

COSEWIC
Assessment and Status Report

on the

Poor Pocket Moss
Fissidens pauperculus

in Canada



ENDANGERED
2001

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

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COSEWIC. 2001. COSEWIC status report on the Poor Pocket Moss *Fissidens pauperculus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 15 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Belland, R. 2001. COSEWIC status report on the Poor Pocket Moss *Fissidens pauperculus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-15 pp.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur le Fissident appauvri (*Fissidens pauperculus*) au Canada.

Cover illustration/photo:
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Catalogue No. CW69-14/641-2001E-PDF
ISBN 978-1-100-18723-5



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COSEWIC Assessment Summary

Assessment Summary – November 2001

Common name

Poor Pocket Moss

Scientific name

Fissidens pauperculus

Status

Endangered

Reason for designation

This North American endemic is found in several Pacific states and at only one disjunct locality in southern British Columbia, where it occurs as a single small clump and a few adjacent tiny tufts of plants within a stream bed, and where it is at risk from human disturbance and stochastic events.

Occurrence

British Columbia

Status history

Designated Endangered in November 2001.



COSEWIC
Executive Summary

Poor Pocket Moss
Fissidens pauperculus

Species information

Fissidens pauperculus is a moss distinguished by its minute size, lack of leaf border, stout costa that ends well below an acute to short-acuminate apex, and subentire to irregularly crenate leaf margins.

Distribution

Fissidens pauperculus is a western North American endemic. The main portion of the species' range is California and southwestern Oregon. Isolated outliers occur in northwestern Washington and southwestern British Columbia.

Habitat

Fissidens pauperculus occurs in a Douglas Fir/Western Hemlock forest at the single Canadian location. At this site the species grows on a wet silty outcrop in a seasonal streamlet. In the major part of its range, the species is associated with coastal redwood forests.

Biology

There is little known about the biology of *Fissidens pauperculus*. The species is a monoicous moss that produces spores regularly at the Canadian site. Thus the species can potentially disperse into nearby suitable habitats.

Population sizes and trends

There is no information on population trends. The total known Canadian population consists of one patch approximately 625 cm².

Limiting factors and threats

Limiting factors for the species are unknown. Although secure in a protected area, the species population is potentially threatened by trail maintenance and stochastic events (climatic change).

Special significance of the species

Fissidens pauperculus is known from only one site in Canada. The species is rare also in North America, where it is an endemic restricted to California, Oregon, Washington, and British Columbia.



COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species, subspecies, varieties, and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fish, lepidopterans, molluscs, vascular plants, lichens, and mosses.

COSEWIC MEMBERSHIP

COSEWIC comprises representatives 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 Biosystematic Partnership), three nonjurisdictional members and the co-chairs of the species specialist groups. The committee meets to consider status reports on candidate species.

DEFINITIONS

Species	Any indigenous species, subspecies, variety, or geographically defined population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* 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.

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.



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

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SPECIES INFORMATION

Name and classification

Scientific Name:	<i>Fissidens pauperculus</i> Howe
Bibliographic Citation:	Erythea 2: 97, 1894.
Pertinent Synonyms:	None
Common Name:	Poor Pocket Moss (translated directly from the Latin name)
Family:	Fissidentaceae
Major Plant Group:	Mosses (Musci)

The genus *Fissidens* is a large genus with more than 850 species worldwide. In Canada the genus is represented by 16 species (Ireland et al. 1987), of which 9 occur in British Columbia.

Description

General – plants minute, 1.5-2 mm long, loosely gregarious, decumbent to ascending.

Leaves – 3-5 pairs, similar wet or dry, upper leaves 1.5-2.3 mm x 0.3-0.4 mm, oblong lingulate, strongly folded (vaginant) lamina $\frac{1}{2}$ - $\frac{2}{3}$ length of the leaf, apex acute to short acuminate, subentire to irregularly crenulate above, border lacking or with 1 to 2 rows of small cells; costa stout, ending 8-10 cells below the apex.

Leaf cells – upper leaf cells irregularly hexagonal, smooth, 9-10 μm x 10-40 μm , smaller and rounded toward margins, larger and oblong-rectangular near midrib.

Seta – yellow, reddish with age, 2-3 (5) mm long.

Capsule – terminal, ovoid to oblong-ovoid, inclined to cernuous, operculum conic-rostellate, nearly equaling the urn in length.

Sexuality – Monoicous (male and female reproductive structures on same plant).

