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Recovery Strategy Series
Adopted under Section 44 of SARA

Recovery Strategy for the Lemmon's Holly Fern (*Polystichum lemmonii*) in Canada

Lemmon's Holly Fern



2013

Canada

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

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RECOVERY STRATEGY FOR THE LEMMON'S HOLLY FERN (*Polystichum lemmonii*) IN CANADA

2013

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 Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia" (Part 2) under Section 44 of the *Species at Risk Act.* Environment Canada has included an addition which completes the SARA requirements for this recovery strategy, and excludes the section on Socio-Economic Considerations. Socio-economic factors are not part of the consideration process for federal recovery strategies developed under SARA. These factors are kept isolated from this strategic phase of recovery planning.

The federal recovery strategy for the Lemmon's Holly Fern in Canada consists of two parts:

Part 1: Federal Addition to the "Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia", prepared by Environment Canada.

Part 2: Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia, prepared by the Southern Interior Rare Plants Recovery Implementation Group, for the British Columbia Ministry of Environment.

TABLE OF CONTENTS

PART 1: Federal Addition to the "Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia", prepared by Environment Canada 1

PREFACE 2
ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT 3
1. Species Status Information 3
2. Socio-economic Considerations 3
3. Recovery Feasibility 4
4. Population and Distribution Objectives 4
5. Critical Habitat 5
5.1 Identification of the Species' Critical Habitat 5
5.2 Schedule of Studies to Identify Critical Habitat 7
5.3 Examples of Activities Likely to Result in Destruction of Critical Habitat 7
6. Statement on Action Plans 8
7. Effects on the Environment and Other Species 8
8. References 9

Appendix 1. Map of Critical Habitat for Lemmon's Holly Fern in Canada 10

PART 2: Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia, prepared by the Southern Interior Rare Plants Recovery Implementation Group, for the British Columbia Ministry of Environment 12

PART 1: Federal Addition to the "Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia", prepared by Environment Canada

PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) 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.

The federal Minister of the Environment is the competent minister for the recovery of the Lemmon's Holly Fern and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. It has been prepared in cooperation with the Province of British Columbia. 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 attached provincial recovery strategy for the Lemmon's Holly Fern (Part 2 of this document) was provided to the Province of British Columbia as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared in cooperation with Environment Canada.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Lemmon's 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 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.

ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT

The following sections have been included to address specific requirements of SARA that are either not addressed, or which need more detailed comment, in the "Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia" (Part 2 of this document, referred to hereafter as "the provincial recovery strategy"). In some cases, these sections may also include updated information or modifications to the provincial recovery strategy for adoption by Environment Canada.

1. Species Status Information

Legal Status: SARA Schedule 1 (Threatened) (2005)

Table 1. Conservation Status (from NatureServe 2011, B.C. Conservation Data Centre 2011, and B.C. Conservation Framework 2011) for Lemmon's Holly Fern.

Global (G) Rank	National (N) Rank	Sub-national (S) Rank	COSEWIC Designation	B.C. List	B.C. Conservation Framework
G4*	Canada (N2), United States (N4)	Canada: British Columbia (S2); United States: California (SNR), Idaho (SNR), Oregon (S4), Washington (SNR)	Threatened (2003)	Red	Highest priority: 1, under Goal 3**

* Rank 1– critically imperiled; 2– imperiled; 3- vulnerable to extirpation or extinction; 4- apparently secure; 5– secure; H– possibly extirpated; 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

It is estimated that the percent of the global range of this species in Canada is less than 1%.

2. Socio-economic Considerations

The provincial recovery strategy contains a short statement on socio-economic considerations. As socio-economic factors are not a consideration in any aspect of the preparation of SARA recovery strategies under Section 41(1) of SARA, the Socio-economic Considerations section of the "Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia", is not considered part of the federal Minister of Environment's recovery strategy for this species.

3. Recovery Feasibility

This section replaces the "Recovery Feasibility" section in the provincial recovery strategy.

Recovery of the Lemmon's Holly Fern (*Polystichum lemmonii*) is considered technically and biologically feasible based on the following four criteria outlined in the draft SARA Policies (Government of Canada 2009):

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, plants are capable of vegetative reproduction, and are known to produce spores. The one known extant population appears to be stable.

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

   Yes, there is habitat to support the existing population. The current habitat is sufficient for continued maintenance of the species but expansion is only likely at sites with the same unique conditions found with ultramafic rock outcrops.

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

   Yes, primary threats to the one known extant population of Lemmon's Holly Fern may be avoided or mitigated by cooperation with land managers.

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

   Yes, general recovery methods and techniques to achieve the population and distribution objectives are known.

4. Population and Distribution Objectives

This section replaces the "Recovery Goal" section in the provincial recovery strategy.

Environment Canada has determined the Population and Distribution Objective for Lemmon's Holly Fern to be:

To maintain the distribution, and to maintain or (where feasible) improve the abundance, of the one known extant population of this species in Canada, as well as any other extant populations that may be identified.

Rationale:

Abundance and distribution information for this species shows one known extant population[1] in Canada, that has been recently confirmed (2008[2], 2011[3] surveys). This population occurs on non-federal land at Baldy Mountain, near Oliver, B.C. Lemmon's Holly Fern is restricted to ultramafic soils (that are high in iron and magnesium, low in calcium and nitrogen), which results in a very localized distribution of suitable habitat. There is no information to indicate that the species was previously more widespread; therefore an objective to actively increase the number of populations, is not appropriate. However, if additional naturally occurring populations are discovered, these should also be maintained. The rate of change in abundance for this population is currently unknown; where the best available information and/or long-term monitoring indicates overall population decline, deliberate attempts to improve abundance would be appropriate.

