habitat and are provided as a general location only.

[c] Land tenure is provided as an approximation of the types of land ownership that exist within the critical habitat units and should be used for guidance purposes only. Accurate land tenure will require cross-referencing critical habitat boundaries with surveyed land parcel information.

The critical habitat for the Mountain Holly Fern identified in this recovery strategy is not sufficient to achieve the population and distribution objectives for the species. It does not include critical habitat for the occurrence in Newfoundland and Labrador, whose presence has yet to be confirmed. The schedule of studies below outlines the activities that are required to complete the identification of critical habitat for the species.

8.2 Schedule of Studies to Identify Critical Habitat

This section replaces the “Recommended schedule of studies to identify critical habitat” section in the provincial recovery strategy.

Table 7. Schedule of studies to identify the critical habitat of the Mountain Holly Fern

Description of Activity	Rationale	Timeline
Determine whether the historical occurrence in Newfoundland and Labrador still exists	Necessary to identify critical habitat for all currently known occurrences, which includes the Newfoundland and Labrador occurrence, until future survey efforts confirm that it is not longer present.	2016–2026

8.3 Examples of Activities Likely to Result in 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 (a feature) of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single activity or multiple activities at one point in time or from the cumulative effects of one or more activities over time. Activities described in Table 8 include those likely to cause destruction of critical habitat for the species; however, destructive activities are not limited to those listed.

Table 8. Examples of activities likely to result in destruction of critical habitat for the Mountain Holly Fern

Description of Activity	Description of effect (on biophysical or other attributes) in relation to function loss	Details of effect
Mineral exploration and mining	Mineral exploration and mining can cause direct loss of habitat through removal of required substrate, burial resulting from debris or substrate deposition, substrate and microhabitat alteration due to compaction of soil by machinery, and possible changes to drainage.	The activity must occur within the critical habitat boundary in order to cause destruction.

9. Measuring Progress

This section replaces the “Performance Measures” section of the provincial recovery strategy.

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives.

The successful implementation of the recovery strategy will be evaluated every five years based on the following performance indicators:

- maintenance of the species’ current distribution;
- maintenance or increase, if necessary, in the abundance of the known occurrences whose presence has been confirmed.

10. Statement on Action Plans

This section replaces the “Statement on Action Plans” section in the provincial recovery strategy.

One or more action plans detailing activities for the implementation of this recovery strategy will be developed within five years following the publication of the recovery strategy on the Species at Risk Public Registry.

11. 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*[12]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[13] (FSDS) goals and targets.

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

The recovery measures proposed to conserve the Mountain Holly Fern are not expected to adversely affect any other species. It is likely that efforts to protect the Mountain Holly Fern will indirectly benefit other species at risk living in the same type of habitat, such as the Green-scaled Willow (*Salix chlorolepis*; Threatened) and Mountain Beaver (*Aplodontia rufa*; Special Concern). Recovery actions for the Mountain Holly Fern will be implemented by taking into consideration all co-occurring species at risk, such that there will be no negative effects on these species or their habitat.

[12] www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[13] www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1

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Part 2 – *Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador*, prepared by the Mountain Holly Fern Advisory Committee for the British Columbia Ministry of Environment

Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador



Prepared by the Mountain Holly Fern Advisory Committee

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Environment

May 2009

About the British Columbia Recovery Strategy Series

This series presents the recovery strategies that are prepared as advice to the Province of British Columbia on the general strategic approach required to recover species at risk. The Province prepares recovery strategies to meet its commitments to recover species at risk under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada – British Columbia Agreement on Species at Risk*.

What is recovery?

Species at risk 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 a species' persistence in the wild.

What is a recovery strategy?

A recovery strategy represents the best available scientific knowledge on what is required to achieve recovery of a species or ecosystem. A recovery strategy outlines what is and what is not known about a species or ecosystem; it also identifies threats to the species or ecosystem, and what should be done to mitigate those threats. Recovery strategies set recovery goals and objectives, and recommend approaches to recover the species or ecosystem.

Recovery strategies are usually prepared by a recovery team with members from agencies responsible for the management of the species or ecosystem, experts from other agencies, universities, conservation groups, aboriginal groups, and stakeholder groups as appropriate.

What's next?

In most cases, one or more action plan(s) will be developed to define and guide implementation of the recovery strategy. Action plans include more detailed information about what needs to be done to meet the objectives of the recovery strategy. However, the recovery strategy provides valuable information on threats to the species and their recovery needs that may be used by individuals, communities, land users, and conservationists interested in species at risk recovery.

For more information

To learn more about species at risk recovery in British Columbia, please visit the Ministry of Environment Recovery Planning webpage at:

<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>

Recovery Strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador

Prepared by the Mountain Holly Fern Advisory Committee

May 2009

Recommended citation

Mountain Holly Fern Advisory Committee. 2009. Recovery strategy for the mountain holly fern (*Polystichum scopulinum*) in British Columbia, Québec, and Newfoundland and Labrador. Prepared for the B.C. Ministry of Environment, Victoria, BC. 23 pp.

Cover illustration/photograph

Ben Legler

Additional copies

Additional copies can be downloaded from the B.C. Ministry of Environment Recovery Planning webpage at:

<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>

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Disclaimer

This recovery strategy has been prepared by the Mountain Holly Fern Advisory Committee, as advice to the responsible jurisdictions and organizations that may be involved in recovering the species. The British Columbia Ministry of Environment has received this advice as part of fulfilling its commitments under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada – British Columbia Agreement on Species at Risk.*

This document identifies the recovery strategies that are deemed necessary, based on the best available scientific and traditional information, to recover mountain holly fern populations in Canada. Recovery actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and recovery approaches may be modified in the future to accommodate new objectives and findings.

The responsible jurisdictions and all members of the recovery team have had an opportunity to review this document. However, this document does not necessarily represent the official positions of the agencies or the personal views of all individuals on the recovery team.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this strategy. The Ministry of Environment encourages all British Columbians to participate in the recovery of mountain holly fern.

ADVISORY COMMITTEE MEMBERS

Mountain Holly Fern Advisory Committee
- Brenda Costanzo (B.C. Ministry of Environment)
- Ted Lea (retired Ecologist)
- Lucy Reiss (Environment Canada, Canadian Wildlife Service, Pacific &Yukon)
- Guy Jolicoeur (Province of Québec)
- Alain Branchaud (Environment Canada, Canadian Wildlife Service, Québec)
- Joe Brazil (Province of Newfoundland and Labrador)
- Peter Thomas (Environment Canada, Canadian Wildlife Service, Atlantic)

AUTHOR

Ksenia Barton

RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment is responsible for producing a recovery strategy for mountain holly fern under the *Accord for the Protection of Species at Risk in Canada*. The government of Québec, the government of Newfoundland and Labrador, and Environment Canada's Canadian Wildlife Service participated in the preparation of this recovery strategy.

