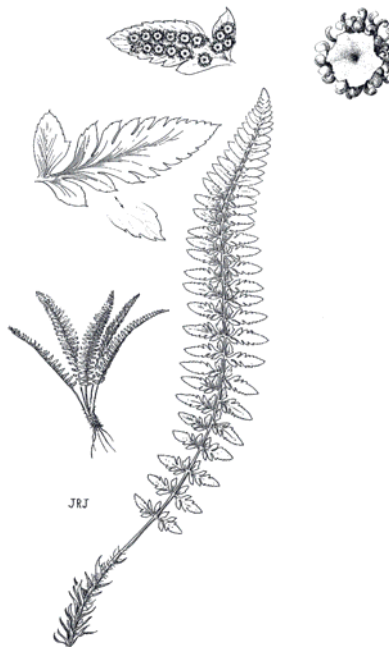


COSEWIC
Assessment and Status Report

on the

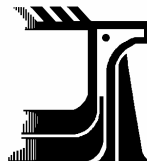
Mountain Holly Fern
Polystichum scopulinum

in Canada



THREATENED
2005

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

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

COSEWIC 2005. COSEWIC assessment and status report on the mountain holly fern *Polystichum scopulinum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 18 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Production note:

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur le polystic des rochers (*Polystichum scopulinum*) au Canada.

Cover illustration:

Mountain holly fern — Line drawing from Hitchcock *et al.* 1969 (by permission).

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COSEWIC Assessment Summary

Assessment Summary – May 2005

Common name

Mountain Holly Fern

Scientific name

Polystichum scopulinum

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 3 in British Columbia, from potential mining activities for precious metals.

Occurrence

British Columbia, Quebec, Newfoundland and Labrador

Status history

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



COSEWIC
Executive Summary

Mountain Holly Fern
Polystichum scopulinum

Species information

Polystichum scopulinum is an evergreen, perennial, tufted fern arising from a short, stout rhizome. The ascending leaves (fronds) are 10-50 cm long, 3-7 cm wide and 1-pinnate. The 20-40 leaflets (pinnae) on each side of the rachis are oblong with acute leaflet divisions (pinnules) and have ultimate segments that are minutely, spiny-toothed. The round spore dots (sori) are attached near the midvein and covered with entire or fringed flaps of tissue (indusia).

Distribution

Polystichum scopulinum ranges from southwestern British Columbia, sporadically south in the western United States to Colorado, Arizona and California. It is also disjunct to northeastern Quebec and western Newfoundland. In British Columbia it is known from the Tulameen River valley, northwest of Princeton in southwestern British Columbia. In Quebec, it is known from Mont Albert on the Gaspé Peninsula. The status of a historic population known from a 1950 collection from Humber West (North Arm) in western Newfoundland is still unknown in spite of recent limited searches.

Habitat

In North America, *P. scopulinum* is restricted to sites with ferromagnesian or ultramafic (serpentine) rock outcrops. Although a number of ultramafic rock outcrops occur in western British Columbia, only the ultramafic (olivine clinopyroxenite) band (at elevations of 978 to 1768 m) between Olivine Mountain and Grasshopper Mountain in the Tulameen River valley supports the species. These slopes have a typically depauperate ultramafic flora and tree cover. This is in contrast to the dense surrounding montane forests dominated by Douglas-fir (*Pseudotsuga menziesii*). In Quebec, *P. scopulinum* is restricted to the southerly slopes of the Vallée du Diable, on the eastern flank of Mount Albert, at an elevation of 800 to 900 m. The flora is similarly depauperate and includes local serpentine endemics like *Minuartia marcescens*, *Salix chlorolepis* and *Solidago simplex* subsp. *simplex* var. *chlorolepis*. The species occurrence in Newfoundland was reported from southerly slopes of a dry serpentine ridge.

Biology

There is only limited information on biology and ecology of *P. scopulinum*. Plants occurring on ultramafic habitats are adapted to tolerate low levels of calcium, nitrogen, phosphorus and molybdenum and high levels of magnesium, chromium and nickel. These rock outcrop habitats are also characterized by shallow soils and a sparse groundcover thus creating xeric microclimates that also exclude many nearby species adapted to more mesic microclimates.

Population sizes and trends

The three recorded populations of *P. scopulinum* in British Columbia occur on a 100 m by 4 km band of ultramafic rock outcrop that extends from Olivine Mountain on the south side of the Tulameen River to Grasshopper Mountain on the north side of the Tulameen River. Population numbers range from five to 400 plants. It is quite likely that a number of other populations occur on the ultramafic band, but the rugged terrain makes access extremely difficult. The population of *P. scopulinum* in BC has remained stable between 1996 and 2002. The single Quebec population consists of nine small colonies in close proximity, with a total of about 215 individuals. No demographic data are available for a Newfoundland population last seen in 1950. Due to its relatively remote location, perennial nature, and asexual reproduction by spreading rhizomes the population may still be extant.

Limiting factors and threats

The most direct threat to *Polystichum scopulinum* in British Columbia at the present time is from mining exploration, road construction or forest fires. In Quebec, it is suspected that over-collecting has significantly reduced the population in the first half of the 20th century; no such threat exists presently. Due to the ultramafic properties of the soils at all sites, introduced species are of no concern. Threats, if any, cannot be determined at present for the historic Newfoundland population.

