

Management Plan for Banded Cord-moss (*Entosthodon fascicularis*) in Canada

Banded Cord-moss



August 2011



Parks
Canada

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Canada

Canada

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

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RECOMMENDATION AND APPROVAL STATEMENT

The Parks Canada Agency led the development of this federal management plan, working together with the other competent minister(s) for this species under the Species at Risk Act. The Chief Executive Officer, upon recommendation of the relevant Park Superintendent(s) and Field Unit Superintendent(s), hereby approves this document indicating that Species at Risk Act requirements related to management plan development (sections 65-72) have been fulfilled in accordance with the Act.

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MANAGEMENT PLAN FOR THE BANDED CORD-MOSS (*Entosthodon fascicularis*) IN CANADA

August 2011

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada.

In the spirit of cooperation of the Accord, the Government of British Columbia has provided the 'Management Plan for banded cord-moss (*Entosthodon fascicularis*) in British Columbia' to the Government of Canada. The federal Minister responsible for the Parks Canada Agency and the federal Minister of the Environment as the competent ministers under the Species at Risk Act (SARA) adopt or incorporate, in whole or in part, this management plan pursuant to section 69 of the Act, with any exceptions or modifications as detailed within the body of this document.

The finalized management plan, once included in the Species at Risk Public Registry, will be the SARA management plan for this species. Implementation of this plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

This management plan for the Banded Cord-moss in Canada consists of two parts:

1. The SARA Management Plan for banded cord-moss (*Entosthodon fascicularis*) in British Columbia being adopted/incorporated, developed by the British Columbia Bryophyte Recovery Team and Garry Oak Ecosystems Recovery Team for the Province of British Columbia (Appendix 2).
2. The federal text which completes the existing management plan in terms of meeting the requirements of SARA section 65. This text included additions, exceptions or modifications to the document being adopted or incorporated, in whole or in part.

EXECUTIVE SUMMARY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed Banded Cord-moss (*Entosthodon fascicularis*) as Special Concern in Canada in 2005. It is listed as 'Special Concern' under Canada's *Species at Risk Act* (SARA).

Banded Cord-moss is a tiny yellow-green moss that reaches 2-4 mm in height. It grows in small patches on thin soil over rock in open to semi-shaded habitats, usually in or adjacent to seasonally moist sites. It is most common in Garry oak ecosystems, which are threatened in Canada. Its current Canadian range consists of 18 occurrences in southwestern British Columbia and a single occurrence in the Kootenay region.

Potential threats to the survival of Banded Cord-moss populations include urban or highway development and recreational activities.

The management goal is to maintain known populations of Banded Cord-moss in British Columbia. The management objectives for Banded Cord-moss are as follows:

- To initiate stewardship of known populations of Banded Cord-moss by 2016.
- To mitigate threats associated with recreational activities and with invasive species by 2016.
- To clarify the distribution of all populations of Banded Cord-moss in British Columbia and to update population and distribution objectives as needed by 2014.
- To increase public awareness of the existence and conservation value of Banded Cord-moss by 2010.
- To address knowledge gaps (e.g., biological attributes, habitat requirements, effects of invasive species) by 2016.

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ADDITIONS, MODIFICATIONS, AND EXCLUSIONS TO THE ADOPTED OR INCORPORATED DOCUMENT

Protection under SARA

This section provides clarity on the use of "protection" in the "Management Plan for banded cord-moss (*Entosthodon fascicularis*) in British Columbia" (Appendix 2) in relation to the concept of protection under SARA, the Act under which this document is being adopted as the SARA management plan for this species (section 69).

"Protection" is defined in the "Management Plan for banded cord-moss (*Entosthodon fascicularis*) in British Columbia" in a manner which may not equate to the concept of protection under SARA. Under SARA the adequacy of a given protection measure can only be determined on a case-by-case and/or site-by-site basis. For information on protection under SARA, please see the relevant sections of the Act and the draft SARA Policies, available on the Species at Risk Public Registry.

APPENDIX 1: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the section 2.6 of the adopted management plan.

APPENDIX 2: MANAGEMENT PLAN FOR BANDED CORD-MOSS (*ENTOSTHODON FASCICULARIS*) IN BRITISH COLUMBIA

As provided by the Government of British Columbia

British Columbia Bryophyte Recovery Team and Garry Oak Ecosystems Recovery Team. 2010. Management plan for banded cord-moss (*Entosthodon fascicularis*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, BC. 14 pp.