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Mountain holly fern (*Polystichum scopulinum*) was designated by COSEWIC as threatened in Canada in May 2005 and is listed on the federal *Species at Risk Act* Schedule 1. Its current known Canadian range consists of five populations found in British Columbia, Québec, and Newfoundland and Labrador. Mountain holly fern is an evergreen, perennial fern with leaflets that are folded inward and twisted horizontally with slanting bases. This fern is a species of montane ultramafic (serpentine) outcrops. In British Columbia, it is found in three populations in the Tulameen River valley. As well, it is found in 2 other provinces: one population in Québec on the Gaspé Peninsula, and a historic population in western Newfoundland and Labrador at North Arm Mountain.

In general, specific local threats apply primarily to the British Columbia populations of mountain holly fern. No specific local threats to the Québec population are known. It is not known whether the Newfoundland and Labrador population is extant, but the historic locality is remote and not at risk from human activities.

No critical habitat, as defined under the federal *Species at Risk Act* is proposed for identification at this time. It is expected that critical habitat will be proposed following consultation and development of stewardship options with affected landowners and organizations, and completion of outstanding work required to identify specific habitat and area requirements for this species.

The recovery goal for mountain holly fern is to **protect and maintain** all known populations in Canada.

The recovery objectives for this species are

1. to secure long-term protection for extant populations and their habitats (areas of occupancy plus appropriate essential habitat);
2. to refine the current distribution of the species in Canada;
3. to address knowledge gaps including: determining population trends, demographic patterns, and life history (survival and reproduction) of extant populations; and
4. to determine whether augmentation of the populations is necessary and, if required, develop and test techniques to establish populations on existing and historic sites.

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BACKGROUND

Species Assessment Information from COSEWIC

Date of Assessment: May 2005
Common Name (population): Mountain holly fern
Scientific Name: *Polystichum scopulinum*
COSEWIC Status: Threatened
Reason for designation: A fern of very restricted occurrence on serpentine substrates in three widely separated areas of Canada. These very small populations are at risk from stochastic events and, the three in British Columbia, from potential mining activities for precious metals.
Canadian Occurrence: British Columbia, Québec, Newfoundland and Labrador
COSEWIC Status History: Designated Threatened in May 2005. Assessment based on a new status report.

Description of the Species

Mountain holly fern, *Polystichum scopulinum*, is an evergreen, perennial fern (Figure 1). The stems curve upwards and the upright leaves (fronds) are 10–30 cm long (occasionally ≤ 50 cm long). The leaf stalk (petiole) is 0.2–0.33% the length of the leaf and is densely covered in light brown scales that become smaller and sparser towards the leaf. The leaf is several times longer than wide, broadest above the base, and narrowed towards the tip. The leaf is divided into leaflets (pinnae) that are themselves partially divided. The 1–3 cm long leaflets are longer than broad, with nearly parallel sides but narrowing towards the tips. Leaflets are overlapping, folded inward, and twisted horizontally, with slanting bases. Leaflet edges have fine, sharp, forward-pointing teeth that curve inward. Leaflet tips range from being blunt to having a short, abrupt, rigid point. Towards the tip of the leaflet, the teeth are smaller than the tooth at the tip. The underside of the leaf has a sparse covering of small hair-like growths that have stout projections. The growths are much longer than wide, broadest above the base, and narrowed towards the tips. The thin, scale-like coverings (indusia) of the immature spore-producing bodies (sori) are fringed with hairs. The spores are brown. Several technical descriptions of the species are available (including Wagner 1993; Douglas *et al.* 2000).

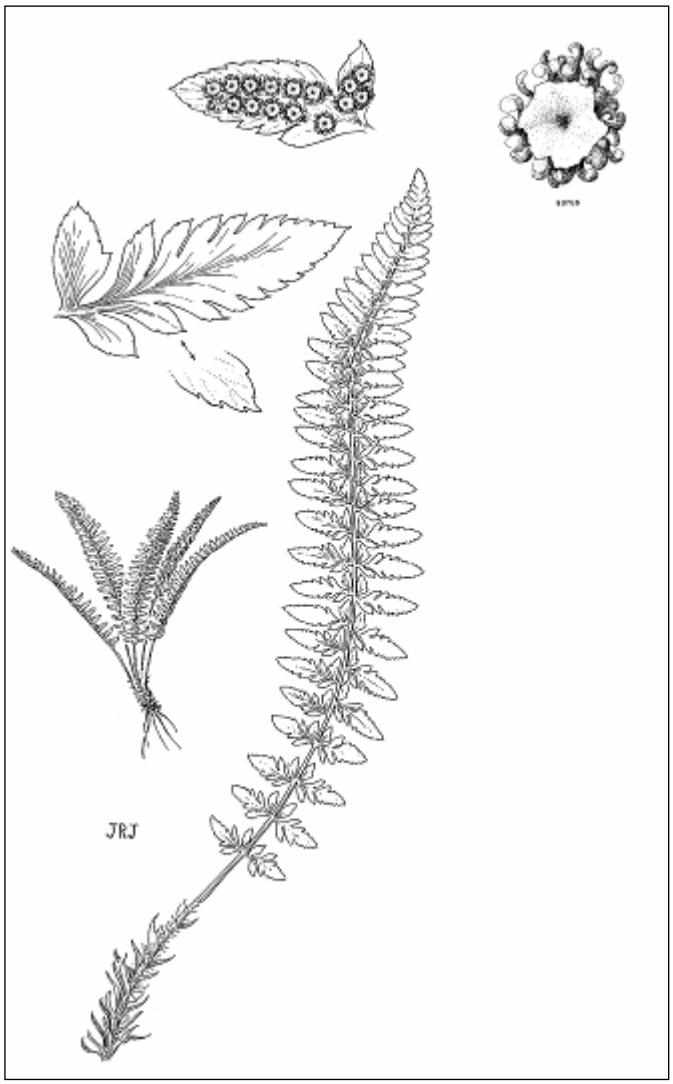


Figure 1. Illustration of mountain holly fern (reproduced with permission from the "Vascular Plants of the Pacific Northwest", University of Washington Press).

Populations and Distribution

Globally, mountain holly fern is restricted to North America (Figure 2). The species ranges from southwestern British Columbia (B.C.), sporadically south in the western United States (U.S.) to Colorado, Arizona, and California. Disjunct populations also occur in eastern Québec and western insular Newfoundland and Labrador (Wagner 1993; COSEWIC 2005).



Figure 2. Map of global distribution of mountain holly fern (based on data from COSEWIC 2005; Graham and Ackerfield 2007; Montana Natural Heritage Program 2007; USDA 2007).

In Canada, mountain holly fern occurs in B.C., Québec, and Newfoundland and Labrador (Figures 3 and 4). The B.C. populations are at the northern extent of their range in North America. Table 1 summarizes the details of the Canadian populations.

Table 1. Canadian populations of mountain holly fern (from COSEWIC 2005; USDA 2007).