The distinctive leaves consisting of 3 parts (strongly folded lamina, apical lamina, dorsal lamina) are a distinguishing feature of the genus. *Fissidens pauperculus* is distinguished by its minute size, lack of a leaf border, subentire to irregularly crenulate (by projecting leaf cells) leaf margins, and stout costa ending 8-10 cells below an acute leaf apex (Figure 1). There are no other species in British Columbia that closely resemble *F. pauperculus*. Although some populations of *F. aphyllifolius* have been misidentified as *F. pauperculus*, the former species differs from *F. pauperculus* in size, habitat, and presence of a distinct leaf margin.

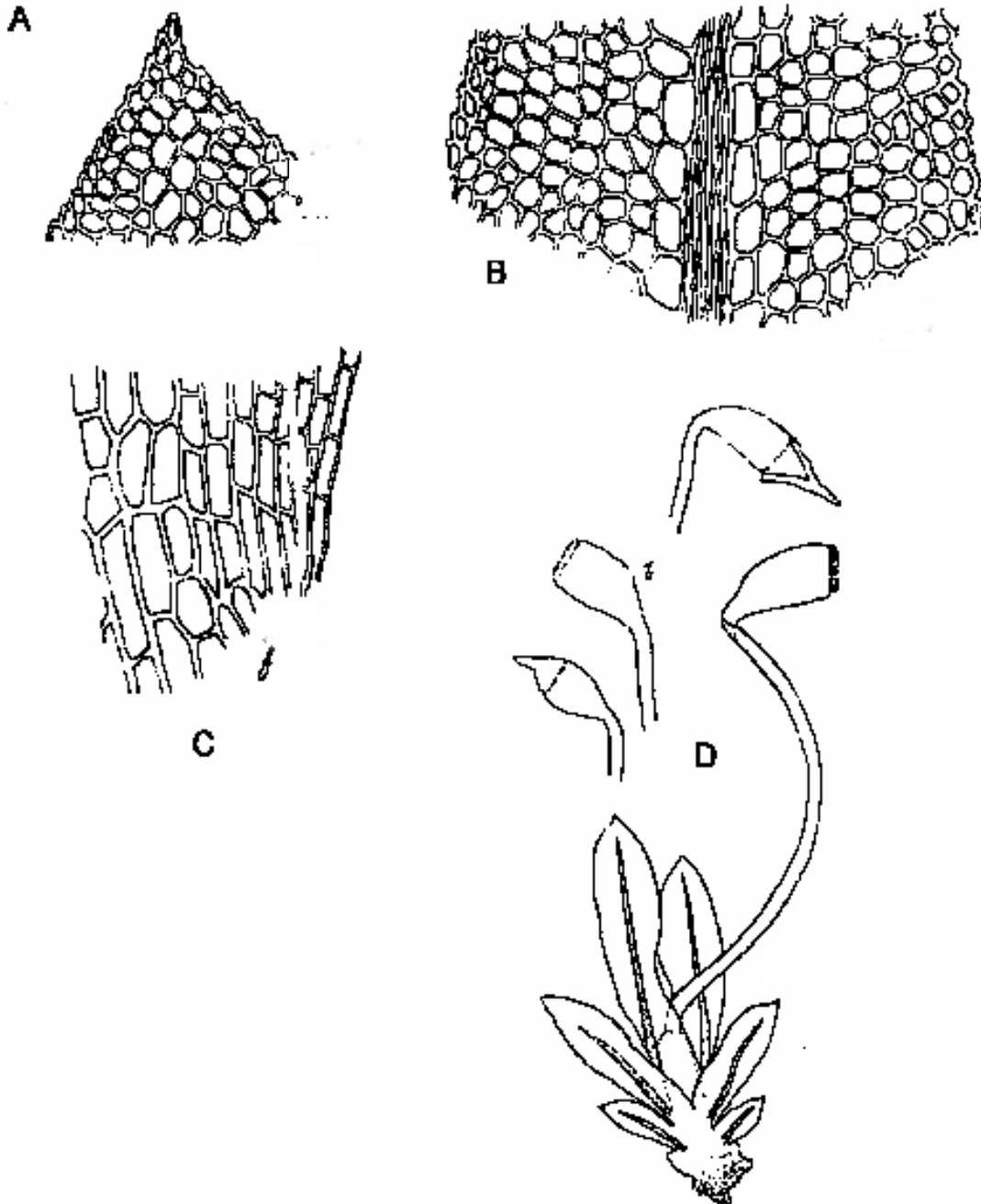


Figure 1. Morphology of *Fissidens pauperculus*. A. Apical leaf cells showing the lack of a midrib. B. Median leaf cells. Note the lack of a differentiated leaf border. C. Basal leaf cells. D. Habit showing sporangia. (From Grout 1936.)