Management Plan for banded cord-moss (*Entosthodon fascicularis*) in British Columbia



Prepared by the British Columbia Bryophyte Recovery Team and
the Garry Oak Ecosystems Recovery Team



Ministry of
Environment

July 2010

About the British Columbia Management Plan Series

This series presents the management plans that are prepared as advice to the province of British Columbia. Management Plans are prepared in accordance with the priorities and management actions assigned under the British Columbia Conservation Framework. The Province prepares management plans for species' that may be at risk of becoming endangered or threatened due to sensitivity to human activities or natural events.

What is a management plan?

A management plan identifies a set of coordinated conservation activities and land use measures needed to ensure, at a minimum, that target does not become threatened or endangered. A management plan summarizes the best available science based information on biology and threats to inform the development of a management framework. Management plans set goals and objectives, and recommend approaches appropriate for species or ecosystem conservation.

What's next?

Direction set in the management plan provides valuable information on threats and direction on conservation measures that may be used by individuals, communities, land users, conservationists, academics, and governments interested in species and ecosystem conservation.

For more information

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

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

To learn more about the British Columbia Conservation Framework, please visit the Ministry of Environment Conservation Framework webpage at:<

<http://www.env.gov.bc.ca/conservationframework/>>

**Management Plan for banded cord-moss (*Entosthodon fascicularis*)
in British Columbia**

**Prepared by the British Columbia Bryophyte Recovery Team and
the Garry Oak Ecosystems Recovery Team**

July 2010

Recommended citation

British Columbia Bryophyte Recovery Team and Garry Oak Ecosystems Recovery Team. 2010. Management plan for banded cord-moss (*Entosthodon fascicularis*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, BC. 14 pp.

Cover illustration/photograph

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Additional copies

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

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

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Disclaimer

This management plan has been prepared by the British Columbia Bryophyte Recovery Team and the Garry Oak Ecosystems Recovery Team, as advice to the responsible jurisdictions and organizations that may be involved in managing the species.

This document identifies the management actions that are deemed necessary, based on the best available scientific and traditional information, to prevent banded cord-moss populations in British Columbia from becoming endangered or threatened. Management actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and recovery approaches may be modified in the future to accommodate new objectives and findings.

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

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this management plan. The Ministry of Environment encourages all British Columbians to participate in conservation of the banded cord-moss.

RECOVERY TEAM MEMBERS

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RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment is responsible for producing a management plan for banded cord-moss under the *Accord for the Protection of Species at Risk in Canada*. Parks Canada Agency and Environment Canada's Canadian Wildlife Service participated in the preparation of this management plan.

ACKNOWLEDGEMENTS

Funding for this management plan was provided by the B.C. Ministry of Environment. Members of the Plants at Risk Recovery Implementation Group of the Garry Oak Ecosystems Recovery Team (GOERT) contributed comments to this management plan: Tracy Cornforth (Canadian Forces Base, Esquimalt, Department of National Defence) and Andrea Schiller (Natural Resources Canada).

EXECUTIVE SUMMARY

Banded cord-moss (*Entosthodon fascicularis*) was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Special Concern in Canada in May 2005. It was listed on the federal *Species at Risk Act* (SARA) Schedule 1 in 2006. In British Columbia, the banded cord-moss is ranked S2S3 (imperiled to vulnerable) by the Conservation Data Centre and ranked G4G5 (apparently secure to secure) globally by NatureServe. The Conservation Framework has assigned banded cord-moss a conservation priority 2, under Goal 3: to maintain the full diversity of native species and ecosystems.

Its current Canadian range consists of 18 occurrences in southwestern British Columbia and a single occurrence in the Kootenay region. Banded cord-moss is a tiny moss that grows as individual plants or in small patches on thin soil over rock in open to semi-shaded habitats, usually in or adjacent to seasonally moist sites. It is most common in Garry oak ecosystems, which are threatened in Canada. Potential threats to the survival of banded cord-moss populations include urban or highway development and recreational activities.

The management goal is to maintain known populations of banded cord-moss in British Columbia.

The management objectives for banded cord-moss are as follows:

1. To initiate habitat protection for known populations of banded cord-moss by 2016.
2. To mitigate threats associated with recreational activities and with invasive species by 2016.
3. To clarify the distribution of all populations of banded cord-moss in British Columbia and to update population and distribution objectives as needed by 2014.
4. To increase public awareness of the existence and conservation value of banded cord-moss by 2016.
5. To address knowledge gaps (e.g., biological attributes, habitat requirements, effects of invasive species) by 2016.