Special significance of the species

Polystichum scopulinum belongs to a relatively small group of species with a restricted Pacific Coast range that have their northern limits in southwestern British Columbia. In Quebec the species is even more dramatically disjunct. The importance of these peripheral and disjunct populations, especially with respect to their genetic characteristics, has yet to be studied adequately. Peripheral populations are often genetically and morphologically divergent from central populations and may have an evolutionary and ecological significance out of proportion to the percentage of the species they represent. The protection of genetically distinct peripheral populations may be important for the long-term survival of the species as a whole.

Existing protection or other status designations

The British Columbia Conservation Data Centre has ranked this species as S1 and is on the provincial Ministry of Sustainable Resource Management red list. This is the most critical category for imperiled rare native vascular plants in the province. In Quebec it is also ranked S1 by the Centre de données sur le patrimoine naturel du Québec, Ministère de l'Environnement du Québec. 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.” Globally, *P. scopulinum* is ranked G5 and is frequent to common in the core of its range.

There is no specific legislation for the protection of rare and endangered vascular plants in British Columbia. The population in the Tulameen River area of British Columbia is on public land but is not part of a protected area. It is conceivable that this area could qualify as an ecological reserve but this status has yet to be proposed. In Quebec, *P. scopulinum* is located in a provincial park (Parc de la Gaspésie). The species was designated "Threatened" by the Quebec government in 1993, and its habitat is legally protected. In Newfoundland, the species is ranked as SH by NatureServe and “May Be At Risk” by the province.



COSEWIC HISTORY

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

COSEWIC MANDATE

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

COSEWIC MEMBERSHIP

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

DEFINITIONS (NOVEMBER 2004)

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

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

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

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



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

COSEWIC Status Report

on the

Mountain Holly Fern *Polystichum scopulinum*

in Canada

2005

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SPECIES INFORMATION

Name and classification

Scientific name: *Polystichum scopulinum* (D.C. Eaton) Maxon¹
Synonym: *Polystichum mohrioides* (Bory) Presl var. *scopulinum* (D.C. Eaton)
Fern.
Common names: Mountain Holly Fern or Polystic des Rochers
Family: Dryopteridaceae (Wood Fern Family)
Major plant group: ferns

Description

Mountain holly fern, *P. scopulinum* (D.C. Eaton) Maxon, is a member of a cosmopolitan genus of over 175 species (Wagner 1993; Smith and Lemieux 1993). It is one of eight *Polystichum* species occurring in British Columbia (Ceska 2000; Douglas *et al.* 2002a), four occurring in Quebec (Wagner 1993), and three on the island of Newfoundland (Meades *et al.* 2000). Nine *Polystichum* species are found in Canada (Cody and Britton 1989; Wagner 1993).

Polystichum scopulinum is an evergreen, perennial, tufted fern arising from a short, stout rhizome (Figure 1; Ceska 2000). The ascending fronds are 10-40 cm long, 3-7 cm wide and 1-pinnate. The 20-40 pinnae on each side of the rachis are oblong with acute pinnules and have ultimate segments that are minutely, spiny-toothed. The round sori are attached near the mid-vein with entire or fringed indusia.

In British Columbia, *P. scopulinum* may be confused with either *P. lemmonii* Underw. or *P. kruckebergii* W.H. Wagner. It may be distinguished from *P. lemmonii* by the presence of spines on the teeth of the ultimate segments of its pinnae (Hitchcock *et al.* 1969; Wagner 1993; Ceska 2000). It differs from *P. kruckebergii* in having pinnae that are obtuse at the tips (especially at the base of the fronds) and armed with fine, incurved teeth, whereas *P. kruckebergii* has pinnae that are abruptly pointed at the tips (especially at the base of the fronds) and armed with coarse, spreading teeth (Hitchcock *et al.* 1969; Wagner 1993; Ceska 2000). Prior to the work of Wagner (1966), who recognized and named *P. kruckebergii*, all material of the latter in British Columbia was identified as *P. scopulinum* (e.g., Taylor 1963, 1970).

The four species in Quebec and three on the island of Newfoundland are all readily distinguishable on the basis of their leaf morphology (see Gleason 1963).

¹Taxonomy and nomenclature follow Douglas *et al.* 1998a, 1998b, 1999, 2000; Gleason and Cronquist 1991; or Marie-Victorin 1995.

DISTRIBUTION

Global range

Polystichum scopulinum ranges from southwestern British Columbia, sporadically south in the western United States to Colorado, Arizona and California (Figure 2, Wagner 1993). It is also disjunct to northeastern Quebec and western Newfoundland (Figure 2, Wagner 1993).