Nationally significant populations

Only one population of *Fissidens pauperculus* is known in Canada. This population is located in Lynn Canyon Park, a city park managed by the City of North Vancouver.

DISTRIBUTION

Global range

Fissidens pauperculus is a North American endemic that is restricted to western North America. The species' range is centred in California, and southwestern Oregon, with isolated occurrences in northwestern Washington (Clallam County) and southwestern British Columbia (Figure 2). The species is uncommon throughout its range, and is known from fewer than 20 locations globally.

Canadian range

In Canada, *Fissidens pauperculus* is restricted to southwestern British Columbia where it is known from only one site in North Vancouver. There are no historic records for the species.

HABITAT

Habitat requirements

There are no detailed published accounts of the habitat of *Fissidens pauperculus*. References to the habitat of the species in floras include those of Lawton (1971) who gives the habitat (and microhabitat) as "... on bare, moist soil banks, often growing with *F. bryoides*". Label information from herbarium vouchers provide more detail, as follows: 1) earth banks in small shaded valley (Marin Co. Calif.), 2) hard moist earth under redwoods (San Mateo Co, Calif.), 3) on soil at base of *Sequoia sempervirens* (Marin Co., Calif.), 4) on logs (Humboldt Co, Calif.), 5) earth hummock on forest slope (San Mateo Co, Calif.), 6) on barren clay soil in cut-over redwood forest (Humboldt Co, Calif.) and, 7) on earth in redwood forest (Santa Cruz Co, Calif.). In the main part of its western North American range, the species thus appears most frequently in redwood (*Sequoia sempervirens*) forests.

At the Lynn Canyon site, Schofield (1968) and Krause & Schofield (1977) give the habitat as "silty outcrop in seasonal streamlet", and "seepy consolidated silt cliff" (respectively). Herbarium voucher label information gives also "silt of damp slope" and "silt outcrop on canyon slope". During fieldwork conducted in 1999 and 2000, the species grew on a silty outcrop in a streamlet within a mature Douglas-Fir/Western Hemlock (*Pseudotsuga menziesii* / *Tsuga heterophylla*) forest. The outcrop is intermittently wet. During the summer, the outcrop remains mostly dry; in the late fall and winter the outcrop is irrigated from more or less continuous runoff as a result of winter rains in the region (Koch 1951). Habitat photographs taken at the Lynn Canyon site are included as Figures 3-5.