5. Critical Habitat

5.1 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 2007 provincial recovery strategy for Lemmon's Holly Fern noted that critical habitat could not be identified at that time (nor is it required in the provincial process), owing to a lack of information on habitat and area requirements for the species. Environment Canada has reviewed the available information and concluded that sufficient information is available to identify critical habitat at this time. 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. A primary consideration in the identification of critical habitat is the amount, quality, and locations of habitat needed to achieve the population and distribution objectives.

[1] "Populations" are characterized as being separated by >1 km, and "sub-populations" represent records of individuals, or patches of individuals, that are within 1 km of each other.
[2] Matt Fairbarns 2008 report: Monitoring Lemmon's Holly Fern (*Polystichum lemmonii*), Baldy Mountain, British Columbia. Prepared for B.C. Ministry of Environment
[3] Surveyed June 21, 2011: observers Kella Sadler (Environment Canada), Terry McIntosh (consultant), Orville Dyer (B.C. Ministry of Natural Resource Operations), Kirk Safford (B.C. Ministry of Environment), Mark Weston (B.C. Parks)

Ecological attributes of Lemmon's Holly Fern habitat are outlined in the provincial recovery strategy, and in the COSEWIC status report (COSEWIC 2003):

1. Lemmon's Holly Fern is restricted to ultramafic rock outcrops, which produce soils that are high in iron and magnesium, and low in calcium and nitrogen. Baldy Mountain is one of only three isolated ultramafic sites in British Columbia, and it appears to have a geology that is unique from the other two (Tulameen River area, Bridge River area).
2. Ultramafic rock outcrop habitats that support Lemmon's Holly Fern are characterized by a predominant lack of tree cover, shallow soils and sparse groundcover. Many plant species are unable to colonize ultramafic soils owing to the soil's unique chemistry.
3. Lemmon's Holly Fern plants are found on generally steep, mostly east-facing and north-facing slopes, on a variety of soil types; owing to the steepness of terrain, substrata are typically unstable, and slumping can occur. Although there is predominantly a lack of tree cover, some plants grow well in the shade of rock outcrops or trees.

Critical habitat for Lemmon's Holly Fern in Canada is identified as the area occupied by individual plants or patches of plants, including the associated potential location error from GPS units (ranging from 5 m to 25 m uncertainty distance), plus an additional 50 m (i.e., critical function zone distance[4]) to encompass immediately adjacent areas. Critical habitat also includes the entire portion of distinct ecological features[5] which are associated with, and are integral to, the production and maintenance of suitable habitat conditions, and which provide ecological context for occupied microhabitats. The distinct ecological feature identified as critical habitat for Lemmon's Holly Fern includes the series of ultramafic rock outcrops located in close proximity along a mountain ridge, and the associated coniferous forest providing contextual habitat qualities, including shade. Since the two sub-populations are in close proximity (location uncertainty plus critical function zone boundaries are less than 30 m apart), and since they occur in association with the same distinct ecological feature, showing continuous suitable habitat characteristics between them, connective habitat (i.e., the area in between the sub-populations) is identified as critical habitat.

Given that existing anthropogenic features (including active roads) do not possess the biophysical attributes required for the Lemmon's Holly Fern, they are not included as critical habitat, even when they occur within the minimum critical function zone distance (i.e., 50 m) of the plant occurrence. The area containing critical habitat is shown in Appendix 1. Detailed methods and decision-making processes relating to critical habitat identification are archived in a supporting document.

[4] Critical function zone distance has been defined as the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g., critical light, moisture, humidity levels necessary for survival). Existing research provides a logical basis for suggesting a minimum critical function zone distance of 50 m is identified as critical habitat for all rare plant species occurrences.

[5] "Distinct" ecological, or landscape features are here referred to as those that are distinguishable at a landscape scale (through use of detailed ecosystem mapping or aerial photos), which, at that scale, appear as ecologically contiguous features with relatively distinct boundaries (e.g., cliffs, banks, or slopes, drainage basins, seepage plateaus, or distinct vegetation assemblages), and which comprise the context for a species occurrence.

5.2 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.

The critical habitat identified for Lemmon's Holly Fern is sufficient to meet the population and distribution objectives; therefore a schedule of studies is not required.

5.3 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 of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single or multiple activities at one point in time or from the cumulative effects of one or more activities over time. The provincial recovery strategy provides a description of limitations and potential threats to Lemmon's Holly Fern. Activities described in Table 2 include those likely to cause destruction of critical habitat for the species; destructive activities are not limited to those listed.

Table 2. Examples of activities likely to result in destruction of critical habitat for Lemmon's Holly Fern.

Activity	Description of activity resulting in or contributing to the destruction of critical habitat	Threat level
Mineral exploration	Results in direct loss of habitat through removal of required substrate, burial resulting from debris deposition, or substrate and microhabitat alteration by machinery.	Moderate / Unknown
Deliberate removal of ultramafic rock materials for road construction	Results in direct loss or alteration of ultramafic rock outcrop habitat required for Lemmon's Holly Fern.	Moderate / Unknown

Degradation or destruction of the ultramafic rock outcrop that supports the one known extant population of Lemmon's Holly Fern have been identified as activities likely to result in destruction of critical habitat. Ultramafic rock formations often contain viable quantities of precious metals. Although currently inactive, the mining claims for the Baldy Mountain Ridges could be reactivated at any time. Extraction of ultramafic rock materials for road construction is also a concern, if further development takes place in the area.

6. Statement on Action Plans

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

An action plan for Lemmon Holly's Fern will be posted on the Species at Risk Public Registry by 2017.

7. 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*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

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

The recovery measures proposed are not expected to negatively affect any other species.
Any efforts to conserve Lemmon's Holly Fern will indirectly benefit other species in the area. The two ultramafic ridges that support the one confirmed extant population are not known to support any other listed species at risk at this time.