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1. SPECIES INFORMATION

1.1 Species Assessment Information from COSEWIC

<p>Date of Assessment: May 2005</p> <p>Common Name (population): Banded Cord-moss</p> <p>Scientific Name: <i>Entosthodon fascicularis</i></p> <p>COSEWIC Status: Special Concern</p> <p>Reason for Designation: This rare species is endemic to western North America. Almost all Canadian populations of this moss occur in the threatened Garry oak habitat of southwestern British Columbia. Should habitat destruction continue at the present rate, the species will become increasingly vulnerable.</p> <p>Canadian Occurrence: British Columbia</p> <p>COSEWIC Status History: Designated Special Concern in May 2005. Assessment based on a new status report.</p>

1.2 Species Assessment Information: General

Banded cord-moss¹	
Legal Designation	
Identified Wildlife²: No	B.C. Wildlife Act: No SARA Schedule: 1 (2006)
Conservation Status³	
B.C. Rank: S2S3 (2007)	B.C. List: Blue Global Rank: G4G5 (2001)
Subnational (State) Ranks⁴: S2 in WA and OR; Not Ranked in AZ, ID or CA	
B.C. Conservation Framework⁵	
Goal 1: Contribute to global efforts for species and ecosystem conservation.	Priority ⁶ : 3 (2009)
Goal 2: Prevent species and ecosystems from becoming at risk.	Priority: 6 (2009)
Goal 3: Maintain the diversity of native species and ecosystems	Priority: 2 (2009)
Action Groups:	Compile Status Report; Send to COSEWIC; Planning; Habitat Protection; Habitat Restoration; Private Land Stewardship; Monitor Trends

¹ Data Source: B.C. Conservation Data Centre (2010) unless otherwise noted

² Identified Wildlife under the *Forest and Range Practices Act*

³ S = Subnational; N = National; G = Global; B = Breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable

⁴ Data Source: NatureServe (2009)

⁵ Data Source: Ministry of Environment (2010).

⁶ Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

1.3 Description of the Species

This description is based on COSEWIC (2005) and Miller and Miller (2007). Banded cord-moss grows as tiny (usually 2–4 mm tall), erect plants in small patches on seasonally wet soil. Its light green to yellow-green, oblong to obovate (egg-shaped) leaves are crowded at the top of the stems, forming rosettes. Leaves are usually weakly toothed along their upper margins and end in a small, narrow tip. They are erect-spreading when moist and inwardly contorted when dry.

Banded cord-moss has both male and female structures on the same stem, helping to ensure fertilization. Because of this, sporophytes (structures that produce spores) are common within populations. Sporophytes are composed of spore-producing capsules borne on 5–8 mm stalks (setae) that arise from the tops of the stems. Capsules are ovoid to pear-shaped, erect, and red-brown to yellow-brown when mature, and are often contracted below the mouth and wrinkled at the base when dry. Large hoods (calyptrae) with long, thin tips completely cover the maturing capsules. Following the release of the calyptra and a rounded operculum (a lid at the tip of the capsule), spores are released from an opening at the top of the capsule. Sporophytes are produced towards the end of the winter rains and develop into spring. Figure 1 shows maturing capsules of this species.

Banded cord-moss can be easily be misidentified as common cord-moss (*Physcomitrium pyriforme*), which is similar in morphology and also grows on soil in open habitats in coastal British Columbia. However, the top of the operculum of banded cord-moss is rounded and usually smooth, although it sometimes has a small, rounded bump when young, whereas the operculum of common cord-moss always has a short beak or pointed bump on top. Also, common cord-moss usually occupies more heavily disturbed areas than banded cord-moss and can form much larger patches in most cases.



Figure 1. Patch of banded cord-moss showing plants and young sporophytes (note the long-tipped calyptrae covering the maturing capsules; ~ x 15). Photograph by C. Engelstoff.

1.4 Populations and Distribution

Banded cord-moss is found in western North America and western Eurasia with a disjunct distribution. It is relatively rare in North America, found only in British Columbia, Washington, Idaho, Oregon, California, and Arizona (Miller and Miller 2007, NatureServe 2009; Figure 2). It is widespread in Europe, where it is found in Sweden, Denmark, Britain, and Ireland (Smith 1989), and possibly occurs in the Middle East (Kürschner 2000).