Population	Location	Land tenure	Year last observed & status	Number of plants	Area of occupancy	Proximity to other populations
Olivine Mountain	Near Tulameen, BC	B.C. Crown land	1996 Extant	4	200 m^2	2.5 km from Britton Ck. population; 230 km from nearest known population in the U.S. (WA)
Britton Creek	Near Tulameen, BC	B.C. Crown land	2002 Extant	400[a]	1 ha	1.1 km from Grasshopper Mtn. population; 230 km from nearest population in the U.S. (WA)
Grasshopper Mountain (2 subpopulations)	Near Tulameen, BC	B.C. Crown land	1996 Extant	5 + 30[b]	200 m^2 + 500 m^2	1.1 km from Britton Ck. population; 230 km from nearest population in the U.S. (WA)
Mont Albert	Southerly slopes of the Vallée du Diable, eastern flank of Mont Albert, Gaspé Peninsula, QC	Québec Crown land in Gaspésie National Park	2004 Extant	215	8 ha	550 km from historic NL population; 3200 km from closest population in the U.S. (CO)
North Arm Mountain, Bay of Islands	Western Newfoundland and Labrador, NL	NL Crown land	1950 Unknown	?	?	550 km from QC population; 3800 km from closest population in the U.S. (CO)

[a] Population stable since 1995.

[b] B.C. Conservation Data Centre records the size of this subpopulation as 30 plants (B.C. CDC 2007), while COSEWIC (2005) states that the subpopulation consists of three plants.

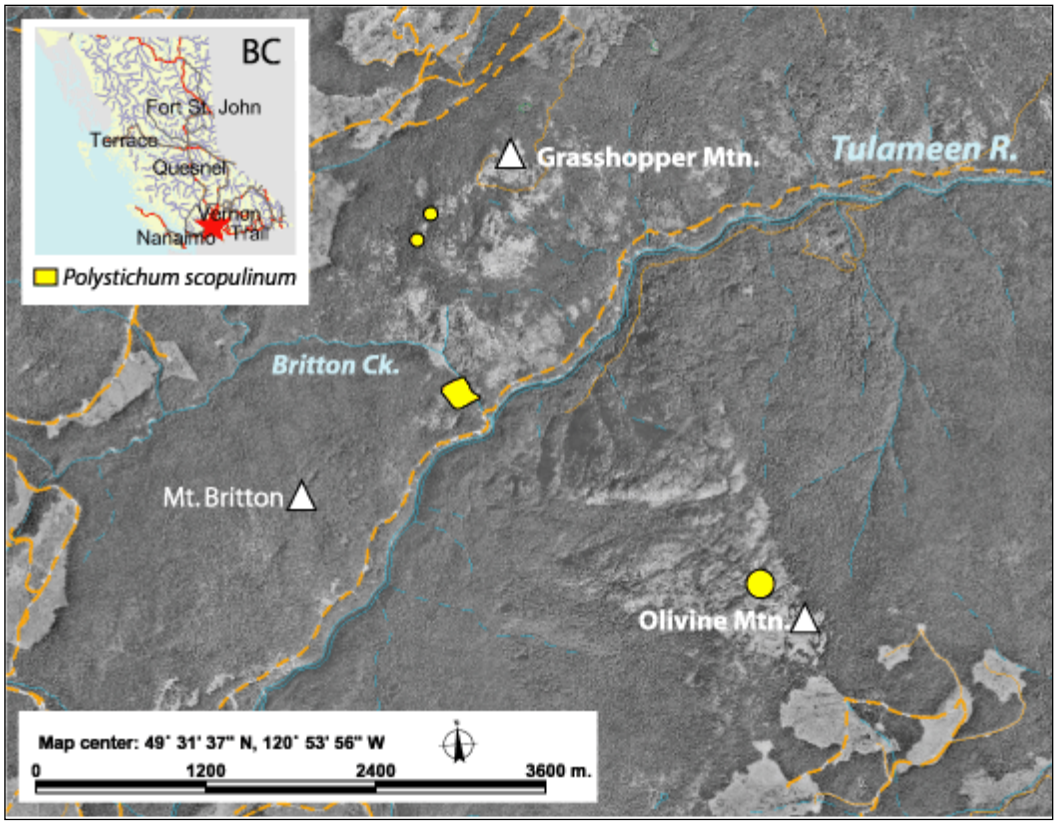


Figure 3. Map of mountain holly fern distribution in British Columbia (adapted from B.C. CDC 2007).

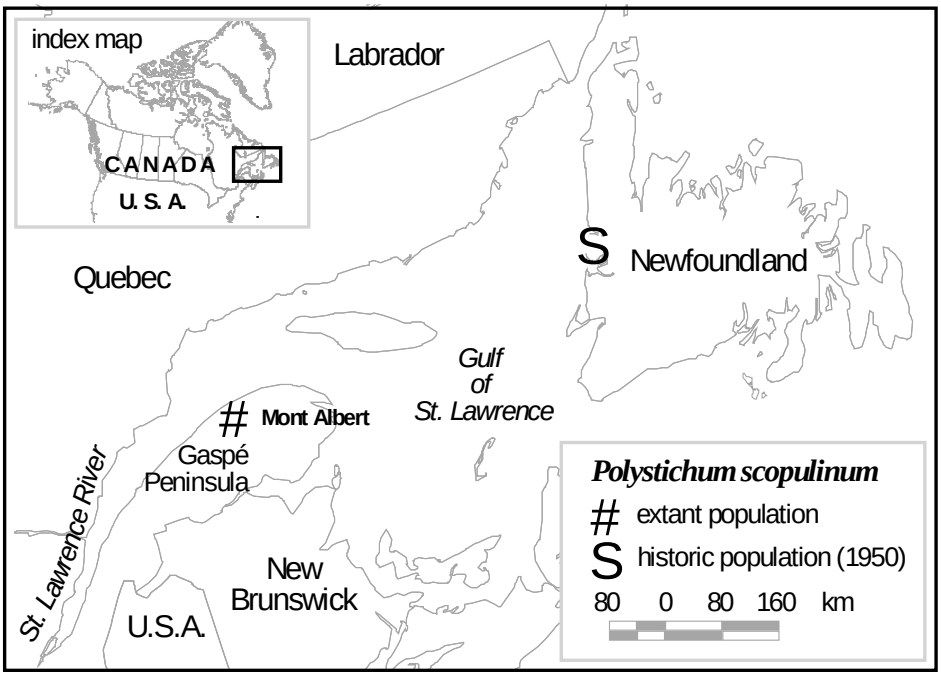


Figure 4. Map of mountain holly fern distribution in Eastern Canada (Wagner and Rouleau 1984; COSEWIC 2005).

Globally, mountain holly fern has a Secure (G5) Conservation Status Rank, meaning that it is common, widespread, and abundant (NatureServe 2007). In the U.S., the species' conservation status rank has not been assessed. In Canada, the species is considered Critically Imperiled (N1) (NatureServe 2007) and Threatened (COSEWIC 2005). The conservation status of the species at the state and provincial levels is summarized in Table 2. Mountain holy fern is a priority 2 species under goal 3 of the B.C. Conservation Framework (see <http://www.env.gov.bc.ca/conservationframework/> for details)

Table 2. Conservation status of mountain holly fern at the subnational level (from NatureServe 2007).