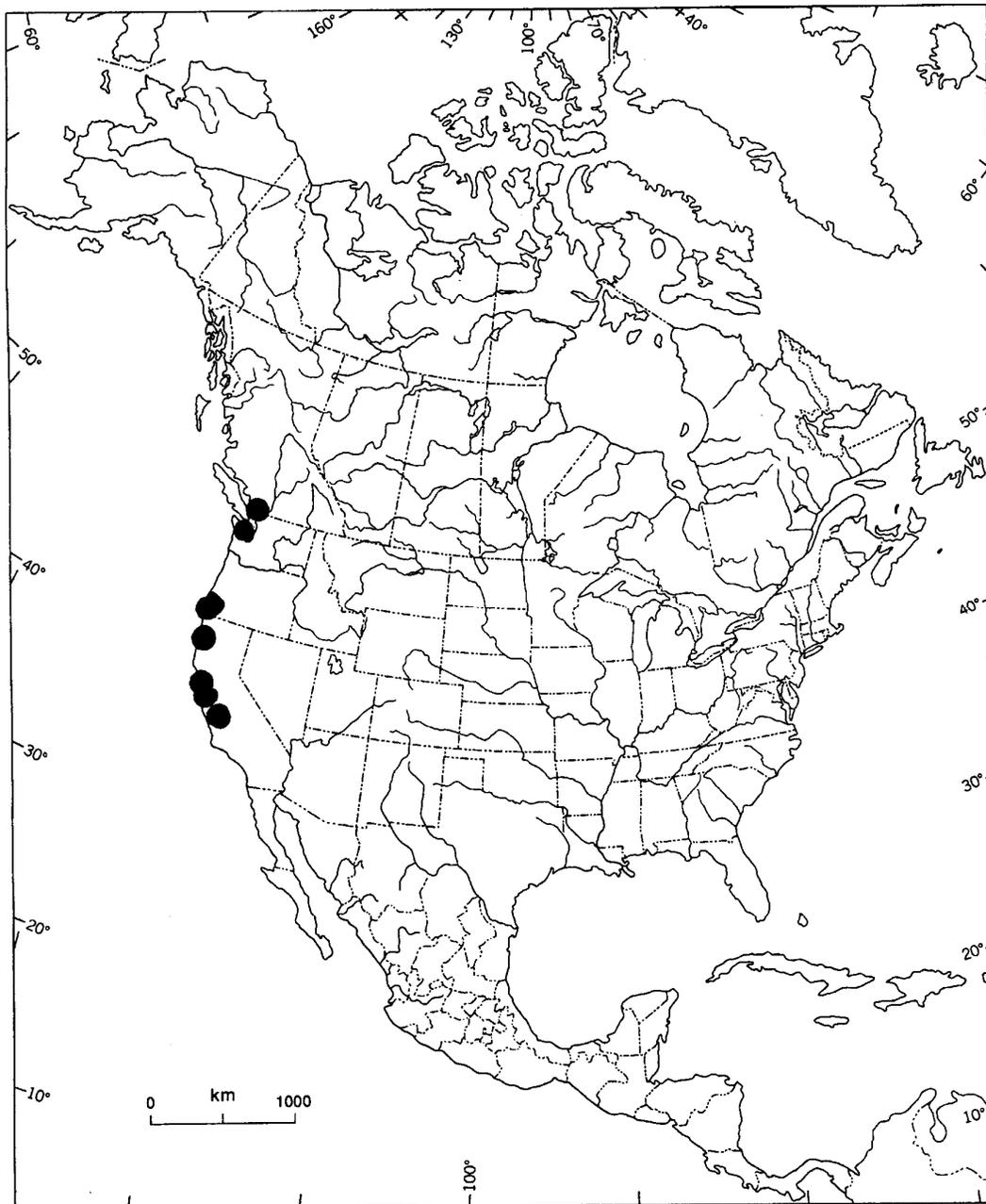


Figure 2. Distribution of *Fissidens pauperculus* in North America. The map represents the world distribution of the species. Some dots in the USA represent two occurrences.

Protection/ownership

The only known site for the species in Canada is within a city park that is managed as a public nature park by the City of North Vancouver.



Figure 3. General habitat of *Fissidens pauperculus* at Lynn Canyon. Arrow points to the single *F. pauperculus* patch. The stick pen above the arrow is shown for scale. Note the boards (debris) in the upper part of the photo.



Figure 4. Closeup of *Fissidens pauperculus* microhabitat at Lynn Canyon (see Figure 3). Line encloses the single *F. pauperculus* patch. Note the stick pen included for scale.



Figure 5. *Fissidens pauperculus* habitat at Lynn Canyon. View from trail showing the debris from old foot bridge.

BIOLOGY

Reproduction

There is no detailed information available that is specific to the reproduction of *Fissidens pauperculus*.

As with all species of moss, sexual reproduction is by spores produced within a specialized structure called a sporangium. *Fissidens pauperculus* is a monoicous species, where male and female reproductive structures are on the same plant. As compared with dioicous mosses (male and female structures on separate plants), monoicous species produce spores much more frequently and potentially increase the species' ability to disperse over long distances.

There are no published accounts of asexual reproduction for this species. Asexual reproduction, if present, is considered to be important only for local dispersal and establishment. It is well known that many moss species reproduce asexually from broken leaf fragments or other plant parts, as well as from specialized propagules such as gemmae or deciduous leaves. Although not documented, it is likely that *Fissidens pauperculus* could possess some means of asexual reproduction from plant fragments.

Movements/dispersal

Spores are the primary means by which mosses are able to disperse long distances and to establish themselves in new areas. At the single Canadian site, *Fissidens pauperculus* produces spores regularly (Table 1). Of the six observations of the species, *F. pauperculus* was found with sporophytes five times.

There is very little possibility of rescue effect from southern populations of the species should the B.C. population become exterminated. Although the nearest population occurs in the Olympic Mountains of Washington (ca 160 km distant), the latter is itself an isolated population that is not likely to furnish propagules to restock the Canadian population. Furthermore, the nearest population to the Washington site is about 700 km away in extreme southwestern Oregon. The two known Oregon populations are at the northern edge of the species' main range that lies in California. There, *F. pauperculus* populations are scattered within the coastal redwood forests and mostly separated by distances of 100 km or more.