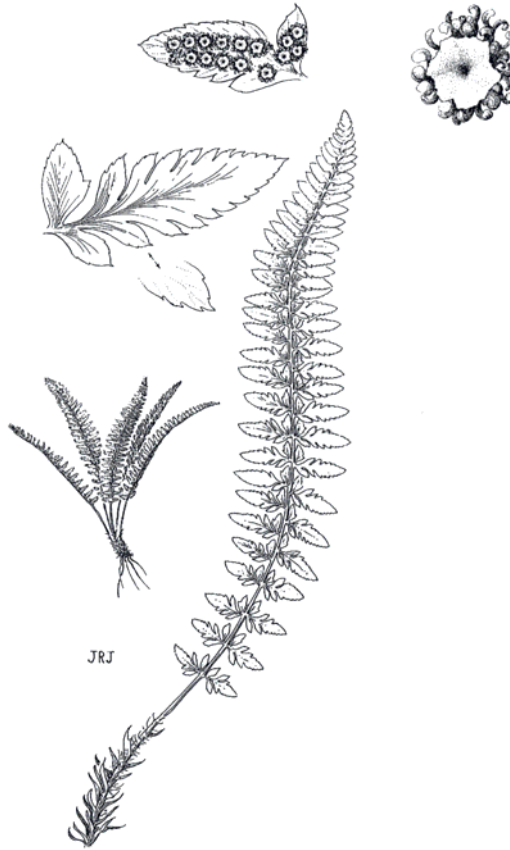


Figure 1. Illustration of *Polystichum scopulinum*: plant growth habit with enlarged leaf and leaflets (leaflets x 0.5) with one showing the underside with clusters of sori (top left); enlarged sorus with sporangia surrounding the central flap of protective tissue, the indusium (top right, x 15). Line drawing from Hitchcock *et al.* (1969) by permission.

Canadian range

In Canada *Polystichum scopulinum* is known from three areas, one in British Columbia, one in Quebec and one on the island of Newfoundland. In British Columbia there are three populations (including two sub-populations on Grasshopper Mountain) in the Tulameen River (Figure 3; Ceska 2000; Douglas *et al.* 2002a, b). In Quebec, it is known from Mont Albert on the Gaspé Peninsula (Figure 4; Labrecque and Lavoie

2002). A population was recorded in 1950 from Humber West (North Arm) in western Newfoundland (Bouchard *et al.* 1991; Meades *et al.* 2000). A limited search was conducted on North Arm Mountain in 2000 but no plants were located (Djan-Chékar, pers. comm. 2004). The site is remote and the original location and habitat description provided by Rouleau, the collector, are quite general. It may be premature to presume that the population is extirpated (Djan-Chékar, pers. comm.).

Polystichum scopulinum was first collected in BC on Olivine Mountain, Tulameen River valley in 1952 by A.R. Kruckeberg. All three populations in the Tulameen Valley (Figure 3) were visited and assessed in 1996 by G.W. Douglas. In 2002, G.W. Douglas returned to, and assessed, the Britton Creek population.

Throughout its North American range *P. scopulinum* occurs only on ultramafic (serpentine) soils (Kruckeberg 1969). In British Columbia, there are approximately 20 of these ultramafic localities, with only one of them supporting *P. scopulinum*. Almost all ultramafic localities have been searched thoroughly since these localities always support one or more of three rare *Polystichum* species (*P. kruckebergii*, *P. lemmonii* and *P. scopulinum*) and are of special interest to botanists. In southern Quebec, the main other area of serpentine bedrock is around the highly disturbed asbestos mining area of the Thetford Mines in the Eastern Townships. These have been surveyed extensively. The fern is likely absent here because it tends to be alpine in nature and the outcrops in the Eastern Townships are at low elevations.

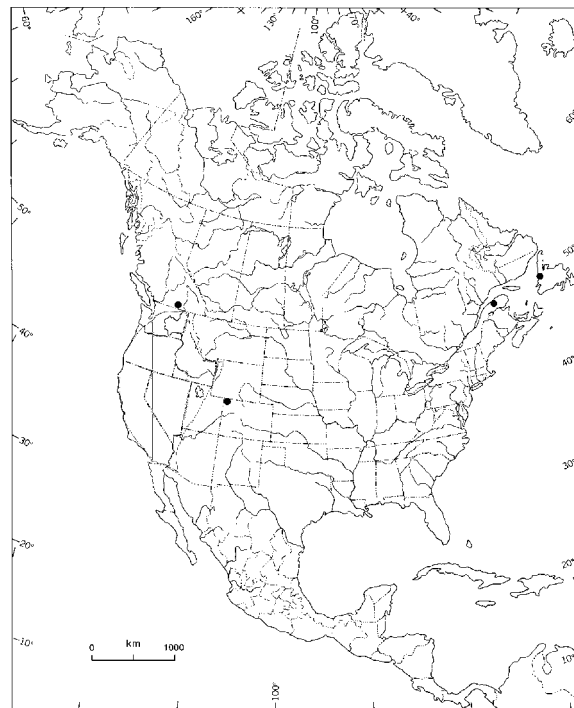


Figure 2. North American distribution of *Polystichum scopulinum* adapted from Wagner (1993). The Newfoundland population was last seen in 1950.

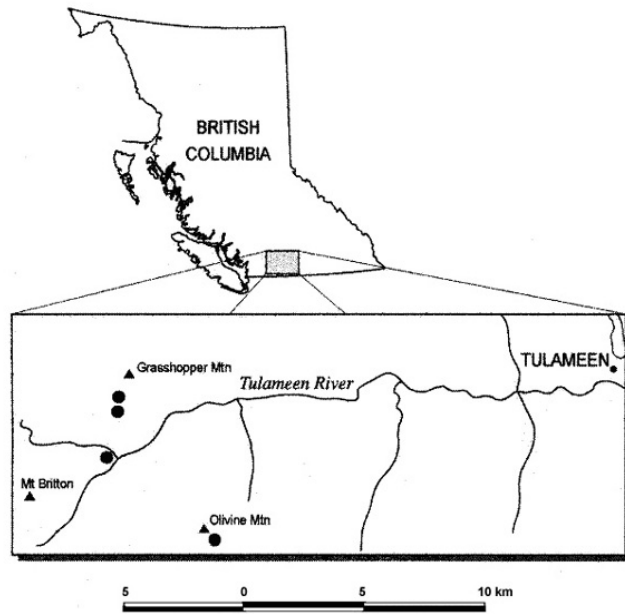


Figure 3. Distribution (●) of *Polystichum scopulinum* in British Columbia. Three populations are present with two sub-populations occurring on Grasshopper Mountain.