Country	Province or state	NatureServe rank code	NatureServe rank
Canada	British Columbia	S1	Critically Imperiled
	Québec	S1	Critically Imperiled
	Newfoundland and Labrador	SH	Possibly Extirpated (Historical)
U.S.	Arizona	S2	Imperiled
	California	SNR	Unranked
	Colorado	S1	Critically Imperiled
	Idaho	SNR	Unranked
	Montana	S1	Critically Imperiled
	Nevada	SNR	Unranked
	Oregon	SNR	Unranked
	Utah	S2	Imperiled
	Washington	SNR	Unranked
	Wyoming	SH	Possibly Extirpated (Historical)

If the mountain holly fern populations in Canada are lost, the potential for populations to re-establish from spores dispersed from other populations is relatively low. While fern spores can disperse across remarkable distances (Wagner and Rouleau 1984; Barrington 1993), many fern species appear to have difficulty in establishing and recruiting new individuals (Wild *et al.* 2006). While mountain holly fern spores can disperse across thousands of kilometers, the species apparently has low success in colonizing new sites based on the number of apparently suitable montane ultramafic sites (see "Habitat and biological needs" section for description) that are not occupied by the species (Figure 5).

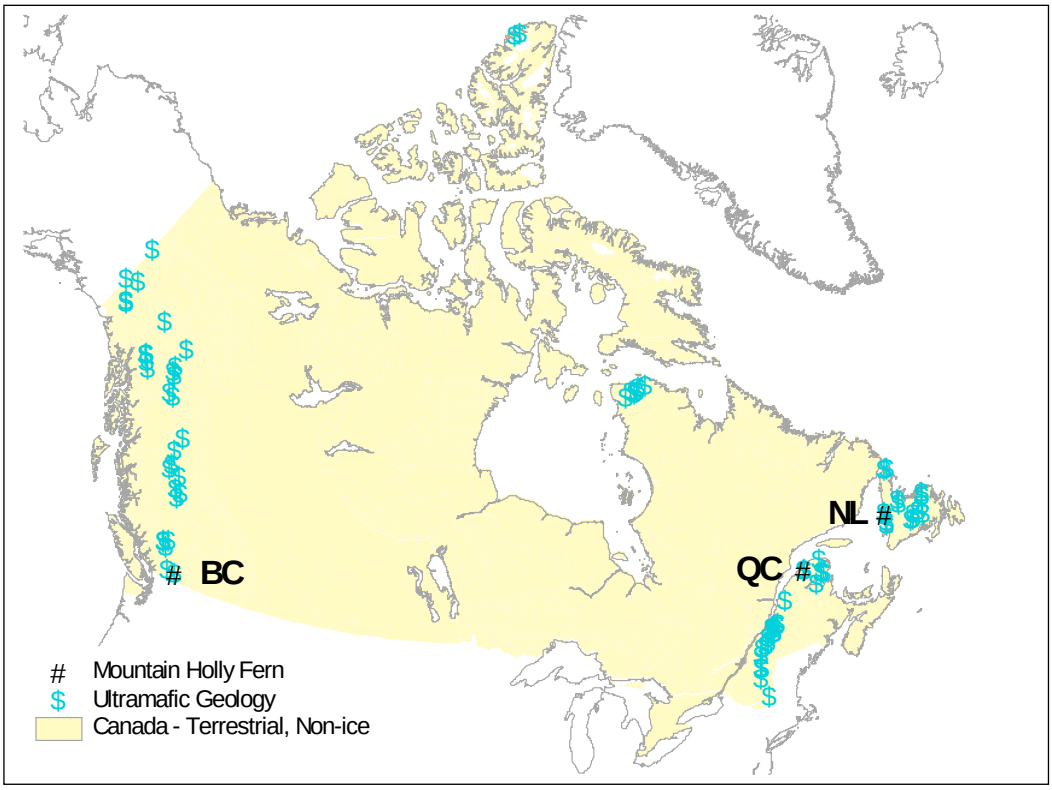


Figure 5. Map of mountain holly fern distribution in Canada in relation to ultramafic geology (based on data from Wheeler et al. 1996; COSEWIC 2005). Note: not all occurrences of ultramafic geology provide suitable habitat for mountain holly fern — the species colonizes dry, montane slopes only.

Although the global population size of mountain holly fern is unknown, it is likely that the estimated population size of less than 1000 plants in Canada (COSEWIC 2005) represents far less than 1% of the global population.

Little is known about the rate of change in geographical distribution and populations of mountain holly fern in Canada. All populations are known to be extant except for the Newfoundland and Labrador one, the status of which is unknown since it was originally discovered in 1950. The collection location is vague and the area is very remote (boat access), therefore is it possible that the population has persisted to the present without being re-discovered (COSEWIC 2005; C. Hanel, pers. comm., 2007). British Columbia and Québec populations are assumed to be stable.

Needs of the Mountain Holly Fern

Habitat and biological needs

Mountain holly fern is a species of montane ultramafic (serpentine) outcrops (Wagner 1993). Ultramafic rocks are granular, and consist almost entirely of ferromagnesian minerals (Longwell *et al.* 1969). Habitats associated with ultramafic outcrops have several distinct characteristics that influence vegetation:

- ultramafic rocks are highly erodible (Brooks 1987);

- available water in the soil is generally reduced by adsorption to montmorillonite clays (Brooks 1987);
- ultramafic slopes can also have excess moisture in the form of seepage, as is commonly observed in Newfoundland and Labrador (C. Hanel, pers. comm., 2007);
- soils are poor in nitrogen and phosphorus nutrients, and the calcium: magnesium ratio is low (Kruckeberg 1984; Brooks 1987); and
- soils may be toxic to most plants due to the presence of heavy metals such as chromium and nickel (Brooks 1987).

In B.C., mountain holly fern occurs along the ultramafic band (olivine clinopyroxenite) between Olivine Mountain and Grasshopper Mountain in the Tulameen River valley. The mountain holly fern populations occur at elevations from 979 to 1768 m. The vegetation of the sites is characteristically depauperate (in contrast to the dense surrounding forest), with dominant species including lodgepole pine (*Pinus contorta*), whitebark pine (*Pinus albicaulis*), Indian's-dream (*Aspidotis densa*), Kruckeberg's holly fern (*Polystichum kruckebergii*), common juniper (*Juniperus communis*), lance-leaved stonecrop (*Sedum lanceolatum*), Rocky Mountain butterweed (*Senecio streptanthifolius*), and kinnikinnick (*Arctostaphylos uva-ursi*).

In Québec, mountain holly fern occurs in a south-facing montane setting above the treeline (800–900 m). The fern grows in cracks in the ultramafic bedrock (serpentinite, dunite, and pyroxenite) and at the bases of large rocks. The depauperate vegetation is dominated by black spruce (*Picea mariana*), dwarf birch (*Betula nana*), Labrador tea (*Ledum groenlandicum*), lingonberry (*Vaccinium vitis-idaea*), and shrubby cinquefoil (*Dasiphora floribunda*). Associated plants include local serpentine endemics such as serpentine stitchwort (*Minuartia marcescens*), green-scaled willow (*Salix chlorolepis*), and Mount Albert goldenrod (*Solidago simplex* ssp. *simplex* var. *chlorolepis*), as well as eastern disjuncts such as Aleutian maidenhair (*Adiantum aleuticum*) and Indian's dream (*Aspidotis densa*) (COSEWIC 2005; MDDEP 2006).

The original locality description for the Newfoundland and Labrador occurrence was given as "southerly slopes of dry serpentine ridge" (Wagner and Rouleau 1984).

The gametophytic stage of mountain holly fern has not been observed in Canada, and its habitat requirements are unknown.