In Canada, banded cord-moss is mainly restricted to Vancouver Island and the adjacent Gulf Islands of British Columbia. A single collection has been made in the Kootenay area in the southeast part of the province (Figure 3). On Vancouver Island, 12 populations have been reported from Sooke north to Nanoose (Notch) Hill, north of Nanaimo, with the majority of the populations reported from the Victoria area. Six populations have been reported from the Gulf Islands (Trial Island, Hornby Island, Saturna Island, and Salt Spring Island; the latter has three populations). One of the Vancouver Island populations and all of the Salt Spring Island populations were discovered following the completion of the status report on this species (COSEWIC 2005). Although general bryological surveys have been completed along the coast in the past 50 years, efforts by bryologists to search for rare mosses have intensified since 2002. There has been no targeted search effort for this species in the Kootenays. However, because of the extensive available habitat that has not yet been surveyed, and the usually small size of the populations, there is the potential that other occurrences for this species are still undiscovered (McIntosh, pers. comm. 2008). Table 1 lists data for the documented populations of banded cord-moss in British Columbia. Most of the populations are represented by a few small patches or as scattered individual plants; one population on Channel Ridge is represented by numerous, unusually large patches that are scattered over a relatively wide area.

An assessment of population trends is not possible at this time, although some populations are considered stable because they are in protected areas where threats are minimal. The Canadian populations of banded cord-moss probably represent about 5% of its global distribution and abundance (there are no reported estimates of global distribution and abundance for this moss).

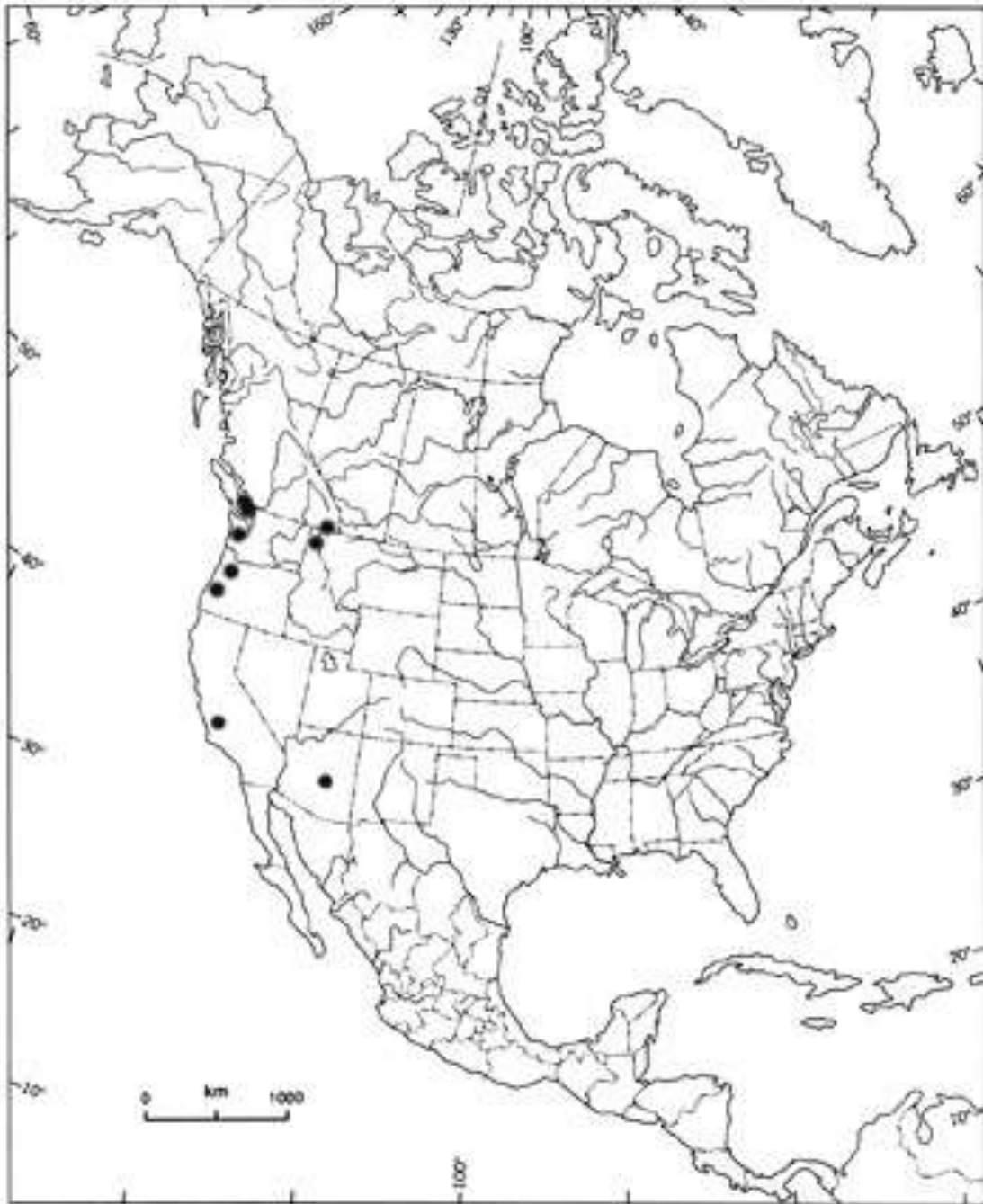


Figure 2. North American distribution of banded cord-moss.



