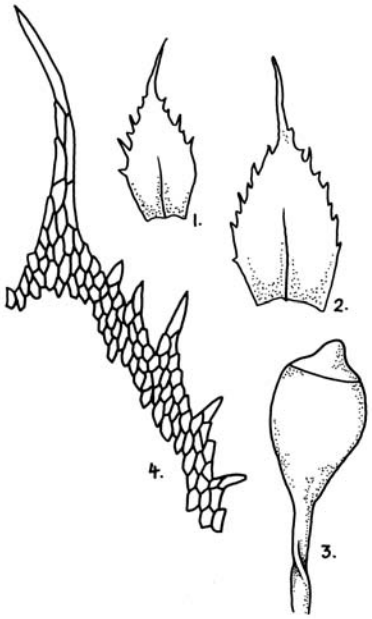
COSEWIC
Assessment and Status Report

on the

Silver Hair Moss
Fabronia pusilla

in Canada



ENDANGERED
2002

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION DES
ESPÈCES EN PÉRIL
AU CANADA

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

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Cover illustration:
Silver hair moss — Provided by the author, redrawn from Lawton (1971) and Sharp (1994).

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COSEWIC
Assessment Summary

Assessment Summary – November 2002

Common name
Silver hair moss

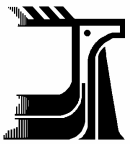
Scientific name
Fabronia pusilla

Status
Endangered

Reason for designation
Silver hair moss is a small species that grows among other mosses, either as an epiphyte on trees or on rock faces. In Canada it is known from two locations; one that is now submerged, and a second associated with a cliff in southwestern British Columbia. The latter is the northernmost location for this species. Although the species was not relocated at its extant site during recent surveys, the expanse of available habitat at the only known sites combined with the small stature of the moss suggest that the species may still be present in Canada.

Occurrence
British Columbia

Status history
Designated Endangered in November 2002. Assessment based on a new status report.



COSEWIC
Executive Summary

Silver hair moss
Fabronia pusilla

Species information

Fabronia pusilla, the silver hair moss, is a tiny, creeping moss characterized by small leaves that are bordered by cilia-like and often multi-cellular teeth along the margins. Long, clear awns, or leaf tips, are also characteristic of this species. Occasionally, it has been considered a synonym of *F. ciliaris*, but the often multi-cellular, cilia-like teeth along the leaf margins separate *F. pusilla* from this species.

Distribution

Globally, this species has a western North American – western Europe/North African distribution, principally in Mediterranean-type climates. In Canada, it has been found at only two sites: on Sumas Mountain east of Abbotsford, and near Lower Arrow Lake in the Kootenay Valley. The Arrow Lake site is now submerged behind a dam, and it has not been collected from the area since the late 1800s. The Canadian populations appear to be at the northern limit of the distribution of this species, which is more widespread and common southwards.

Habitat

In British Columbia, *Fabronia pusilla* has been found only on rock faces and in crevices. Elsewhere, it has been found in seasonally dry habitats on rock and trees. The British Columbia habitat appears stable.

Biology

It is a perennial, creeping moss that grows on semi-exposed rock or bark substrata. It is an autoicous moss that produces sporophytes frequently across its range. Both of the Sumas Mountain collections have sporophytes.

Population sizes and trends

It was not found during the present work, and no detailed information on its population was gathered when it was first collected in 1968.

Limiting factors and threats

Competition with associated larger moss species, forest fire, and rock face degradation are potential, but probably minor, threats.

Special significance of the species

Fabronia pusilla is relatively widespread in the southern portions of its range in North America, but becomes less common northward, and is rare in southern British Columbia.

Existing protection or other status designations

No legislation, regulations, customs, or conditions exist to protect Canadian populations of *Fabronia pusilla*. Globally this species is tentatively considered common to very common (G5?). *F. pusilla* is Red-listed (S1) in British Columbia and listed S1 in Oregon.

Summary of the status report

The single Canadian site for *Fabronia pusilla* was intensively surveyed in 2001, but the species was not re-located. While it is possible that the *Fabronia pusilla* is still extant at the site because of the extensive area of suitable habitat, the species' small size and gregarious nature make it difficult to find in the field. These factors may also account for the species' apparent rarity in Canada.