8. References

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Appendix 1. Map of Critical Habitat for Lemmon's Holly Fern in Canada

In Canada, Lemmon's Holly Fern has been recorded from 1 location, which includes a series of two main ultramafic rock outcrops in close proximity. This population is on non-federal land on Baldy Mountain, near Oliver B.C. (Figure A1).

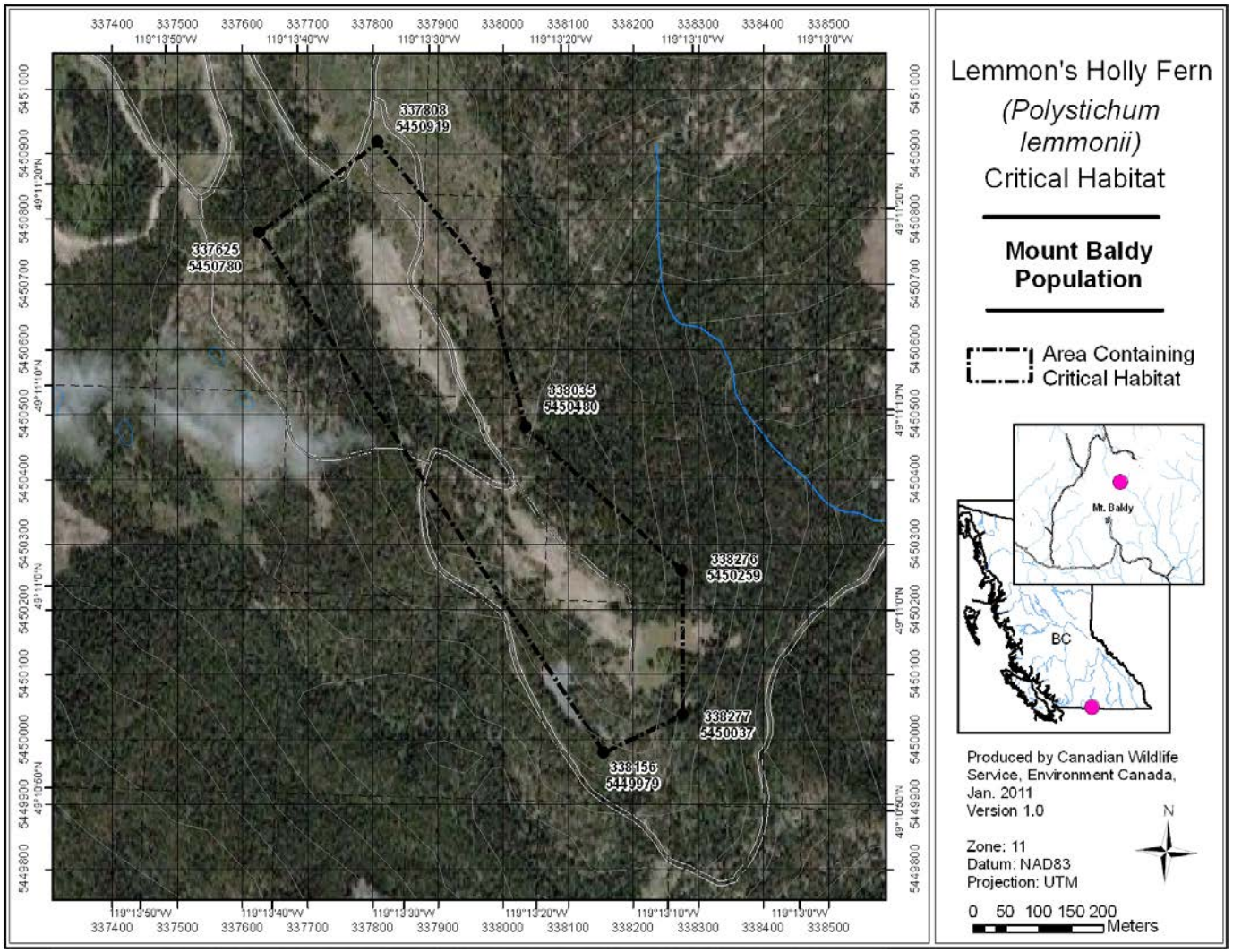


Figure A1. Area containing critical habitat for Lemmon's Holly Fern on Baldy Mountain, near Oliver, British Columbia. The polygon indicates an area of 21.4 ha. Existing anthropogenic features within the indicated polygon, including active roads, are not identified as critical habitat.

PART 2: Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia, prepared by the Southern Interior Rare Plants Recovery Implementation Group, for the British Columbia Ministry of Environment

Recovery Strategy for the Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia



Prepared by the Southern Interior Rare Plants Recovery Implementation Group

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Environment

July 2007

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 our 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 Lemmon's holly fern (*Polystichum lemmonii*) in British Columbia

Prepared by the Southern Interior Rare Plants Recovery Implementation Group

July 2007

Recommended citation

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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 Southern Interior Rare Plants Recovery Implementation Group, 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 Lemmon's holly fern populations in British Columbia. 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 Lemmon's holly fern.

RECOVERY TEAM MEMBERS

Southern Interior Rare Plants Recovery Implementation Group

Harold Baumbrough, Botanist
Brenda Costanzo, B.C. Ministry of Environment
George W. Douglas, Botanist/contractor (deceased)
Orville Dyer (co-chair), B.C. Ministry of Environment
Ron Hall, Osoyoos Indian Band
Pam Krannitz, Environment Canada (Canadian Wildlife Service)
Ted Lea (co-chair), B.C. Ministry of Environment
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RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment is responsible for producing a recovery strategy for Lemmon's holly fern under the *Accord for the Protection of Species at Risk in Canada*. Environment Canada, Canadian Wildlife Service participated in the development of this recovery strategy.