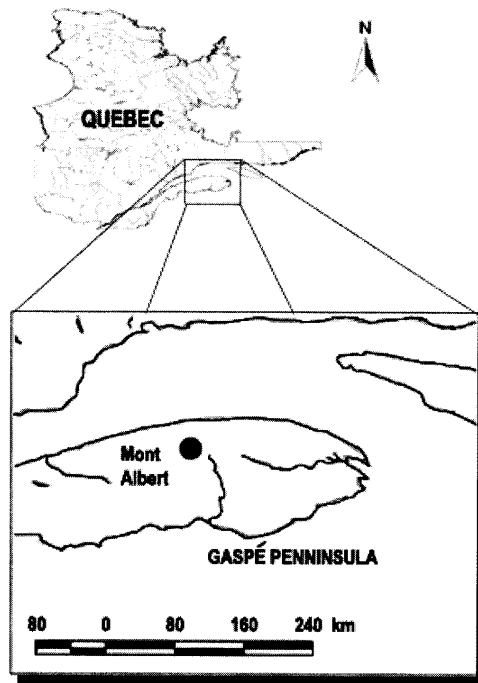


Figure 4. Distribution (●) of *Polystichum scopulinum* in Quebec.

HABITAT

Habitat requirements

In North America, *P. scopulinum* is restricted to sites with ferromagnesian or ultramafic rock outcrops (Figure 3; Kruckeberg 1969; Wagner 1993). Although a number of ultramafic rock outcrops occur in western British Columbia, only the ultramafic (olivine clinopyroxenite) band (at elevations of 978 to 1768 m) between Olivine Mountain and Grasshopper Mountain in the Tulameen River valley supports *P. scopulinum*. These slopes have a typically depauperate ultramafic flora and tree cover. This is in contrast to the dense surrounding montane forests dominated by *Pseudotsuga menziesii*. Conspicuous species on the slopes include: *Pinus contorta*, *P. albicaulis*, *Aspidotis densa*, *P. kruckebergii*, *Juniperus communis*, *Sedum lanceolatum*, *Senecio streptanthifolius* and *Arctostaphylos uva-ursi*. In Quebec, *P. scopulinum* is restricted to the southerly slopes of the Vallée du Diable, on the eastern flank of Mont Albert, at an elevation of 800 to 900 m. Ultramafic rock types in this area include serpentinite, dunite and pyroxenite. The flora is similarly depauperate, with *Picea mariana*, *Betula glandulosa*, *Ledum groenlandicum*, *Vaccinium vitis-idaea* and *Potentilla fruticosa* being the predominant species. Other associates include local serpentine endemics such as *Minuartia marcescens*, *Salix chlorolepis* and *Solidago simplex* subsp. *simplex* var. *chlorolepis*, as well as western disjuncts such as *Adiantum aleuticum* and *Aspidotis densa*. The original locality description for the Newfoundland occurrence was given as “southerly slopes of dry serpentine ridge.”

Trends

At the British Columbia sites, habitat trends are mainly dependent on development activities. The latter area is being actively logged and mining exploration occurs sporadically. The largest population on Britton Creek would be especially susceptible to such activities. In Quebec, the population on Mount Albert seems stable and is protected from development activities. No specific information is available for the North Arm Mountain area locality in Newfoundland.

Protection/ownership

There is no specific legislation for the protection of rare and endangered vascular plants in British Columbia. The population in the Tulameen River area of British Columbia is on public land but is not part of a protected area. It is conceivable that this area could qualify as an ecological reserve but this status has yet to be proposed. In Quebec, *P. scopulinum* has been legally designated as "Threatened" (Loi sur les espèces menacées ou vulnérables, Gouvernement du Québec 1993). The habitat of the species is located in Parc de la Gaspésie, and is legally protected. The collecting of *P. scopulinum* and the modification of its habitat is forbidden and subject to legal prosecution. Ownership of the North Arm Mountain locality area has not yet been determined.

BIOLOGY

General

There is only limited information on the biology and ecology of *P. scopulinum*. Plants occurring on ultramafic habitats are adapted to tolerate low levels of calcium, nitrogen, phosphorus and molybdenum and high levels of magnesium, chromium and nickel (Kruckeberg 1969). These rock outcrop habitats are also characterized by shallow soils and a sparse groundcover thus creating xeric microclimates that also exclude many nearby species adapted to more mesic microclimates.

Some genetic information is available for the species. *Polystichum scopulinum* is an allopolyploid, thought to be derived, on morphologic grounds, from the hybridization of *P. imbricans* and *P. lemmonii* (Wagner 1979). The chromosome number for the species is $2n = 164$.