Ecological role

The ecological role of mountain holly fern is unknown, but it is assumed to be minor given its small population sizes (Table 1). The ultramafic habitat of the species may allow the species to survive in a situation where competition from other vegetation is low.

Limiting factors

Several biological factors limit the recovery potential of mountain holly fern in Canada.

Potentially sterile populations
Given their dramatically disjunct locations, the Québec and Newfoundland and Labrador populations of mountain holly fern can be assumed to have arisen from spore dispersal. In Washington State, however, primary sterile diploid hybrids of the species have been found (as opposed to the normal fertile tetraploid form) (Wagner and Rouleau 1984). Sterile hybrids are incapable of dispersing or reproducing by spores and depend totally on vegetative reproduction. Given the proximity of the B.C. populations to the Washington State ones, it is possible that some or all of the B.C. populations consist of sterile diploid hybrids.

Ecological requirements of gametophytic stage
If Canadian populations of mountain holly fern do reproduce by spore then, like other ferns, the colonization and persistence of the species may be limited by the ecological requirements of the gametophytic stage, including the need for specific moisture regimes and substratum chemistry (Given 1993; Wild *et al.* 2006). This factor has been used to explain the frequently observed "empty niche" phenomenon in fern species, where apparently suitable habitat is not occupied (Wild and Gagnon 2005). In B.C., George Douglas speculated that mountain holly fern reproduction occurs primarily through vegetative means, given that he failed to find gametophytes in the field (COSEWIC 2005). However, the failure to find gametophytes for fern species is not uncommon (Farrar 1976).

Poor competitors
Ferns tend to be poor competitors with other plant species and this could also limit the colonization and persistence of mountain holly fern (Given 1993).

Habitat specificity and limited habitat extent
Because montane ultramafic habitats are relatively rare in Canada, there is relatively little potential habitat for mountain holly fern to colonize. The habitat of the species is also inherently highly fragmented (controlled by geological outcroppings). The species may also have additional unknown habitat requirements at the edges of its range that further limit its potential habitat.

Small population sizes
The small population sizes of the species in Canada (see Table 1) place the populations at risk for extirpation due to demographic stochasticity.

Threats

In general, specific local threats apply primarily to the B.C. populations of mountain holly fern. No specific local threats to the Québec population, which occurs in the Gaspésie National Park, are known (F. Coursol, pers. comm., 2007). It is not known whether the Newfoundland and Labrador population is extant; however, the assumed historical locality is very remote and not currently at risk from human activities (C. Hanel, pers. comm., 2007).

Threat classification

Potential threats to the survival of mountain holly fern populations in B.C. include mining, road construction, slope failure, and severe fire. Current threats to the species within in B.C. include mountain pine beetle (*Dendroctonus ponderosae*) control and mineral exploration. Potential threats in all three provinces include climate change and botanical collecting (summarized in Table 3).

Table 3. Threat classification table for mountain holly fern.

1 Mineral exploration		**Threat attributes**		
Threat category	Habitat loss or degradation, accidental mortality	**Extent**	Widespread in B.C.	
			Local	**Range-wide**
General threat	Mineral exploration	**Occurrence**	B.C.: anticipated QC: not anticipated NL: not anticipated	Unknown
		Frequency	Unknown	Unknown
Specific threat	Destruction, removal, or burial of plants and alteration of habitat	**Causal certainty**	High	High
		Severity	High	High
Stress	Increased mortality, reduction in population size, population extinction	**Level of concern**	Medium	
2 Mining		**Threat attributes**		
Threat category	Habitat loss or degradation, accidental mortality	**Extent**	Widespread in B.C.	
			Local	**Range-wide**
General threat	Mining	**Occurrence**	B.C.: anticipated QC: not anticipated NL: not anticipated	Unknown
		Frequency	Unknown	Unknown
Specific threat	Destruction, removal, or burial of plants and alteration of habitat	**Causal certainty**	Low	Low
		Severity	Low	Low
Stress	Increased mortality, reduction in population size, population extinction	**Level of concern**	Low	
3 Mountain pine beetle control		**Threat attributes**		
Threat category	Habitat loss or degradation, accidental mortality	**Extent**	Localized	
			Local	**Range-wide**
General threat	Harvesting of *Pinus* trees to control the spread of the mountain pine beetle	**Occurrence**	B.C.: current QC: not anticipated NL: not anticipated	-
		Frequency	One-time	-
Specific threat	Destruction or burial of plants and alteration of habitat	**Causal certainty**	Low	-
		Severity	High	-

Stress	Increased mortality, reduction in population size, population extinction	**Level of concern**	Medium	
4	**Road construction**	**Threat attributes**		
Threat category	Habitat loss or degradation, accidental mortality	**Extent**	Widespread in B.C.	
			Local	**Range-wide**
General threat	Road construction	**Occurrence**	B.C.: anticipated QC: not anticipated NL: not anticipated	Unknown
		Frequency	One-time	One-time
Specific threat	Destruction, removal, or burial of plants and alteration of habitat	**Causal certainty**	High	High
		Severity	High	High
Stress	Increased mortality; reduction in population size; population extinction	**Level of concern**	Medium	
5	**Climate change**	**Threat attributes**		
Threat category	Climate and natural disasters	**Extent**	Widespread	
			Local	**Range-wide**
General threat	Climate change	**Occurrence**	-	Current
		Frequency	-	Seasonal
Specific threat	Potential for increased frequency and length of drought periods	**Causal certainty**	-	Low
		Severity	-	Unknown
Stress	Poor reproductive success, increased mortality, reduction in population size, population extinction	**Level of concern**	Low	
6	**Slope failure**	**Threat attributes**		
Threat category	Climate and natural disasters	**Extent**	Widespread	
			Local	**Range-wide**
General threat	Slope failure	**Occurrence**	-	Anticipated
		Frequency	-	Recurrent
Specific threat	Destruction, burial, and uprooting of plants	**Causal certainty**	-	Low
		Severity	-	High
Stress	Increased mortality, reduction in population size, population extinction	**Level of concern**	Low	
7	**Severe fire**	**Threat attributes**		
Threat category	Climate and natural disasters	**Extent**	Widespread	
			Local	**Range-wide**

General threat	Severe fire	**Occurrence**	B.C.: anticipated QC: not anticipated NL: not anticipated	Anticipated
		Frequency	-	Recurrent
Specific threat	Destruction of plants	**Causal certainty**	-	Low
		Severity	-	High
Stress	Poor reproductive success, increased mortality, reduction in population size, population extinction	**Level of concern**	Low	
8 Botanical collecting		**Threat attributes**		
Threat category	Disturbance or persecution	**Extent**	Widespread	
			Local	**Range-wide**
General threat	Discriminate killing	**Occurrence**	-	Anticipated
		Frequency	-	Unknown
Specific threat	Collection of botanical specimens	**Causal certainty**	-	Medium
		Severity	Moderate in Canada	Low
Stress	Reduction in population size, population extinction	**Level of concern**	Low	

B.C. = British Columbia; NL = Newfoundland and Labrador; QC = Québec.