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The initial draft of this document was prepared by George W. Douglas (deceased) of Douglas Ecological Consultants. Graham Nixon, British Columbia Geological Survey, kindly provided information on rock types in the Baldy Mountain area. Jenifer Penny, B.C. Conservation Data Centre, provided information from the Conservation Data Centre database. Funding was provided by the Habitat Conservation Trust Fund, Okanagan University College, and the British Columbia Ministry of Environment (formerly Ministry of Water, Land and Air Protection).

EXECUTIVE SUMMARY

Lemmon's holly fern (*Polystichum lemmonii)* was designated by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as threatened in Canada in May 2003, and listed on the federal *Species at Risk Act* (SARA) Schedule 1 in January 2005. Its current known Canadian range consists of a single disjunct population in south-central British Columbia. Lemmon's holly fern is an evergreen, perennial, tufted fern arising from a short, stout rhizome. This fern is restricted to ultramafic (high in iron and magnesium, low in calcium and nitrogen) soils throughout its entire range in western North America. In British Columbia, it occurs on two small, open, adjacent rocky ridges.

Potential threats to the survival of the population include the degradation or destruction of the habitat through mining exploration and road construction for forest harvesting.

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 within a recovery action plan following: (1) consultation and development of options with affected land mangers, and (2) completion of outstanding work required to quantify specific habitat and area requirements for this species.

Recovery Goal

The goal of the Lemmon's holly fern recovery strategy is to maintain the extant population at its approximate present size (1.39 ha) and numbers (1739 individuals).

Recovery Objectives

The recovery strategy has the following objectives:

I. To secure long-term protection for the known population.
II. To monitor the known population to reliably determine population trends.
III. To increase the understanding of the demographic patterns of the fern.

TABLE OF CONTENTS

RECOVERY TEAM MEMBERS iii
AUTHORS iii
RESPONSIBLE JURISDICTIONS iii
ACKNOWLEDGMENTS iii
EXECUTIVE SUMMARY iv
BACKGROUND 1
Species Assessment Information from COSEWIC 1
Description of the Species 1
Populations and Distribution 3
Needs of the Lemmon's holly fern 6
Habitat and biological needs 6
Ecological role 6
Limiting factors 7
Threats 7
Description of threats 7
Actions Already Completed or Underway 8
Knowledge Gaps 8
RECOVERY 8
Recovery Feasibility 8
Recovery Goal 8
Recovery Objectives 8
Approaches Recommended to Meet Recovery Objectives 9
Recovery Planning Table 9
Narrative to support recovery planning table 9
Performance Measures 10
Critical Habitat 11
Identification of the species' critical habitat 11
Recommended schedule of studies to identify critical habitat 11
Existing and Recommended Approaches to Habitat Protection 11
Effects on Other Species 11
Socioeconomic Considerations 11
Recommended Approach for Recovery Implementation 11
Statement on Action Plans 12
REFERENCES 13

BACKGROUND

Species Assessment Information from COSEWIC

Date of Assessment: May 2003

Common Name (population): Lemmon's holly fern

Scientific Name: *Polystichum lemmonii*

COSEWIC Status: Threatened

Reason for Designation: This species consists of a single, small population occurring within a geographically highly restricted area of specialized habitat. The habitat consists of shallow soils over serpentine bedrock high in heavy metals. The population is considerably disjunct from other such populations in the adjoining state to the south and occurs in the area potentially subject to mineral extraction.

Canadian Occurrence: B.C.

COSEWIC Status History: Designated threatened in 2003. Status based on new status report.

Description of the Species

Lemmon's holly fern (*Polystichum lemmonii)* is an evergreen, perennial, tufted fern arising from a short, stout rhizome (Figure 1; Ceska 2000). The decumbent to ascending fronds are 10–40 cm long, 3–7 cm wide, and 2-pinnate. The 20–35 pinnae on each side of the rachis are ovate with rounded pinnules. The ultimate segments are entire or weakly toothed. The round sori are attached near the midvein with entire or minutely toothed indusia.