Reproduction

As with most evergreen fern species, *P. scopulinum* often retains significant numbers of mature spores over the winter, to be released the following spring (Farrar 1976). *Polystichum scopulinum* also grows vegetatively by subterranean rhizome elongation often resulting in large clumps of clones. Because of the dry site conditions, which are not ideal for spore germination or gamete fertilization, most reproduction is probably by rhizome elongation. No prothalli (sexual plantlets in the reproductive cycle) were observed at the BC or QC sites.

Survival

No information available.

Physiology

No information available.

Movements/dispersal

The successful long-distance dispersal of spores of *P. scopulinum* is evident by the species' occurrence across North America at widely disjunct localities on ultramafic substrates. Its absence from some areas of ultramafic bedrock may be a reflection of the hit-or-miss aspect of such a means of dispersal or reflect a contracting range. The species does not occur at either Mt. Baldy, British Columbia, 125 km to the east or in the Twin Sisters Range, Washington, 125 km to the southwest, where *P. lemmonii* is found (Kruckeberg 1969, Douglas 2002). It is also absent to the northwest in British Columbia where *P. kruckebergii* occurs on ultramafic rock outcrops. The nearest location in the United States to the British Columbia area of occurrence is in the adjacent state of Washington in the Wenatchee Mountains, part of the North Cascades

Range (Kruckeberg 1969), a distance of about 230 km. The Quebec populations are even more dramatically disjunct (about 4000 km) from the nearest occurrences in British Columbia (Canada) and Utah (USA). The Newfoundland population is about 600 km east of the Quebec population across the Gulf of St. Lawrence.

Nutrition and interspecific interactions

No information available.

Behaviour/adaptability

No information available.

POPULATION SIZES AND TRENDS

The three recorded populations of *P. scopulinum* in British Columbia occur on a 100 m by 4 km band of ultramafic rock outcrop that extends from Olivine Mountain on the south side of the Tulameen River to Grasshopper Mountain on the north side of the Tulameen River (Figure 3). Population numbers ranged from four to 400 plants (Table 1). It is quite likely that a number of other populations occur on the ultramafic band, but the rugged terrain makes access extremely difficult. The population of *P. scopulinum* at Britton Creek has remained stable between 1996 and 2002.

Table 1. Data for populations in the Tulameen River valley, British Columbia.

| Population/sub-population | Elevation | Last Observation/Observer | # Plants/area |
|--|-----------|---------------------------|---------------------------|
| Olivine Mountain | 1768 m | 1996 – Douglas & Norris | 4/200 m ² |
| Britton Creek | 979 m | 2002 – Douglas & Penny | 400/10,000 m ² |
| Grasshopper Mountain (north subpopulation) | 1378 m | 1996 – Douglas & Norris | 5/200 m ² |
| Grasshopper Mountain (south subpopulation) | 1360 m | 1996 – Douglas & Norris | 3/500 m ² |

The single Quebec population was examined recently in 2002 when it was recorded as consisting of seven small colonies in close proximity (0.04 km²), with a total of about 100 individuals. A more extensive survey in 2004 reported nine small colonies in an area of 0.08 km², with a total of about 215 individuals. Because of the rugged terrain, it is possible that other individuals could be found in the Vallée du Diable or on the southern flank of Mount Albert. It is suspected that the population is stable. A site index of “A” (the highest value) has been assigned to the Quebec population and its habitat based on the presence of over 200 plants in an area > 200 m² and presence within an area that receives little disturbance (a provincial park). It is possible that the fern may occur on the small outcrop of serpentine on mont du Sud, a few kilometres to the southwest of Mount Albert.

The population size for the Newfoundland location is unknown but is likely highly restricted in occurrence and possibly in size. The locality for the 1950 collection of *P. scopulinum* is indicated as site 1 in serpentine area A of Figure 5. Several recent collections of *Minuartia marcescens*, another serpentine species, have been made within the approximate area of locality 1 but no further localities have been found for the fern. Survey effort within the two largest serpentine sites in Newfoundland (areas A and B, Figure 5) is reflected, in part, by about 20 historic and recent collections of *M. marcescens* in area A and about 10 in area B, with plants in these areas estimated to occur in the millions.

The lack of additional records of the fern from these two major serpentine areas is taken as an indication that *P. scopulinum* is likely present only in small numbers and may also be highly restricted in area of occupancy. The black areas in Figure 5 represent locations of serpentine outcrops in Newfoundland. These cover an area of about 3% (about 3200 km²) of the total Newfoundland land mass of 106,000 km² (Roberts 1992). It is conceivable that the fern may be present in other serpentine areas, but considering that *M. marcescens*, a species abundant in two serpentine areas along the west coast is only found in small numbers in one other inland site (Area C, along the North Gander River), *P. scopulinum*, a seemingly much rarer plant, may be much more restricted in its occurrence. The west coast serpentine areas are in a region of higher precipitation than the inland sites and would therefore be more conducive to spore germination and fern establishment on these substrates that characteristically have thin soils and little vegetation cover.