Description of the threats

Mining

Mining was identified as the primary potential threat to mountain holly fern in B.C. (COSEWIC 2005). Bright Star Ventures, a mining exploration company (now delisted), no longer seems to be active in the area as was the case when the status report was written (COSEWIC 2005). Despite decades of intensive exploration activities in the area, most prospects fail to get developed. Mining is not considered to be a threat for Québec or Newfoundland and Labrador populations.

Mineral exploration

Mineral exploration in the Tulameen area currently represents a greater threat to B.C. mountain holly fern populations than mining. Figure 6 illustrates the locations of current and past mining activities near mountain holly fern populations. Mining and mineral exploration are not considered threats for Québec or Newfoundland and Labrador populations.

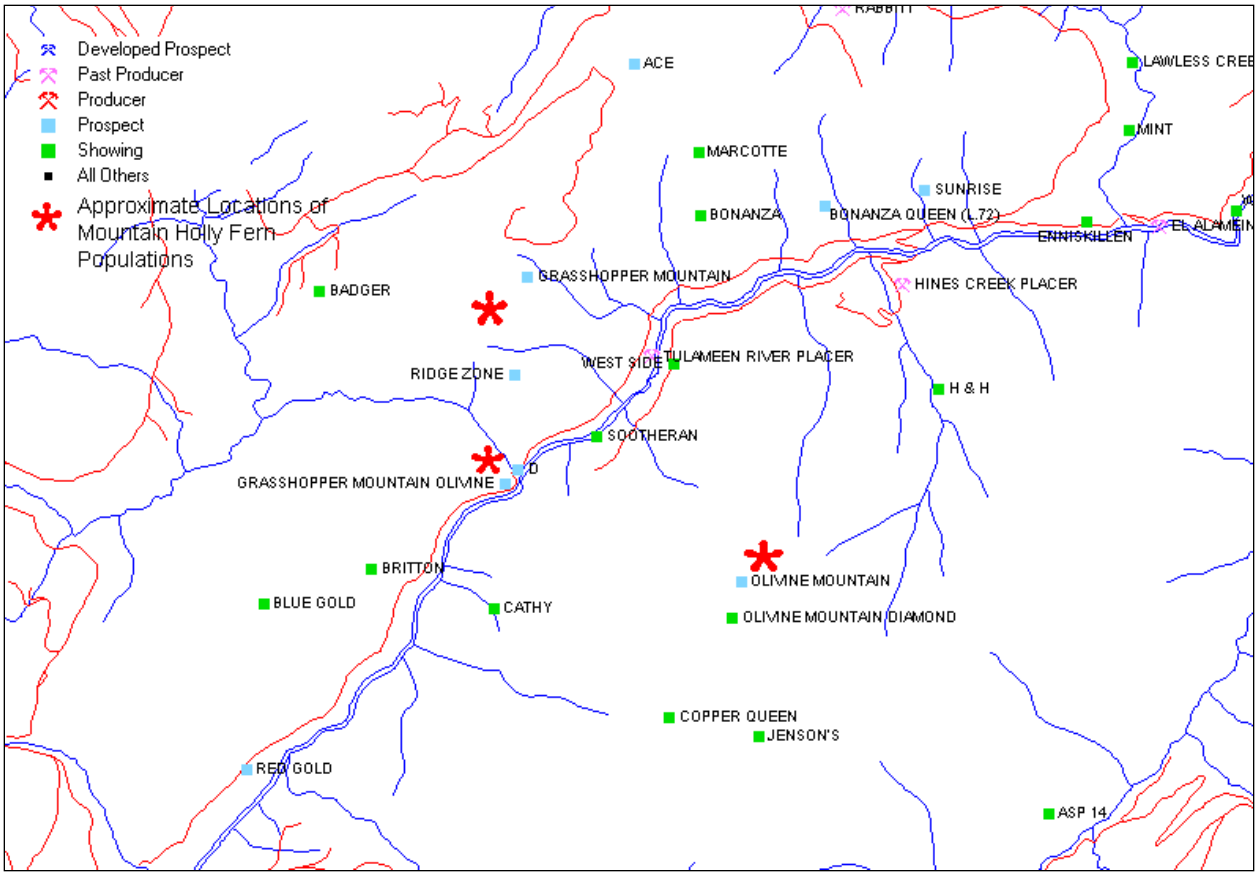


Figure 6. Mining activity locations near mountain holly fern populations in B.C. Source: B.C. MEMPR (2007).

Mountain pine beetle control

The Merritt Timber Supply Area in B.C. is experiencing an exponential increase in mountain pine beetle attack and the B.C. Ministry of Forests and Range is currently taking "an aggressive pro-active approach to identifying and managing the destructive forest pests" (Senger 2006). As part of their strategy, they set a forest licensee salvage/sanitation harvest target of 212,524 m^3 in the Tulameen Landscape Unit (where the B.C. mountain holly fern populations occur) in 2006–2007 (Senger 2006). However, the 3 known populations of mountain holly fern occupy less than 2 ha of the Tulameen Landscape Unit and it is unknown how much of this harvest could overlap with mountain holly fern populations.

Salvage logging activities of this nature could result in habitat destruction by disturbing rocks and soil. Plants could also be destroyed by heavy machinery and buried under disturbed rocks and soil. Mountain pine beetle control is not a threat for Québec or Newfoundland and Labrador populations.

Road construction

Road construction is a potential threat near mountain holly fern populations in B.C. The construction of mining exploration roads is not subject to the same degree of regulation as that of

forestry roads, and they may cause more habitat destruction. Road construction is not a threat for Québec or Newfoundland and Labrador populations.

Climate change
The potential impacts of climate change on mountain holly fern populations are difficult to assess. Although altered climate regimes may be favourable for populations by creating conditions more similar to those in the centre of the species' range, there is a risk of more extreme climatic conditions, which could potentially reduce the viability of populations (e.g., more severe droughts). Climate change is a potential threat to the species throughout its range.

Slope failure
Severe slope failures (due to the colluvial nature of the soil) could eradicate some populations. It is not known which populations are most at risk due to this potential threat but it applies to populations throughout Canada.

Severe fire
Severe fires could eradicate the B.C. mountain holly fern populations. The populations occur within areas where stand-replacing fires are expected to occur every 4–50 years or every 100 years (Natural Disturbance Types 3 and 4) (Senger 2006).

The Québec population is less at risk because it occurs above the tree line (COSEWIC 2005). The Newfoundland and Labrador population, if extant, is unlikely to be at risk due to severe fire because of the climate in which it occurs (C. Hanel, pers. comm., 2007).

Botanical collecting
Given the small population sizes of mountain holly fern in Canada (Table 1), indiscriminate botanical collecting in extant populations could have significant impacts on population sizes. This potential threat is a minor one for all of the Canadian populations due to their locations, which are either remote, or at least removed from human pathways.

Actions Already Completed or Underway

A preliminary conservation plan has been drafted for the Québec population (MDDEP 2006). Searching for the historic Newfoundland and Labrador population was conducted in 2000 (seven people searched for one day). No specific recovery actions have been completed or are underway in B.C.

Knowledge Gaps

Recovery efforts for mountain holly fern in Canada are limited by several knowledge gaps, discussed below.