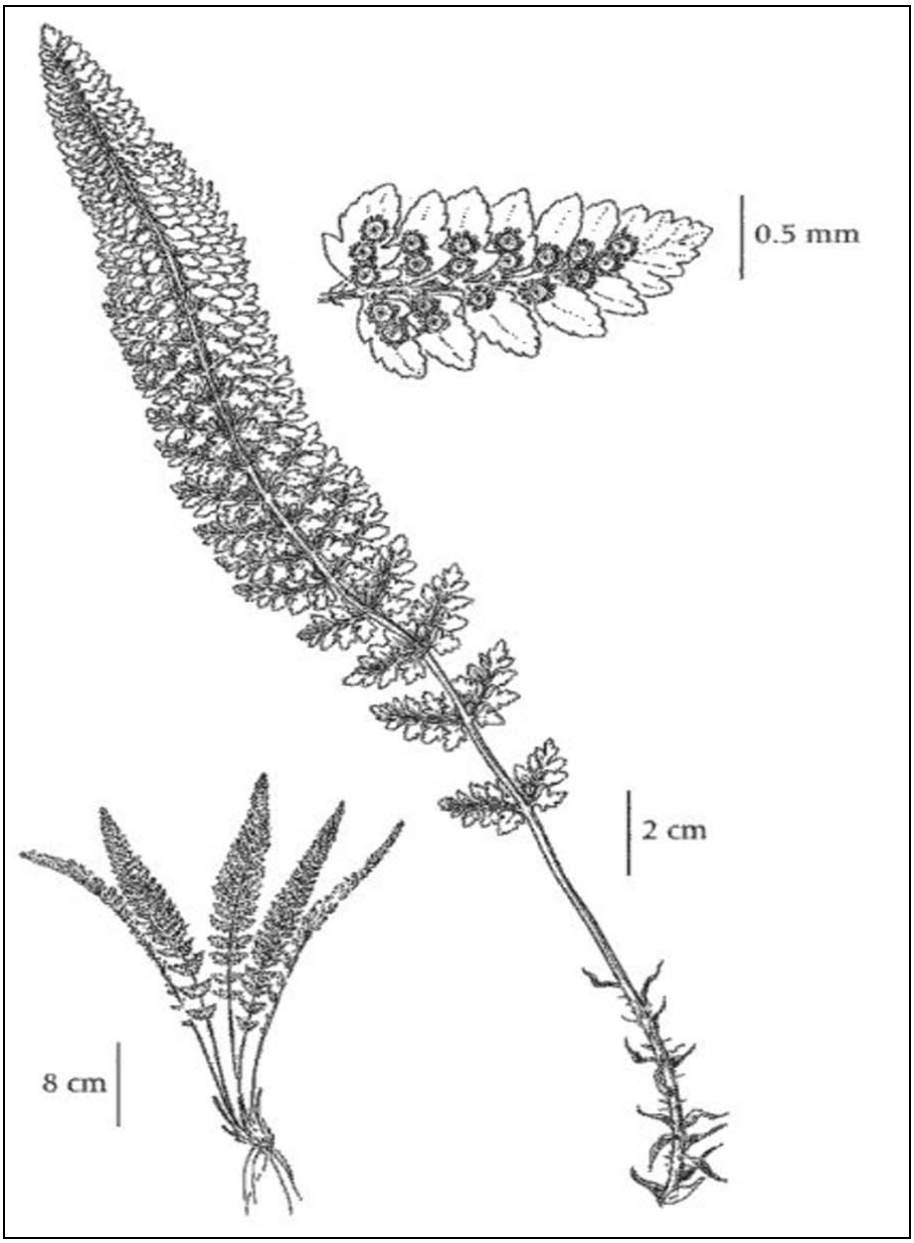


Figure 1. Illustration of Lemmon's holly fern. (With permission, University of Washington Press.)

Populations and Distribution

Lemmon's holly fern ranges from south-central British Columbia, south through Washington and Oregon to northern California (Figure 2; Smith and Lemieux 1993; Wagner 1993). In Canada, a disjunct population is known only from the Mount Baldy area on the eastern side of the Okanagan River valley in south-central British Columbia at an elevation of approximately 1829 m (Figure 3; Ceska 2000; Douglas *et al.* 2002). Less than 1% of the global range occurs in Canada. The distribution trend outside Canada is unknown. In Canada, this fern is known from only a single site.

There is no evidence of a range-wide decline. Globally, Lemmon's holly fern is ranked G4 (apparently secure) and is frequent to common in its range (NatureServe Explorer 2004).

The single population of Lemmon's holly fern occurs on two adjacent, open rocky ridges. The ridges, which are about 280 and 200 m long by 50 m wide, are separated by 160 m. The first collection from this site was made in 1961 without reference to population information. A 2001 count of all plants in the population by G. Douglas revealed a total of 853 plants over 0.72 ha. In 2005 and 2006, the combined count of individuals at the two locations was 1739 plants over 1.39 ha. A collection by D.M. Britton (Department of Agriculture, Ottawa, ON) in 1987 mentions a population size of "perhaps a thousand plants" but the estimate was likely not based on a detailed count. The latter estimate, however, would indicate that the population has remained relatively stable for at least the last 19 years. The population examined contained numerous younger plants that appeared vigorous in 2006 (T. Lea, pers. comm., 2006).

The British Columbia Conservation Data Centre has ranked this species as S1 and placed it on the British Columbia Ministry of Environment Red list (Douglas *et al.* 2002). A rank of S1 is considered "critically imperiled" because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factors making it especially vulnerable to extirpation or extinction. The national rank for this species is N1 (critically imperiled).