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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Canada

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

COSEWIC Status Report

on the

Silver hair moss
Fabronia pusilla

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2002

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SPECIES INFORMATION

Name and classification

Fabronia pusilla Raddi is a member of the moss family *Fabronia*ceae. It is the only species of *Fabronia* in Canada (Ireland et al. 1987). Other North American species of *Fabronia* include *F. ciliaris* (Brid.) Brid., found from the north-eastern to south-western portions of the United States, and *F. ravenelii* Sull. found from Maryland to Florida (Anderson et al. 1990, Crum and Anderson 1981). Grout (1928-1940) considered *F. pusilla* to be a subspecies of *F. ciliaris*, but most other authors do not agree. *Fabronia pusilla* has long, often cilia-like teeth along the leaf margins and the teeth are often comprised of more than one cell. The marginal teeth of *F. ciliaris* are less distinct, never cilia-like, and are comprised of one cell (Crum and Anderson 1981, Lawton 1971).

Description

Fabronia pusilla is a tiny, pleurocarpous or creeping moss that grows in thin, flat mats, often admixed with other bryophyte species, in particular *Homalothecium* spp. Its narrow stems have an irregular branching pattern, with the leaves appressed along its length except for the leaf ends that tend to stick outwards towards the end of the stem.

Its stem leaves range in size from 0.4 to 0.75 (0.85) mm long and from 0.2 to 0.35 mm wide. They are ovate-lanceolate and awned, with each awn, or leaf tip, ending in a single, generally 50 to 80 µm long, cell. The awns are hyaline or colourless. The upper two-thirds of the leaf margins are bordered by sharp, often multicellular and cilia-like teeth, with the terminal cell usually much longer than the adjacent lower cells. Together, the awns and the teeth contribute to giving the plant a silvery to whitish-green cast. The narrow leaf costa is relatively short and often less than half the length of the leaf. Median and upper leaf cells range in size from 30 to 45 µm X 10 to 12 µm, and the basal cells are quadrate to short-rectangular and about the same width as the upper cells. Distinct alar regions are lacking.

Fabronia pusilla is autoicous, with male and female organs on the same stem. The perigonial bracts are ovate and lack distinct teeth and costae. The perichaetial bracts are longer, and more leaf-like and have small teeth along their margins, but also lack costae. The erect to somewhat curved seta is about 3 mm long. Its capsule is erect, ovate to obovate, with a somewhat wrinkled base when mature. The operculum is low-conical, and the peristome teeth are more or less fused in eight pairs. Lawton (1971) reports its spores to be finely papillose and from 9-14 µm in diameter, whereas Grout (1928 -1940) reports them as rough and from 12 to 17 µm in size. Buck (1994) describes the spores as papillose.

Although the marginal teeth are not visible in the field under the low magnification of a hand lens, its diminutive size, obvious leaf tips, and the general whitish green cast help to distinguish this species. Some small members of the Leskeaceae that have a similar habitat may be confused with it at first. Its small size and habit of growing with

other larger pleurocarpous mosses may result in *F. pusilla* being overlooked in field surveys.

Taxonomic keys are found in Grout (1928 – 1940), Lawton (1971), and Sharp et al. (1994), with Lawton and Sharp et al. providing illustrations. Grout's illustrations of *F. gymnostoma* Sull. & Lesq. appear to be of *Fabronia pusilla*, because of the multicellular teeth along the leaf margins. Crum and Anderson (1990) consider *F. gymnostoma* to be a variety of *F. ciliaris* (var. *ciliaris*). Crum and Anderson (1981) provide a discussion about the differences between *F. pusilla* and *F. ciliaris*. Figure 1 provides illustrations of *F. pusilla* modified from Lawton and Sharp et al (1994).