Distribution of species in Canada
The potential for finding additional populations in B.C. is relatively high. Known populations occur at montane ultramafic sites. Ultramafic sites have attracted a lot of botanical interest, but mountain holly fern populations are likely easily overlooked, particularly when the species co-

occurs with other *Polystichum* species such as the more common Kruckeberg's holly fern (*Polystichum kruckebergii*) which is found in the area. Also, some ultramafic sites occur in remote mountainous areas that have presumably received less search effort.

Additional survey effort is needed to determine whether the historic Newfoundland and Labrador population is extant. Relatively little survey effort has been devoted to the area due to its remote location (boat access only) (C. Hanel, pers. comm., 2007). The Newfoundland and Labrador specimen of mountain holly fern was also originally misidentified as Braun's hollyfern (*Polystichum braunii)* until 1978 (Wagner and Rouleau 1984).

The likelihood of finding additional populations in Québec is relatively low, given the intensive search effort that has been devoted to ultramafic sites (G. Hall, F. Coursol, pers. comm. via M. Wild 2007).

Gametophyte ecology
The importance of the gametophyte stage in the reproduction of mountain holly fern in Canada is unknown, as are the habitat requirements of the gametophyte, if applicable (gametophytes have not been observed in Canada). Information about gametophyte ecology would influence recovery actions and could be used to refine a definition of critical habitat.

Vegetative reproduction
The importance of vegetative reproduction in population persistence, growth, and dispersal is unknown. If vegetative reproduction is the primary mode of reproduction as suggested by COSEWIC (2005), recovery actions and the estimation of population viabilities will be influenced.

Genetics of Canadian populations
Investigations are needed to determine whether Canadian populations consist of the normal fertile tetraploid form or of the sterile diploid form of mountain holly fern (Wagner and Rouleau 1984). This information would influence recovery actions and estimates of population viability.

RECOVERY

Recovery Feasibility

The recovery of mountain holly fern in Canada is **feasible**, based on the following criteria:

- Mature sporophytes capable of vegetative reproduction (and possibly sexual reproduction) are currently available to improve the population growth rate and population abundance.
- Sufficient suitable habitat is available to support the species (according to the known habitat requirements).
- Significant threats to the species or its habitat can be avoided or mitigated through recovery actions.
- The necessary recovery techniques exist — most have been demonstrated to be effective.

Recovery Goal

The recovery goal for mountain holly fern is to **protect and maintain** all known[1] populations in Canada.

Rationale for the Recovery Goal

The recovery goal is based on ensuring the survival of the species in Canada. Distribution within Canada was historically, and is currently, very restricted. While the populations face some threats, the recovery potential of mountain holly fern is primarily limited by the biological factors discussed in the "Limiting factors" section.

Recovery Objectives

The recovery goal for mountain holly fern is supported by the following objectives (which should be achieved by 2014):

1. to secure long-term protection for extant populations and their habitats (areas of occupancy plus appropriate essential habitat);
2. to refine the current distribution of the species in Canada;
3. to address knowledge gaps including: determining population trends, demographic patterns, and life history (survival and reproduction) of extant populations; and
4. to determine whether augmentation of the populations is necessary and, if required, develop and test techniques to establish populations on existing and historic sites.

[1] "All known populations" will include the Newfoundland and Labrador population if it is re-located.

Approaches Recommended to Meet Recovery Objectives

Recovery planning table

Recovery planning for mountain holly fern is summarized in Table 4.

Table 4. Recovery planning table for mountain holly fern.

Priority	Threat or concern addressed	Broad strategy to address threat	Recommended approaches to meet recovery objectives
Objective 1: to secure long-term protection for extant populations and their habitats (areas of occupancy plus appropriate essential habitat)			
High	Mining and mineral exploration, mountain pine beetle control, road construction, slope failure, severe fire	Protection (habitat, species), management (habitat, species), stewardship, research, enforcement, coordination, communication and outreach	• designate the Crown land on which B.C. populations grow for the conservation of natural resources under Section 17 of the B.C. Land Act to make land users aware of the location of the species • list the mountain holly fern as a species at risk under the B.C. Forest and Range Practices Act and establish wildlife habitat areas • determine the amount of habitat required to adequately protect the populations (including those that occur in unstable, sloping habitats) • communicate with and facilitate the development of an appropriate road construction plan with B.C. Ministry of Forests and Range and Ministry of Energy, Mines and Petroleum Resources • assist the B.C. Ministry of Forests and Range in developing a site management plan for the area • develop management plans in B.C. that include guidelines on: o mitigating the effects of mountain pine beetle control on mountain holly fern populations, and o managing the risk of severe fires extirpating populations.
Low	Botanical collecting	Communication and outreach	• education of botanical collectors regarding the need to protect the species and its habitat
Objective 2: to refine the current distribution of the species in Canada			
Medium	Knowledge gaps	Inventory, communication and outreach	• NL: conduct additional field surveys for the species in its presumed historic locality • B.C.: identify potential habitats in the southern part of the province using detailed geological mapping and aerial photography; conduct field surveys in potential habitats • B.C.: communicate with Ministry of Energy, Mines and Petroleum Resources in regard to the locations of the fern with respect to mining and mineral exploration • B.C.: communicate with the Ministry of Forests and Range in regard to the locations of the fern with respect to Mountain Pine Beetle control and road construction • QC: conduct surveys on south-facing slopes that have not yet been surveyed • provide field botanists with descriptions of mountain holly fern and its habitat
Objective 3: to address knowledge gaps including: determining population trends, demographic patterns, and life			

history (survival and reproduction) of extant populations			
Medium	Knowledge Gaps	Research, inventory, and monitoring	• develop a research program to estimate the viability of extant populations • conduct studies to estimate critical population viability parameters including: o population sizes and structures (and trends) o demographic parameters (including survival and fecundity of gametophytes, surveys for gametophytes in all extant populations, the importance of the various modes of dispersal, etc.) o genetic parameters (determine whether populations consist of sterile diploid hybrids or fertile tetraploids)
Objective 4: to determine whether augmentation of the populations is necessary and, if required, develop and test techniques to establish populations on existing and historic sites			
Low	Climate change (and to support the recovery goal in general)	Research, propagation	• assess the appropriateness of reintroduction • delineate potential habitat if determined appropriate • conduct greenhouse studies to investigate the potential of propagating plants from field-collected spores, from the spore bank, and from vegetative propagules • conduct field studies to investigate methods of transplanting propagated plants for potential population augmentation

B.C. = British Columbia; NL = Newfoundland and Labrador; QC = Québec.

Description of the recovery planning table

The first high priority of recovery planning is to protect the populations and habitats of mountain holly fern in Canada. This objective addresses the majority of the threats to the species and prevents the extirpation of populations due to anthropogenic causes in the short term. Most of the recovery approaches focus on the B.C. populations. Although B.C. populations occur on provincial Crown land, they are not covered by any stewardship initiatives nor are they specifically protected.