POPULATION SIZES AND TRENDS

The definition of individuals and hence population size for mosses is difficult since one tuft of moss that consists of many shoots may have arisen from the germination of a single spore. Here we follow the recommendation proposed by Hallingbäck *et al.* (2000) where a single discrete patch of moss is counted as one individual.

There are no data on population trends for *Fissidens pauperculus* (see comments below). However, several visits to the site over the past 40 years show that the species has persisted at the site since its initial discovery in 1961 and has been observed at the site at least six times (Table 1).

Table 1. Summary of observations of *Fissidens pauperculus* at Lynn Canyon, British Columbia, Canada.

Collector	Year	Herbarium Collection	Sporangia?
Schofield, W.B.	2000	No	Yes
Belland, R.J. & W.B. Schofield	1999	No	Yes
Schofield, W.B.	1992	Yes	No
Schofield, W.B.	1970	Yes	Yes
Schofield, W.B. & H. Crum	1964	Yes	Yes
Schofield, W.B.	1961	Yes	Yes

In April 2000, W.B. Schofield reported that the species occurred as one patch measuring about 625 cm². A subsequent visit by the author in 2001 revealed that there were several scattered plants present in addition.

The population may have diminished in size since its discovery. *F. pauperculus* was first found on a small silty cliff above the streamlet, as reported by Krause & Schofield (1977). This microhabitat is less than 2 metres from the silty outcrop where the species now grows. W.B. Schofield (pers. comm. March 2001) notes that the species has since disappeared from the cliff. It is not known if the species existed at both microhabitats at the time that the species was first reported.

LIMITING FACTORS AND THREATS

Human disturbance is the greatest threat to this species in Canada. Although the species is in a protected area, the site is on a steep slope just below an abandoned trail. Some of the boarding used to construct a nearby footbridge has been washed downslope and are now close to the single species population. If the park decides to remove this debris, it is quite possible that the workers could trample the population, thereby decimating it.

Stochastic events are an important element in the species persistence in Canada. At the B.C. site, climatic change that results in producing 2-3 hot, dry summers in the Vancouver area could lead to excessive desiccation of the substrate on which the species depends. Excessive dryness would lead to exfoliation of the substrate and the ultimate demise of *F. pauperculus*.

SPECIAL SIGNIFICANCE OF THE SPECIES

The Lynn Canyon Park site is the only one known for the species in Canada. Furthermore, the species is rare also in North America where it is an endemic restricted to California, Oregon, Washington, and British Columbia; the species is known from fewer than 20 locations worldwide.

EVALUATION AND PROPOSED STATUS

Existing protection or other status designations

The Nature Conservancy (TNC) global ranking for *Fissidens pauperculus* is G3? (the '?' indicates that the species has been tentatively assigned). G3 elements are defined as having 21-100 occurrences and may be rare and local throughout their range, or in a restricted range, although the element may be abundant in some locations. G3 elements may be susceptible to extirpation because of large-scale disturbances. Although TNC ranks the species as possibly G3?, the author has been unable to find more than 20 occurrences for the species, and it is estimated that the species occurs in significantly fewer sites.

In Oregon, the species is ranked as S1, defined as an element having 5 or fewer occurrences or only a few remaining individuals, and which may be especially vulnerable to extirpation because of some factor of its biology.

In British Columbia, the species is also S1. In addition, the species is on the Red List, which includes any indigenous species or subspecies (taxa) considered to be extirpated, endangered, or threatened in British Columbia.

Assessment of status and author's recommendation

Using COSEWIC criteria, *Fissidens pauperculus* qualifies for Endangered status, based on criteria D1 (population size < 250). The species is isolated from the main range of the species, which itself is rare in North America. Thus, the possibility of rescue effect is very small. In addition, *F pauperculus* grows in a habitat susceptible to human disturbance and to stochastic events.