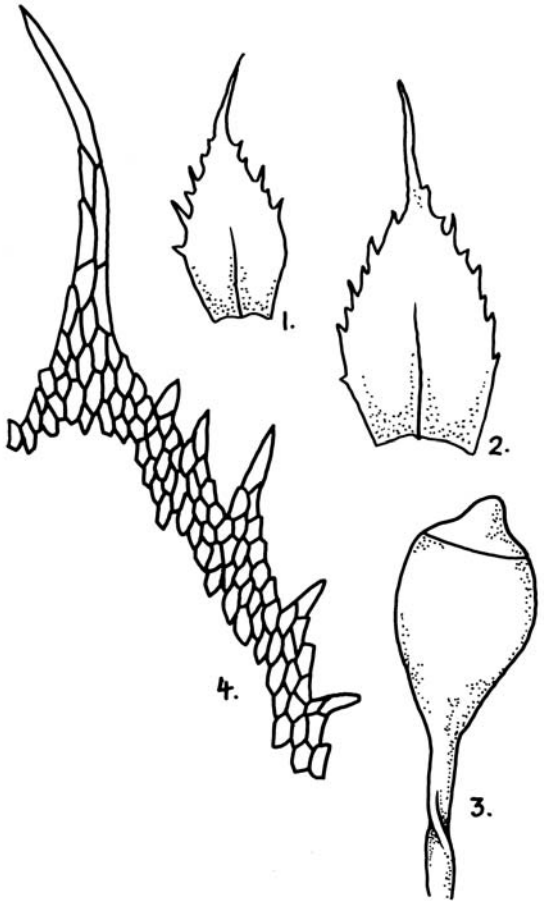

Figure 1. Illustrations of *Fabronia pusilla*: 1 and 2 are outlines of typical leaves (redrawn from Lawton 1971), 3 is a capsule and upper portion of the seta (redrawn from Lawton 1971), and 4 is detail of the leaf margin and apex (redrawn from Lawton 1971 and Sharp *et al.* 1994).

Nationally significant populations

To date, the only extant populations of *Fabronia pusilla* are at the south-west end of Sumas Mountain near Abbotsford, British Columbia, where the species was collected twice by W. B. Schofield in 1968. Ryan (1996) reported these collections along with a third collection made on a trunk of black cottonwood, *Populus trichocarpa*. Investigation of this collection shows that this specimen is not *F. pusilla*, but a different species in the Leskeaceae family. The only other collections of this species were made by J. Macoun in 1890 in the Arrow Lake area in the Kootenay Valley of south-eastern British Columbia, but these locations are now submerged behind a dam (Tan 1980). If still extant, the Abbotsford site should be considered a nationally significant population.

DISTRIBUTION

Global range

Fabronia pusilla has a western North American – western Europe/North African distribution, principally in Mediterranean-type climates. It has been found in western North America, Mexico, Europe, and North Africa (Buck 1994). Crum and Anderson (1981) report that it is also present in the Dominican Republic, but this is in error (Buck 1994). In western North America it has been reported from southern British Columbia, Washington, Idaho, Oregon, Colorado, New Mexico, Arizona, and California (Lawton 1971, Grout 1928 – 1940, Koch 1950; Fig. 2). The Canadian populations appear to be at the northern limit of the distribution of this species; the species is more widespread and more plentiful southwards.

Canadian range

Fabronia pusilla is restricted to southern British Columbia where it has been found at two locations: at the west end of Sumas Mountain east of Abbotsford in the south-western part of the province, and at Deer Park near Lower Arrow Lake in the Kootenay Valley in the south-central part of the province. The Arrow Lake site is now submerged behind a dam, and *F. pusilla* has not been collected from the area since Macoun's collections in the late 1800s. It was last collected from the Abbotsford site in March 1968.

If still extant in the Sumas Mountain site, its total range of occurrence is less than 0.1 square kilometers.

Figure 2. Approximate distribution of *Fabronia pusilla* in North America and Mexico (gray area approximates the distribution in the United States, the black dot is the Sumas Mountain Canadian location and the circle is the extirpated Lower Arrow Lake location).

HABITAT

Habitat requirements

In North America, *Fabronia pusilla* is usually found in seasonally dry habitats in areas with hot summers, preferring either rock or tree bark as substrates. At the Sumas Mountain site, it was found in a cranny on a dry vertical sandstone cliff, and on a damp shaded sandstone cliff face. It was reported from crevices of steep rocks of undetermined type at the Arrow Lake site. A common habitat in California is on the undersides of leaning trunks or limbs (A. Whittemore, pers. comm. 2001), especially those of oaks (Schofield, pers. comm. 2001). Here it can also be found on rock, especially on underhangs of rock walls and in crevices (J. Shevock, pers. comm. 2001), and it has also been collected on soil over rock in Colorado. More precise habitat information is lacking for this species.