LIMITING FACTORS AND THREATS

The most direct threats to *P. scopulinum* in British Columbia, at the present time, are mining exploration, forest/mining road construction or forest fires. All ultramafic geologic formations have potential for the presence of precious metals. This is evident in that all such outcrops have established mineral claims. The Bright Star Ventures (BSV) Message Board web site (week of Aug 20th to Aug 24th, 2001), accessed 1 Feb. 2005, indicated that they were planning a major exploration program at their recently acquired Platinum and Palladium property within the Tulameen Ultramafic Complex west of Princeton, BC. Over 20,000 ounces of placer gold and platinum have been recovered from this area. Other minerals in the area include copper, nickel, and silver (http://www.baystreet.ca/company_profiles/2001/082001to082401.html). Properties of BSV include about 560 ha (1400acres) on Grasshopper Mountain and 1760 ha (4,400 acres) on Olivine Mountain.

At the time of report preparation, only minimal exploration had taken place at the *P. scopulinum* location in the Tulameen River valley. Considering the sizable mineral holdings and various precious metals present, it may be only a matter of time before operations are undertaken; there is, however, uncertainty as to how soon such mining activity may be initiated. Mineral excavation and logging activities are likely to lead to upgrading of the present road and impact drainage.

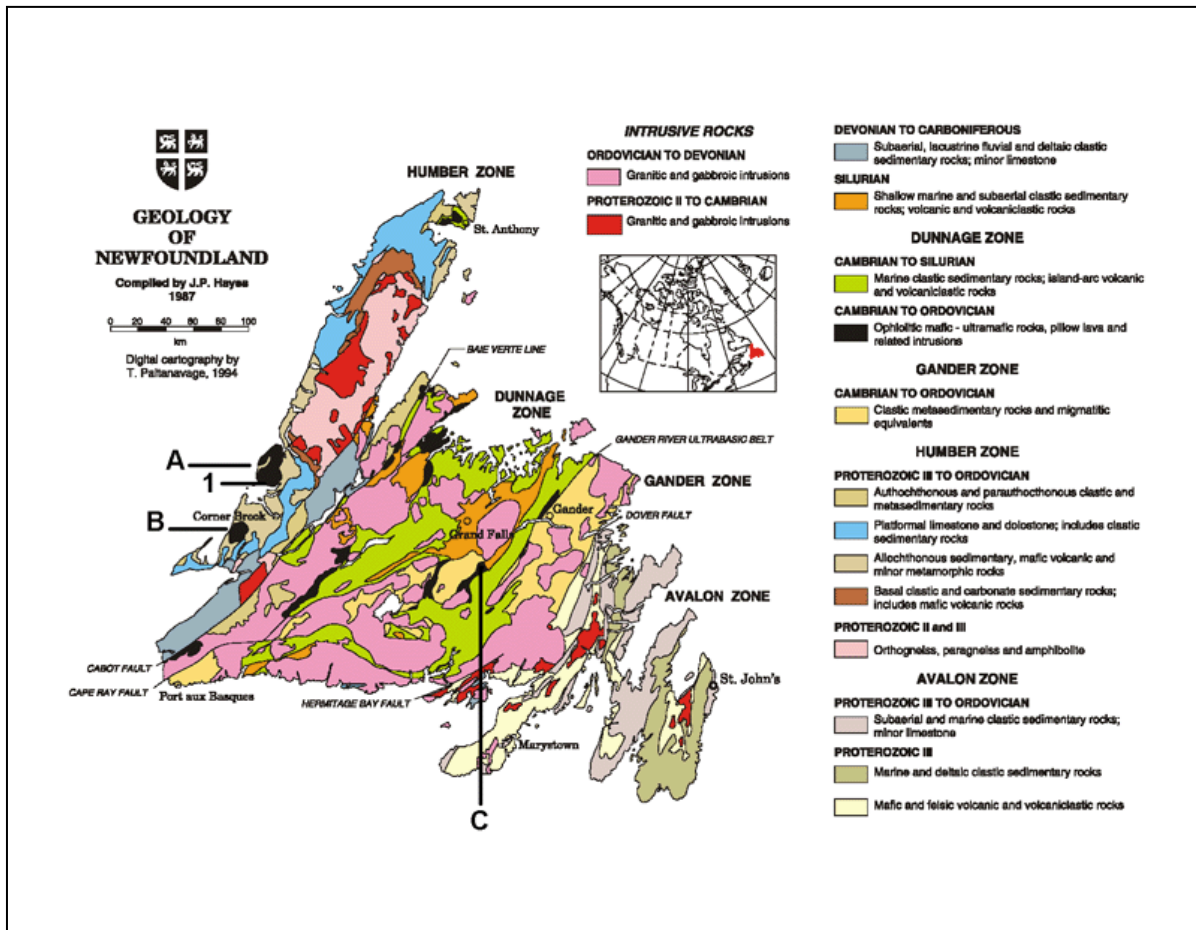


Figure 5. Location of the single historic locality for *Polystichum scopulinum* (site 1) in relation to serpentine outcrops (black areas) in Newfoundland. Areas A, B and C represent areas of occurrence of the serpentine species *Minuartia marcescens*.

The largest population, at Britton Creek, is especially threatened by road upgrading since the site would either have a new cut established or could serve as a borrow pit. Forest fires are also a major threat in the Tulameen River valley. The second-growth forests have high fuel loads on the forest floor due to aggressive fire suppression activities. When forest fires occur under conditions of high winds and low fuel moisture in the understory fuels, they result in intense, inferno-like fires that destroy most understory vegetation. Even though the forests on the ultramafic sites are relatively open compared to immediately adjacent forests, high winds could easily carry a fire that would eliminate this rare fern.