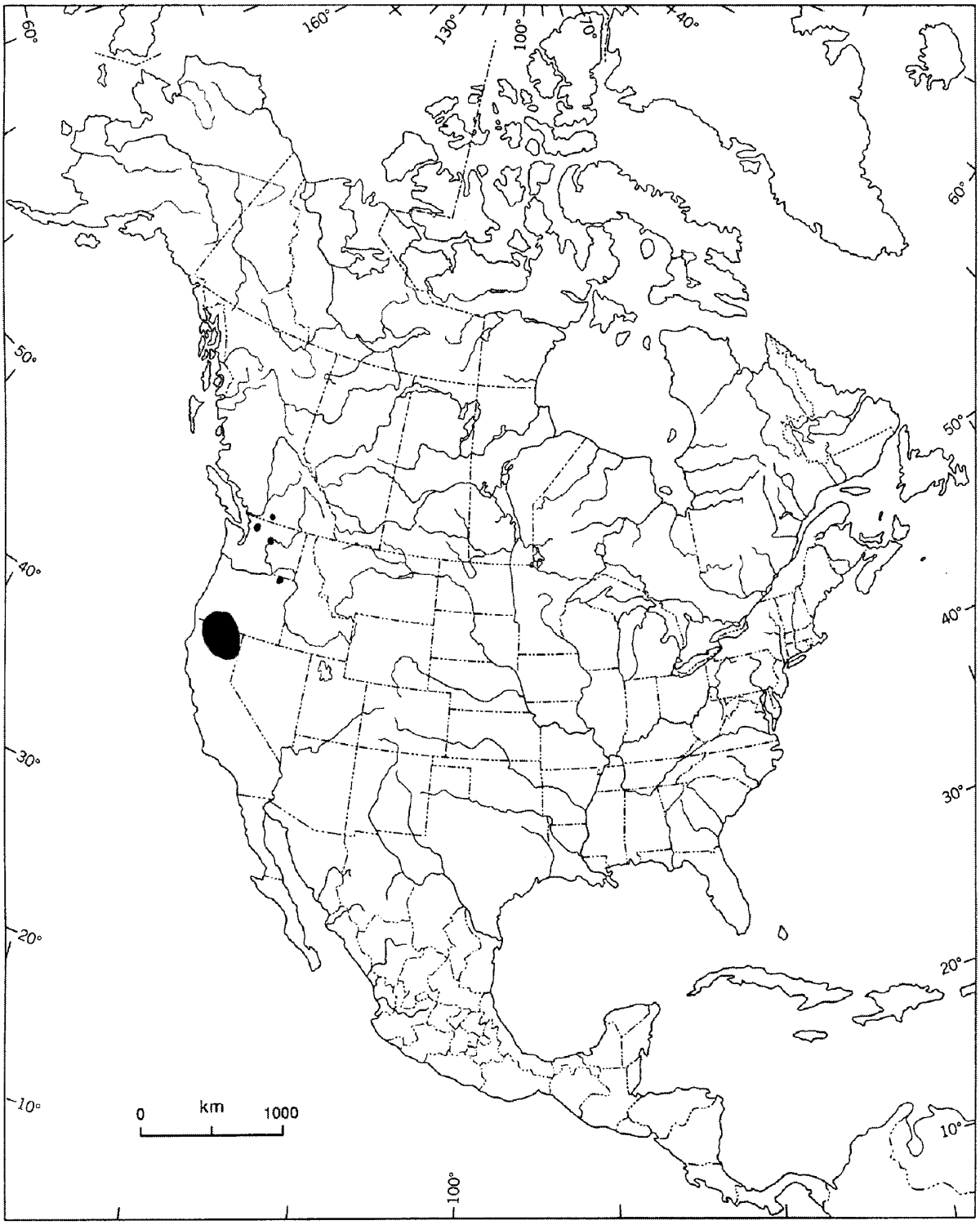


Figure 2. North American range of Lemmon's holly fern (Douglas 2003).

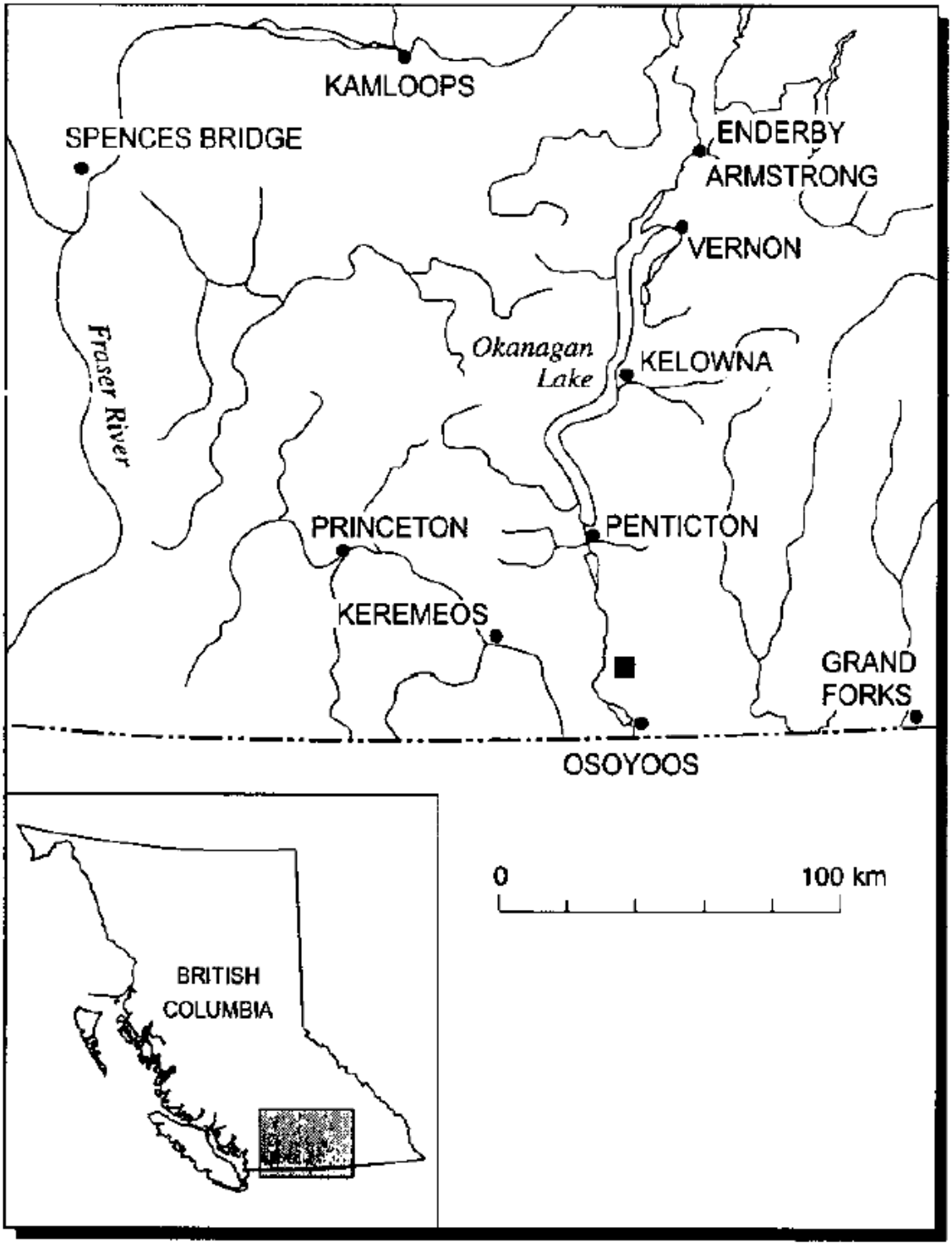


Figure 3. Location of Lemmon's holly fern in British Columbia (■) (Douglas 2003).