Trends

The sandstone cliffs near Abbotsford are very extensive (about 1.5 km. in length, although somewhat patchy, broken up by talus and forest; Fig. 3 shows the site from about 2 km to the south). Many of the steep and high cliff faces are inaccessible, and unavailable for survey (Figs. 4 and 5 illustrate typical habitat features of the site).

Figure 3. Sumas Mountain site with approximate extent of sandstone cliffs noted by yellow dots (length approximately 1.5 km.).

Figure 4. Typical semi-open habitat near sandstone cliffs at Sumas Mountain site.

Figure 5. Typical open habitat near sandstone cliffs at Sumas Mountain site.

General habitat trends in the Abbotsford site appear stable. We visited the site on three days, in November and December, 2001, and found little disturbance to the rock faces, even though hiking is common along some areas at the base of the cliffs. A number of areas along Sumas Mountain are presently being proposed for development, but the sandstone cliffs on which this moss was found are not within development boundaries. Potential additional sites of suitable habitat may exist for this species across southern British Columbia, such as along the eastern portions of the Fraser River valley, in the Arrow Lake area, and, possibly, on Garry oaks and associated rock habitats along the coast.

Protection/ownership

The site is under private ownership.

BIOLOGY

General

Fabronia pusilla is a perennial, creeping moss that grows on semi-exposed rock or bark substrata. Both of the known sites for this species in British Columbia have hot summers and cool to cold winters. More specific biological information on *F. pusilla* is lacking.

Reproduction and dispersal

Fabronia pusilla is an autoicous moss (both sexes are on the same plant) that produces sporophytes and spores frequently across its range. Both Sumas Mountain collections have sporophytes, although they are not abundant in the collections, and, since some of the Macoun material also has sporophytes, it appears that the Canadian populations were also able to produce spores. Spores are most frequently wind-dispersed, but there is no information on spore dispersal distances, viability, or germination success for this species. There is no evidence of asexual reproduction by specialized propagules or by fragmentation.

Interspecific interactions

There is no information available on interspecific interactions, although it usually grows admixed with other moss species. Many of these species are larger than *F. pusilla* and may out-compete it in its habitat.

POPULATION SIZES AND TRENDS

There is no detailed information on the size or trends of the Canadian populations of *Fabronia pusilla*. Schofield (pers. comm. 2001, 2002) did not gather detailed

information on this species when in the field, other than it was uncommon and found in small patches. It has not been found during recent investigations, even though the area was visited three times, including once with W. B. Schofield. It may be present on some of the largely inaccessible areas of sandstone cliffs.

There is no detailed population information available about the adjacent American populations in Idaho and Washington.

LIMITING FACTORS AND THREATS

Many species of moss that grow with *Fabronia pusilla* are larger and may out-compete it, but no information is available to support this claim.

There are potential, but probably minor, natural environmental threats to the possibly extant population of *Fabronia pusilla*. These include forest fires in areas adjacent to the outcrop and rock face degradation. A number of areas along Sumas Mountain are presently being proposed for development, but the sandstone cliffs are not within the proposed development boundaries. Hiking is common along much of the area beneath the cliffs but no damage to bryophyte populations on the outcrops was observed.

SPECIAL SIGNIFICANCE OF THE SPECIES

Fabronia pusilla is relatively widespread in the southern portions of its range in North America, but becomes less common northward, and is rare in southern British Columbia. This distribution pattern, as well as its apparent preference for oak habitats in California, may indicate that our population is relictual in nature, possibly a remnant of a drier, oak-dominated ecosystem that was present in the southern portions of the province during the warmer hypsithermal period some six to seven thousand years ago.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

No legislation, regulations, customs, or conditions protect Canadian populations of *Fabronia pusilla*. Globally this species is tentatively considered common to very common (G5?) and is Red-listed (S1) in British Columbia (Conservation Data Center 2001, Ryan 1996). In Oregon, this species is S1 (critically imperiled sub-nationally).

SUMMARY OF STATUS REPORT

The only known extant site for the species in Canada, Sumas Mountain, was extensively surveyed recently and *Fabronia pusilla* was not found. However, this may be the result of the tiny stature of this species combined with the species' habit of growing

under and among other species, making finding *F. pusilla* difficult. The challenge in finding the species at Sumas Mountain was compounded by the extensive potential habitat for the species there, much of which is inaccessible.