In Quebec, it is suspected that botanical overcollecting had significantly reduced this disjunct population in the first half of the 20th century, but it is now considered to be relatively stable within Parc de la Gaspésie. Due to the ultramafic properties of the soils at all sites, introduced species are of no concern. Since some of the fern clumps are on

a trail, trampling may be a potential risk; however, since there is no monitoring of the site, the actual impact of such activity is unknown.

The site for the historic collection in western Newfoundland is in a relatively inaccessible location and is probably not at imminent risk if it is still extant.

Considering that the species only occupies a portion of the ultramafic sites at discrete elevational levels and exposure, it is possible that the species' distribution may be affected by inherent characteristics that limit its occurrence and/or by variation in the distributional pattern of elements in the substrate.

SPECIAL SIGNIFICANCE OF THE SPECIES

Polystichum scopulinum belongs to a relatively small group of species with a restricted Pacific Coast range that have their northern limits in southwestern British Columbia. In Quebec the species is even more dramatically disjunct. The importance of these peripheral and disjunct populations, especially with respect to their genetic characteristics, has yet to be studied adequately. Peripheral populations are often genetically and morphologically divergent from central populations and may have an evolutionary and ecological significance out of proportion to the percentage of the species they represent (Mayr 1982; Lesica and Allendorf 1995). The protection of genetically distinct peripheral populations may be important for the long-term survival of the species as a whole (Lesica and Allendorf 1995).

Although no Aboriginal uses were noted in a major ethnological database (<http://herb.umd.umich.edu/>), the widespread eastern Christmas fern (*P. acrostichoides*) and western sword fern (*P. munitum*) are known for a variety of medicinal and other uses by Aboriginal peoples.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

International Status

Polystichum scopulinum is not covered under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Endangered Species Act (USA) or the IUCN Red Data Book. NatureServe has designated a global rank of "G5" for the species, a ranking that indicates that, on a global scale, it is considered to be "common to very common; demonstrably secure and essentially ineradicable under present conditions" (NatureServe 2002).

National and provincial status

The British Columbia Conservation Data Centre has ranked this species as S1 and placed it on the British Columbia Ministry of Sustainable Resource Management red list

(Douglas *et al.* 2002b). This is the most critical category for imperiled rare native vascular plants in the province. In Quebec, it is also ranked S1 by the Centre de données sur le patrimoine naturel, Ministère de l'Environnement du Québec. 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". It is also listed as threatened under the Quebec Act respecting threatened or vulnerable species. NatureServe ranks this species as a historic record (SH) in Newfoundland. The national ranking is N1. The species is ranked as "May Be At Risk" in BC, QC and NL (Wild Species 2000, web site).

British Columbia does not have specific legislation in place for the protection of vascular plants at risk; thus *Polystichum scopulinum* remains unprotected. At the federal level the *Species at Risk Act* will protect listed plants only on Federal lands. The federal minister, however, can recommend a federal Cabinet Order that would provide for protection of COSEWIC species on provincial lands if the laws of the province do not effectively protect the species or the residences (or critical habitats) of its individuals. The habitat of the species in Quebec is located in a provincial park (le Parc de la Gaspésie), and is legally protected. See the provincial government publication by Lavoie *et al.* (1994) for additional details on this plant.

TECHNICAL SUMMARY

Polystichum scopulinum

Mountain Holly Fern

polystic des rochers

Range of Occurrence in Canada: British Columbia, Quebec and Newfoundland & Labrador (on the Island of Newfoundland)

| Extent and Area Information | |
|--|---|
| <ul style="list-style-type: none"> <i>Extent of occurrence (EO)(km²)</i> [approximate area within which the fern occurs, e.g., in BC a band of 0.1 km x 4 km] | BC: 0.4 km ² QC: 0.08 km ² NL: uncertain, but likely quite small |
| <ul style="list-style-type: none"> <i>Specify trend in EO</i> | Stable |
| <ul style="list-style-type: none"> <i>Are there extreme fluctuations in EO?</i> | No |
| <ul style="list-style-type: none"> <i>Area of occupancy (AO) (km²)</i> [total area occupied by the fern] | BC: 0.01 km ² QC: 0.003 km ² NL: uncertain but likely quite small |
| <ul style="list-style-type: none"> <i>Specify trend in AO</i> | Stable in BC and QC and likely so in the remote area of the Newfoundland site |
| <ul style="list-style-type: none"> <i>Are there extreme fluctuations in AO?</i> | No |
| <ul style="list-style-type: none"> <i>Number of known or inferred current locations</i> | BC: 1 area (3 pops.) QC: 1 area (1 pop.) NL: uncertain status of 1 historic population |
| <ul style="list-style-type: none"> <i>Specify trend in #</i> | Stable |
| <ul style="list-style-type: none"> <i>Are there extreme fluctuations in number of locations?</i> | No |
| <ul style="list-style-type: none"> <i>Specify trend in area, extent or quality of habitat</i> | Stable |
| Population Information | |
| <ul style="list-style-type: none"> <i>Generation time (average age of parents in the population)</i> | Unknown (several years) |
| <ul style="list-style-type: none"> <i>Number of mature individuals</i> | >250 and likely <1000 but no data are available for the Newfoundland site |
| <ul style="list-style-type: none"> <i>Total population trend</i> | Likely stable |
| <ul style="list-style-type: none"> <i>% decline over the last/next 10 years or 3 generations.</i> | N/A |
| <ul style="list-style-type: none"> <i>Are there extreme fluctuations in number of mature individuals?</i> | No |
| <ul style="list-style-type: none"> <i>Is the total population severely fragmented?</i> (Widely disjunct in Canada and in BC disjunct by 230 km from WA state population; occurs sporadically and not at all serpentine locations and reproduction is likely almost exclusively vegetative since the relatively dry habitat is not conducive to spore germination and sexual reproduction) | Yes |
| <ul style="list-style-type: none"> <i>Specify trend in number of populations</i> | Stable |
| <ul style="list-style-type: none"> <i>Are there extreme fluctuations in number of populations?</i> | No |
| List populations with number of mature individuals in each: BC: 412; QC: 215; NL: unknown | |