The first medium priority objective is to refine the distribution of the species in Canada. The finding of additional populations of mountain holly fern (or finding the historic Newfoundland and Labrador population) could influence the status of the species and the future refinement of recovery objectives. Although ultramafic habitats in Canada have been the focus of considerable botanical survey effort, mountain holly fern can be confused with other *Polystichum* species in the field where they co-occur. In B.C., mountain holly fern can easily be mistaken for the more common and blue-listed, Kruckeberg's holly fern *Polystichum kruckebergii.* In Newfoundland and Labrador, the single mountain holly fern specimen from 1950 was originally mistaken for *Polystichum braunii* and the specimen was not correctly identified for 28 years (Wagner and Rouleau 1984). Targeted field surveys for the species may therefore reveal additional occurrences. Québec is a lower priority for inventory given that considerable search effort has been undertaken in ultramafic habitats, and no other *Polystichum* species occur in ultramafic habitats there (G. Hall and F. Coursol, pers. comm. via M. Wild, 2007).

The second medium priority objective is estimating the viability of extant populations. This objective addresses many of the knowledge gaps related to the recovery of mountain holly fern.

Once the biology and demography of the species is better understood, more specific recovery objectives can be formulated towards meeting the recovery goal for the species in Canada.

Finally, a low priority objective entails determining whether augmentation of the populations is necessary, and if required, develop and test techniques to establish populations on existing and historic sites. Given (1993) recommends that off-site garden collections and germplasm banks be maintained for fern species as a back-up to *in situ* conservation through the protection of natural habitats. These techniques will be necessary if population objectives are eventually refined to include population augmentation based on additional information about population viability.

Performance Measures

The following performance measures will evaluate the success of the recovery strategy in meeting its objectives:

- population monitoring indicates that the numbers of plants at the known existing sites are stable or increasing by 2014;
- suitable habitat in B.C. for new populations, and in Newfoundland and Labrador for the historic population has been surveyed and documented by 2014;
- demographic patterns and life history (survival and reproduction) of extant populations has been investigated by 2014;
- review of population demographics and life history information has determined whether the populations should be augmented in any of the three jurisdictions by 2014; and
- the known mountain holly fern sites in B.C. are recognized by managers in the B.C. Ministry of Forests and Range and included in their forests and range management plans for fire protection and mountain pine beetle control by 2014.

Critical Habitat

Identification of the species' critical habitat

Critical habitat as legally defined under the federal *Species at Risk Act* will not be proposed until data gaps are addressed and consultation is complete. Relatively little is known about the specific habitat needs of the species or its distribution, and more definitive work must be completed before any specific sites will be formally proposed as critical habitat. It is expected that critical habitat will be proposed following consultation and development of stewardship options with affected landowners and organizations, and completion of outstanding work required to identify specific habitat and area requirements for this species where required.

No critical habitat will be proposed in Newfoundland and Labrador unless the historically known population is confirmed to be extant. If applicable, proposed critical habitat will be addressed through a schedule of studies as part of an action plan for the species.

Recommended schedule of studies to identify critical habitat

Additional information is needed to define the critical habitat of mountain holly fern in B.C. Several studies should be completed within the next 5 years to refine recommendations for critical habitat (Table 5).

Table 5. Schedule of studies.

Description of activity	Outcome/Rationale	Timeline
Using established survey and mapping techniques delineate the boundaries of all occupied habitats for all extant Canadian populations	Mapping of the extant areas of occupancy is needed to define critical habitat	2009–2014
Identify habitat attributes at extant sites	Determine the necessary abiotic and biotic attributes required for critical habitat	2009-2014
Complete survey for extant populations in Newfoundland and Labrador	Areas of occupancy of new populations should be considered for critical habitat	2009–2014
Complete inventory for additional populations in B.C.	Areas of occupancy of new populations should be considered for critical habitat	2009–2014

Existing and Recommended Approaches to Habitat Protection

The Québec population is protected within a provincial park (le Parc national de la Gaspésie), and a conservation plan has been drafted for the species. The B.C. populations occur on provincial Crown land, but the habitat of mountain holly fern is not formally protected. The following approaches to habitat protection in B.C. are recommended:

- identify mountain holly fern as a species at risk under the B.C. *Forest and Range Practices Act* and establish Wildlife Habitat Areas as appropriate;
- *Land Act* designations for the conservation of a natural resource under Section 17 can be sought to make land users aware of the location of mountain holly fern;
- facilitation of the development of an appropriate road construction plan in the areas where mountain holly fern occurs with B.C. Ministry of Forests and Range and Ministry of Energy, Mines and Petroleum Resources;
- communication of the road construction plan to forestry and mining contractors; and
- provide assistance to the B.C. Ministry of Forests and Range in developing site protection and management plans for the known existing mountain holly fern sites.

The historical Newfoundland and Labrador population is thought to occur on provincial Crown land (C. Hanel, pers. comm., 2007) with no special habitat protection in place.

Effects on Other Species

In B.C., mountain holly fern occurs in the same habitats with Kruckeberg's holly fern (*Polystichum kruckebergii*). This species is ranked by the B.C. Conservation Data Centre as Red-listed in the province and by NatureServe as critically imperiled (S1) (B.C. CDC 2007; NatureServe 2007), however, it is widespread in the area and also overlaps with the smaller mountain holly fern sites. Mountain holly fern populations also occur in an area where there have been many observations of Mountain Beaver (*Aplodontia rufa*), which is considered vulnerable (Blue-listed) in B.C. and of Special Concern in Canada (B.C. CDC 2007; COSEWIC 2005). The

Mountain Beaver uses wetter habitats than those colonized by mountain holly fern; however, recovery activities for all species are expected to positively impact the associated rare species and ecological communities, by ensuring local habitat protection. Recovery activities in Québec are not expected to have any effects on other species, as habitat protection is already in place. Recovery activities in Newfoundland and Labrador are not expected to have effects on other species.

Socioeconomic Considerations

Recovery activities in B.C. could have negative impacts on mining interests, but the impacts are expected to be low. Recovery activities for the species in Québec and Newfoundland and Labrador are expected to have negligible socioeconomic impacts.

Recommended Approach for Recovery Implementation

Because three jurisdictions are involved, each with different species at risk legislation, regulations, policies, and priorities, it is recommended that each jurisdiction prepare an action plan under its respective program as detailed in Table 6.

Table 6. Recovery implementation approach.

Jurisdiction	Responsible agency	Federal representative	Type of action plan
British Columbia	Province of British Columbia	Environment Canada, Canadian Wildlife Service (Pacific-Yukon)	Single-species
Québec	Province of Québec	Environment Canada, Canadian Wildlife Service (Québec)	Single-species or multi-species
Newfoundland and Labrador	Province of Newfoundland and Labrador	Environment Canada, Canadian Wildlife Service (Atlantic)	Single-species (if applicable)

Statement on Action Plans

Actions plans for the recovery strategy should be completed as follows under the approach outlined in Table 6:

- by 2014 in British Columbia;
- by 2014 in Québec; and
- in Newfoundland and Labrador, if the presence of the species is confirmed, the Government of Newfoundland and Labrador will consider listing the species under the *Newfoundland and Labrador Endangered Species Act*. A listing of Threatened or Endangered will require the development of a recovery plan however the Province can adopt a national plan if one exists. The timeline for the development of an action plan should take about 2 years from the time of legal listing. If the species presence is confirmed, but the species is not listed under Provincial legislation, the Province will consult with the Federal Government regarding the conservation of the species.

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