It is possible that *Fabronia pusilla* is present at more locations in southwestern British Columbia. However, the species' small stature, in combination with its gregarious habit, may be responsible for it having not been found elsewhere or more frequently in the province. For instance, there are many other dry cliffs and possibly suitable Garry oak habitat in coastal British Columbia that have never been carefully searched specifically for this species (W.B. Schofield, pers. comm. 2002). As a consequence, it is uncertain whether the species is truly rare in Canada, or whether the species' apparent rarity is an artifact attributable to difficulty associated with finding the species in the field.

John Macoun collected *Fabronia pusilla* in abundance in the Arrow Lake area in 1890 (Tan 1980). A detailed investigation of this area is recommended as well as a species-specific search in Garry oak and open cliff habitats along the southwestern British Columbia coast. Even though a great deal of bryological research has been completed by W. B. Schofield and his students in this region, most of these surveys are broad-based and designed to collect mosses over wide areas; they are not usually focused on one particular species or its preferred habitat.

TECHNICAL SUMMARY

Fabronia pusilla
Silver-Hair Moss — Fabronie naine
BC

Extent and Area information	
• *extent of occurrence (EO)(km²)*	< 0.1 km^2
• *specify trend (decline, stable, increasing, unknown)*	unknown
• *are there extreme fluctuations in EO (> 1 order of magnitude)?*	unknown
• *area of occupancy (AO) (km²)*	< 0.1 km^2
• *specify trend (decline, stable, increasing, unknown)*	unknown
• *are there extreme fluctuations in AO (> 1 order magnitude)?*	unknown
• *number of extant locations*	1
• *specify trend in # locations (decline, stable, increasing, unknown)*	unknown
• *are there extreme fluctuations in # locations (> 1 order of magnitude)?*	unknown
• *habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat*	stable
Population information	
• *generation time (average age of parents in the population) (indicate years, months, days, etc.)*	>3 years
• *number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values)*	unknown
• *total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals*	unknown
• *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)?*	unknown
• *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)?*	unknown
• *list each population and the number of mature individuals in each*	unknown
• *specify trend in number of populations (decline, stable, increasing, unknown)*	unknown
• *are there extreme fluctuations in number of populations (>1 order of magnitude)?*	unknown
Threats (actual or imminent threats to populations or habitats) [add rows as needed]	
-	
Rescue Effect (immigration from an outside source)	
• *does species exist elsewhere (in Canada or outside)?*	yes
• *status of the outside population(s)?*	secure
• *is immigration known or possible?*	possible
• *would immigrants be adapted to survive here?*	yes
• *is there sufficient habitat for immigrants here?*	yes

ACKNOWLEDGEMENTS

We thank W. B. Schofield and John Christy for helpful comments on the manuscript. Funding provided by the Canadian Wildlife Service, Environment Canada.

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BIOGRAPHICAL SUMMARY OF CONTRACTOR

Dr. Terry McIntosh completed his Ph. D. in 1985 following a study of dry grassland and steppe bryophytes in the interior portions of British Columbia. He has been active since then collecting bryophytes from many parts of the province. He has been a primary identifier of bryophyte collections from various government and private surveys in the province. He has recently completed sixteen rare species accounts on bryophytes for the Wildlife Branch of the Province of British Columbia.

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COLLECTIONS EXAMINED

Two collections of *Fabronia pusilla* in British Columbia as well as other representative specimens from western North America were examined at the herbarium at the University of British Columbia. Collections from the Arrow Lake site are found in the National Herbarium at the Canadian Museum of Nature in Ottawa (CANM) and have been examined by Tan (1980). The Canadian specimens examined at the University of British Columbia are listed below:

1.
Fabronia pusilla Raddi
damp shaded sandstone cliff
Sumas Mt., W. end, near Chilliwack
W.B. Schofield
Collection #: 35903
March 10, 1968

2.
Fabronia pusilla Raddi
dry cranny of sandstone cliff
Sumas Mt., W. end, near Chilliwack
W.B. Schofield
Collection #: 35907
March 10, 1968