TECHNICAL SUMMARY

Fissidens pauperculus
 Poor Pocket Moss
 BC

Fissident appauvri

Extent and Area information	
• extent of occurrence (EO)(km ²)	<0.1
• specify trend (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in EO (> 1 order of magnitude)?	Unknown
• area of occupancy (AO) (km ²)	<<0.1
• specify trend (decline, stable, increasing, unknown)	Possible decline
• are there extreme fluctuations in AO (> 1 order magnitude)?	No
• number of extant locations	1
• specify trend in # locations (decline, stable, increasing, unknown)	Stable
• are there extreme fluctuations in # locations (>1 order of magnitude)?	No
• habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat	Unknown
Population information	
• generation time (average age of parents in the population) (indicate years, months, days, etc.)	Unknown
• number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values)	1
• total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals	Possible decline
• if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)	Unknown
• are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?	No
• is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., ≤ 1 successful migrant / year)?	Yes
• list each population and the number of mature individuals in each	1 pop (1 main patch and a few scattered tufts)
• specify trend in number of populations (decline, stable, increasing, unknown)	Stable
• are there extreme fluctuations in number of populations (>1 order of magnitude)?	No
Threats (actual or imminent threats to populations or habitats)	
Rescue Effect (immigration from an outside source)	
• does species exist elsewhere (in Canada or outside)?	Yes
• status of the outside population(s)?	Unknown
• is immigration known or possible?	No
• would immigrants be adapted to survive here?	Unknown
• is there sufficient habitat for immigrants here?	Likely
Quantitative Analysis	
	N/A

ACKNOWLEDGEMENTS

The author thanks Dr. Wilfred B. Schofield for his accompaniment in the field and for the loan of specimens from UBC.

Funding provided by the Canadian Wildlife Service, Environment Canada.

LITERATURE CITED

- Grout, A.J. 1936. Moss flora of North America north of Mexico. Volume 1. Part 1. Newfane, Vermont.
- Hallingbäck, T and N. Hodgetts. 2000. Status survey and conservation action plan for bryophyte - mosses, liverworts, and hornworts. IUCN/SSC Bryophyte Specialist Group. Cambridge, U.K. 106 pp.
- Ireland, R.R., G.R. Brassard, W.B. Schofield and D.H. Vitt. 1987. Checklist of the mosses of Canada II. *Lindbergia* 13: 1-62.
- Krause, G., and Schofield, W.B. 1977. The moss flora of Lynn Canyon Park, North Vancouver, British Columbia. *Syesis* 10: 97-110.
- Koch, L.F. 1951. *Fissidens pauperculus* Howe and *Orthotrichum gracile* Bruch & Schimper: mosses associated with the coast redwood forest. *Science* 114: 571-572.
- Lawton, E. 1971. Moss flora of the Pacific Northwest. Hattori Botanical Laboratory, Nichinan, Japan.
- Schofield, W.B. 1968. Bryophytes of British Columbia I. Mosses of particular interest. *Journal of the Hattori Botanical Laboratory* 31: 205-226.

THE AUTHOR

Dr. René J. Belland has extensive experience with bryophytes in many parts of Canada. He has 14 years of field experience in Atlantic Canada where he has studied the bryophyte floras of the Gulf of St. Lawrence. This work includes a detailed study of disjuncts in that region, as well as preparing inventories and analysing the floras (including rare species) in eight national parks. Several years were spent working on the mosses of British Columbia. Dr. Belland has been with the University of Alberta since 1993, where he is currently involved in biodiversity projects that include modelling biodiversity patterns in the Rocky Mountains of Alberta and in British Columbia. In addition, he has worked closely with the Alberta Natural Heritage Information Centre to develop the provincial bryophyte tracking list, and has worked with COSEWIC and the Atlantic Canada Conservation Data Centre on bryophyte-related projects.

Dr. Belland currently co-chairs the Vascular Plants, Mosses and Lichens Species Specialist Group for COSEWIC. He is also a member of the International Union for the Conservation of Nature (IUCN) Species Survival Commission (SSC) - Bryophyte Specialist Group, International Association of Bryology, Standing Committee for Endangered Bryophytes - North American Specialist, and Province of Alberta Endangered Species Scientific Sub-committee.

AUTHORITIES CONSULTED

Schofield, W.B., Professor Emeritus, Department of Botany, University of British Columbia, Vancouver, BC (expert on bryology of British Columbia; discoverer of *Fissidens pauperculus* in BC).

Purcell, R.A. Professor, The Pennsylvania State University, University Park, PA. Taxonomic expert on the genus *Fissidens*.

COLLECTIONS EXAMINED

Lynn Creek Canyon, North Vancouver, June 14, 1961. W.B. Schofield 14539 (UBC).

Lynn Creek, N. Vancouver, March 5, 1964. W.B. Schofield 22607 (UBC).

Lynn Creek Canyon, North Vancouver, August 27, 1970. W.B. Schofield 43098. (UBC).

Lynn Canyon Park, North Vancouver, March 22, 1992. W