Needs of the Lemmon's holly fern

Habitat and biological needs

Other than general information, there is a limited amount of information on the biology of Lemmon's holly fern. This fern is restricted to ultramafic (high in iron and magnesium, low in calcium and nitrogen) soils throughout its entire range in western North America. In the western U.S., the ultramafic habitat has been well studied by Kruckeberg (1969). Plants of ultramafic habitats are adapted to tolerate low levels of calcium, nitrogen, phosphorus, and molybdenum and high levels of magnesium, iron, chromium, and nickel (Kruckeberg 1969). In British Columbia, ultramafic rock outcrops occur only at isolated sites at Baldy Mountain, the Tulameen River, and the Bridge River area.

Habitat for Lemmon's holly fern consists of two adjacent ridges of exposed ultramafic rock outcrops near Mount Baldy in south-central British Columbia, on provincial Crown land. The ridges are 280 and 200 m long by 50 m wide (1.4 ha and 1 ha). No other ultramafic rock outcrops occur nearby and the closest, at the Tulameen River, about 110 km to the west, appears be of a different geologic composition. Lemmon's holly fern is mainly restricted to gentle to steep, east- and north-facing slopes. Lemmon's holly fern occurs on coarse talus slopes, on road surfaces that have talus deposited from above, as well as along roads that have been developed around the rock outcrops. In general, the ferns are found in the open, but a few plants are found under small trees, including subalpine fir (*Abies lasiocarpa* var. *lasiocarpa*) (T. Lea, pers. comm., 2006).

The successful long-distance dispersal of spores of Lemmon's holly fern is evident by the distance to the nearest locations of the species in the adjacent U.S. state of Washington. There, Lemmon's holly fern occurs in the Twin Sisters Range and the Wenatchee Mountains with the North Cascades Range (Kruckeberg 1969), a distance of about 150 km to the southwest and 235 km to the south of Baldy Mountain, respectively. However, the Tulameen River ultramafic site, where both Kruckeberg's holly fern (*P. kruckebergii)* and Mountain holly fern (*P. scopulinum*) occur on ultramafic soils (Kruckeberg 1969; Douglas *et al.* 2002), does not contain Lemmon's holly fern even though the Tulameen River site is about the same distance from the Baldy Mountain site as it is to the Twins Sisters Range. This is likely due to differences in ultramafic soils: dunite at the Lemmon's holly fern site (Douglas 2005) and olivine clinopyroxenite at the Mountain holly fern site (Douglas and Labrecque 2005). Reproduction of Lemmon's holly fern on the ultramafic ridges of the Baldy Mountain area is evident since about 30% of the 853 plants counted in 2001 were relatively young (plant tufts less than 4 cm wide).

Ecological role

The ecological role of Lemmon's holly fern remains unstudied and there is no record of the plant being used for cultural resources (food, clothing, medicine, and ceremonial or symbolic purposes) or ecotourism.

Limiting factors

This fern is restricted to ultramafic soils. It is believed that Lemmon's holly fern is found on dunite rock material, which is high in iron and magnesium, low in calcium and nitrogen (Douglas 2003).

Sporophytes of Lemmon's holly fern often retain significant numbers of mature spores over winter, to be released the following spring (Farrar 1976). However, no gametophytes (minute plants) were observed near, or under, plants at the site. Since Lemmon's holly fern also grows vegetatively by subterranean rhizome elongation, resulting in large clumps of clones, this is likely the main reproductive method at these sites. At the study site surveyed, Lemmon's holly fern occurs on dry, sandy to gravelly, rapidly drained soil; such conditions are not ideal for either spore germination or gamete fertilization. Therefore, it can be inferred that most reproduction at the site is by simple rhizome elongation, likely because the species is stressed here at the edge of its range (Walker 1979).

Threats

Description of threats

Current threats to the survival of the population include the degradation or destruction of the habitat through mining exploration and road construction for forest harvesting (Douglas 2003).

Current threats all are localized, and could present a threat to individual plants within the population or to the habitat that supports Lemmon's holly fern.

Mining exploration
Ultramafic rock formations often contain viable quantities of precious metals. Although the Baldy Mountain ridges have been under active mining claims for many years, tenure status was forfeited in February 2004 (Government of British Columbia 2004). These claims, however, could be reactivated at anytime (Douglas 2003). No data indicate that historical mining exploration activities affected the population. Given the limited extent of occurrence of Lemmon's holly fern, mining exploration activities could present a severe threat. However, as the activity is not imminent, the level of concern is medium.

Mineral extraction for road construction
Although most of the forest road construction appears to have been completed in recent years, further construction might use road materials from the ultramafic ridges and should not be overlooked (Douglas 2003). Extraction of materials could present a severe threat to the population, but the level of concern is medium as there is no indication that these activities will take place.

Actions Already Completed or Underway

An Identified Wildlife Species Account is in development under the British Columbia *Forest and Range Practices Act* (FRPA), Identified Wildlife Management Strategy. The preparation of this Account is necessary for the species to be included in the Category of Species at Risk under FRPA.

In 2005, Orville Dyer counted the population at the north ridge, and in 2006 another count of this population and the south ridge was done by Orville Dyer and Ted Lea, both from the B.C. Ministry of Environment.

Knowledge Gaps

Information is required on the population dynamics and demographic patterns of Lemmon's holly fern in Canada. As well, the biological needs of the species, including the soil characteristics required for growth, need to be investigated.

RECOVERY

Recovery Feasibility

The recovery of Lemmon's holly fern in British Columbia is considered biologically and technically feasible and of minimal effort for recovery. The current population since last seen in 2005 and 2006 appears to be stable, and threats are most likely only potential and minimal in nature. Lemmon's holly fern is currently thought to be reproducing by vegetative means only; although it does produce spores, it is unknown whether these are viable. The current habitat is sufficient for continued maintenance of the species but expansion is only likely at sites with the same restricted conditions found with ultramafic rock outcrops. Techniques are available for recovery of this species, and threats are likely to be easily mitigated.