| | |
|---|-----------------------|
| Threats (actual or imminent threats to populations or habitats) | |
| BC: potential road building and mining exploration and forest fires QC: the species and its habitat are legally protected and under no imminent threat of extirpation although plants occur along a trail and may be subject to trampling NL: site is relatively inaccessible and the population, if extant, is likely under no imminent threat | |
| Rescue Effect (immigration from an outside source) | |
| <ul style="list-style-type: none"> • <i>Status of outside population(s)?</i> USA: | secure (G5) |
| <ul style="list-style-type: none"> • <i>Is immigration known or possible?</i> | Possible but unlikely |
| <ul style="list-style-type: none"> • <i>Would immigrants be adapted to survive in Canada?</i> | Unknown |
| <ul style="list-style-type: none"> • <i>Is there sufficient habitat for immigrants in Canada?</i> | Possibly |
| <ul style="list-style-type: none"> • <i>Is rescue from outside populations likely?</i> | Unlikely |
| Quantitative Analysis [provide details on calculation, source(s) of data, models, etc.] | N/A |
| Current Status COSEWIC: Threatened (May 2005) | |

Status and Reasons for Designation

| | |
|--|---|
| Status: Threatened | Alpha-numeric code: Met criteria for Endangered, B1ab(iii,v)+2ab(iii,v), but designated Threatened because of the uncertainty about the imminent threats from mining activities at the British Columbia sites. The species is also protected in Quebec. Criteria met for Threatened: B1ab(iii,v)+2ab(iii,v); C2a(i); D1+2. |
| Reasons 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 3 in British Columbia, from potential mining activities for precious metals. | |
| Applicability of Criteria | |
| Criterion A (Declining Total Population): N/A | |
| Criterion B (Small Distribution, and Decline or Fluctuation): Meets Endangered B1ab(iii,v)+2ab(iii,v) with highly restricted disjunct occurrences at 3 locations (the BC populations could all be impacted by mining and so are considered as a single location with three populations); a continuing decline is inferred if mining is undertaken at the BC populations with subsequent loss in habitat extent, quality and likely loss of plants; imminence of threat to the BC population is uncertain (no mining initiated since 2001 when mine holdings were promoted). A potential threat exists at the QC site due to hiking activities on a trail through the population. However, since the species is not likely to be completely eradicated along the 4 km stretch of serpentine in BC if mining were to be initiated and the species is also protected in QC, a status of threatened is recommended. | |
| Criterion C (Small Total Population Size and Decline): Threatened C2a(i). Recent declines have not been demonstrated but can be inferred if mining occurs at the BC location; no populations contain >1,000 mature individuals. This is inferred from the fact that seemingly the Newfoundland population, if extant, is likely highly restricted and judging by numbers at the BC and QC localities likely is also relatively small. | |
| Criterion D (Very Small Population or Restricted Distribution): Meets threatened D1 with <1000 plants in total and D2 with <5 locations that are highly fragmented and with a very small area of occupancy (<20km ² in total) and at risk from potential mining activities in BC and possible trampling in QC. | |
| Criterion E (Quantitative Analysis): Not applicable. | |

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BIOGRAPHICAL SUMMARY OF REPORT WRITERS

Dr. George Wayne Douglas (1938-2005), well-known and respected British Columbia botanist, whose contribution to COSEWIC included over 30 status reports, died in Duncan, BC, on 10 February 2005, after a short battle with cancer.

George W. Douglas had an M.Sci. (Forestry) from the University of Washington and a Ph.D. (Botany) from the University of Alberta, Edmonton. George worked with rare plants for over 20 years. He was senior author of *The Rare Plants of the Yukon* (1981), *The Rare Plants of British Columbia* (1985) and *Rare Native Plants of British Columbia* (1998, 2002). He was also the senior editor for the *Illustrated Flora of British Columbia* (1998-2002) and was the program botanist for the British Columbia Conservation Data Centre from 1991 until 2003. George wrote or co-wrote 33 COSEWIC status reports and three update status reports during this period.

Jacques Labrecque has an M.Sci. (Botany) from the Université de Montréal. Jacques has worked with rare vascular plants since 1990 and, since 1994, has been the program assistant botanist at the Centre de données sur le patrimoine naturel. He is co-author of *Les plantes menacées ou vulnérables du Québec* (2002). He is also the author of two COSEWIC status reports and four provincial status reports.

COLLECTIONS EXAMINED

Herbarium specimens housed at the Royal British Columbia Museum in Victoria (V) were viewed and verified.