Recovery Goal

The goal of the Lemmon's holly fern recovery strategy is to maintain a viable and self-sustaining population at the present site at its approximate present size (1.39 ha) and numbers (1739 individuals). This goal also represents the population and distribution objectives for the species.

Recovery Objectives

The recovery strategy has the following objectives (see also Table 1):

I. To secure long-term protection for the known population.
II. To monitor the known population to reliably determine population trends.
III. To increase the understanding of the demographic patterns of the fern.

Approaches Recommended to Meet Recovery Objectives

Recovery Planning Table

Table 1. Recovery Planning Table

Priority	Obj. #	Threats addressed	Broad strategy to address threat	Recommended approaches to meet recovery objectives
Urgent	I	Mining exploration, forest road construction	Habitat protection	• Negotiate to deactivate mineral claims and/or resolve tenure of active or potentially active claims • Establish Wildlife Habitat Area under Identified Wildlife Management Strategy of the *Forest and Range Practices Act* • *Land Act* designation for conservation of natural resources under Section 17 to make land users aware of location
Beneficial	II, III	N/A	Research and monitoring	• Develop a research plan that will prioritize and implement research • Develop and implement a monitoring plan particularly for population dynamics
Beneficial	I	Forest road construction	Site management	• Facilitate the development of a site management and fire protection plan with B.C. Forest Service • Facilitate development of an appropriate road construction plan with B.C. Forest Service and B.C. Energy and Mines • Ensure road construction plan is communicated to forestry and mining contractors

Narrative to support Recovery Planning Table

The following approaches are in order of priority:

Habitat protection

- Negotiate terms necessary to permanently deactivate mineral claims. Lemmon's holly fern occurs only on two small (1.4 ha and 1 ha), adjacent ultramafic ridges. The ridges are on Crown land and the mineral claims have just recently (2004) been terminated. Because they could be reactivated at anytime, formal action should be taken to remove this possibility.

- Create a Wildlife Habitat Area under Identified Wildlife Management Strategy of the *Forest and Range Practices Act.*

Research and monitoring

Lemmon's holly fern has not been monitored for population trends adequately. The first population estimate was made in 1987 when it was stated that "perhaps a thousand plants occur on the ridge." More recently, in 2005 and 2006, a more precise count found 1739 plants over a total area of 1.39 ha (O. Dyer, pers. comm., 2006). Research is required to understand the demographics of Lemmon's holly fern.

Monitoring should be designed to help determine the population characteristics and dynamics of the fern. It is important to determine if the population is increasing, stable, or declining. For each site, the following parameters should be measured:

i. numbers of plants (which appear to have remained stable since the plant's discovery in 1987),
ii. area of occupancy (m^2),
iii. community associates (of which none are listed species),
iv. presence of invasive plants in the future (which are minimal and of no consequence at this time).

Site management

- Fire Management Plan

The two ridges upon which *Polystichum lemmonii* occur are adjacent to forest stands and recent cutblocks. Although the threat presented by wildfire is only moderate at this time, the possibility of degradation of the population by extreme wildfires should not be overlooked. Since the fern population is the only one in Canada, forest fire managers in the B.C. Forest Service should be aware of the fern's values and prepare a plan that specifically deals with the immediate area of the ridges.

- Forest Harvesting or Mineral Exploration Road Construction Plan

Future logging could pose a threat if road builders were to use the ultramafic rocky ridges for road building material. Contractors should be informed of the value of the ridges by the B.C. Forest Service and road building material should be acquired from elsewhere.

Performance Measures

Performance measures for evaluating success:

i. Protection of the site has been secured. (Objective I)
ii. Population monitoring shows that the number of plants at the occupied site and area of occupancy are stable or increasing over the long term. (Objective II and Recovery Goal)
iii. Known site is recognized by managers in the B.C. Forest Service, Fire Protection Branch within their management plan and is demonstrably secure. (Objective II)

iv. Research priorities have been addressed. (Objectives II, and III)

Critical Habitat

Identification of the species' critical habitat

No critical habitat, as defined under the federal *Species at Risk Act* (Environment Canada 2004), is proposed for identification at this time.

It is expected that critical habitat will be proposed within a recovery action plan following: (1) consultation and development of options with affected land managers, and (2) completion of outstanding work required to quantify specific habitat and area requirements for these species.

Recommended schedule of studies to identify critical habitat

1. Identify habitat attributes for Lemmon's holly fern.
2. Using established survey and mapping techniques, delimit the boundaries of all occupied habitats.

Existing and Recommended Approaches to Habitat Protection

Establish a Wildlife Habitat Area under Identified Wildlife Management Strategy of the *Forest and Range Practices Act* for Lemmon's holly fern. Seek a *Land Act* designation for conservation of a natural resource under Section 17 to make land users aware of location of Lemmon's holly fern. Facilitate the development of an appropriate road construction plan with B.C. Forest Service and B.C. Energy and Mines. Ensure that the road construction plan is communicated to forestry and mining contractors. Assist the B.C. Forest Service to develop a site management plan and a fire protection plan for the areas.

Effects on Other Species

The recovery actions proposed are not expected to negatively affect any other species. The recommended habitat protection will indirectly benefit other species in the area. Note that the two ultramafic ridges do not support any other listed species at risk.

Socio-economic Considerations

Socio-economic effects are considered very low due to the nature of site where this species is found. There would potentially only be a minor effect on forestry or mining exploration.

Recommended Approach for Recovery Implementation

A single-species approach is most appropriate for the Lemmon's holly fern recovery strategy, since it has a limited and specific distribution in British Columbia. No other currently designated "at risk" species occurs in the same habitat.

Statement on Action Plans

A recovery action plan will be completed by the Recovery Team by 2012.

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