Figure 3. Canadian distribution of banded cord-moss (dots may represent more than one occurrence; see Table 1 for details).

Table 1. Population data for banded cord-moss in Canada. Populations 4, 15, 16 and 17 were documented after completion of the COSEWIC status report (COSEWIC 2005)¹.

Population number and locality	Dates observed	Estimated number of patches/individuals and extent	Land tenure
1. Sooke	1969	unknown	unknown
2. Victoria (Uplands Park)	1961, 2002	about 30 plants in a small (<1 m ²) area	municipal park
3. Victoria (King's Pond)	2002	a few sterile plants in few cm ² area	private golf course
4. Victoria (Bear Hill)	2005	numerous small patches	private
5. Victoria (Observatory Hill)	2000, 2004	2–3 small patches under a protective rock ledge	federal
6. Victoria (Christmas Hill)	2004	unknown	Saanich Municipality or private
7. Skirt Mountain, Victoria	2004	unknown	Langford Municipality or private
8. Malahat Highway	1982	unknown	Crown land (Ministry of Transportation and Infrastructure)
9. Old Baldy Mountain, near Duncan	1970	unknown	unknown
10. Eagle Heights, near Duncan	1999	unknown	private
11. Harmac, near Nanaimo	2004	1 small patch	private
12. Nanoose (Notch) Hill, north of Nanaimo	1969, 1975, 1976, 1993	unknown	Federal (Department of National Defence)
13. Trial Island	1982, 2000	unknown	ecological reserve
14. Saturna Island	1997	unknown	unknown (possibly within the Southern Gulf Islands National Park Reserve)
15. Isabella Point, Salt Spring Island	2005	1 small patch (2 cm ²)	private
16. Channel Ridge, Salt Spring Island	2005, 2006	numerous (>100) small (<1 cm ²) to large (>50 cm ²) patches on central ridge; also a series of small patches at the base of the ridge	private
17. Mount Maxwell, Salt Spring Island	2006	small patch	ecological reserve
18. Helliwell Provincial Park, Hornby Island	2003	unknown	Provincial park
19. Near Yahk Provincial Park, Kootenay area	1978	unknown	Provincial park or private

¹ Prior to SARA legislation, bryological surveys were conducted for collection locations and distribution records and did not include data required for conservation efforts.

1.5 Needs of the Banded Cord-moss

1.5.1 Habitat and biological needs

In British Columbia, banded cord-moss grows on soil over rock, often amongst other mosses, plant litter, and bases of vascular plants, in open to semi-shaded habitats, usually in or adjacent to seasonally moist sites. Fourteen populations are found in nationally threatened Garry oak (*Quercus garryana*) and associated ecosystems. Of the remaining five populations, four are found in dry coastal Douglas-fir (*Pseudotsuga menziesii*) ecosystems on the coast, and one is in a dry pine/fir forest in the Kootenay region. Due to the lack of scientific studies on this species, nothing is known about its biological needs. However, it appears that this species readily takes advantage of microhabitats where soil is regularly available through erosional processes and where competition from other species is low.

1.5.2 Ecological role

No ecological role is known.

1.5.3 Limiting factors

A possible limiting factor for banded cord-moss is its small size, which may be a competitive disadvantage when growing amongst other mosses and vascular plants. As well, its small patch size could also increase the species' vulnerability to natural stochastic events.

1.6 Threats

1.6.1 Threat classification

Table 2. Threat classification for banded cord-moss.

1 Housing development		Threat attributes		
Threat category	Habitat loss or degradation	Extent	Localized	
			Local	B.C. Range-wide
General threat	Housing construction	Occurrence	Anticipated at 2 sites	Unknown
		Frequency	Recurrent	Unknown
Specific threat	Destruction, removal, or covering of species and alteration of habitat (e.g., fragmentation or destruction of habitat)	Causal certainty	High	Unknown
		Severity	High	Unknown
Stress	Increased mortality, reduced population size, or local extirpation	Level of concern	High	

2 Road construction		Threat attributes		
Threat category	Habitat loss or degradation	Extent	Unknown	
			Local	B.C. Range-wide
General threat	Road construction; road and corridor widening	Occurrence	Anticipated at 1 site	Unknown
		Frequency	Recurrent	Unknown
Specific threat	Destruction, removal, or covering of species and alteration of habitat (e.g., fragmentation or destruction of habitat)	Causal certainty	High	Unknown
		Severity	High	Unknown
Stress	Increased mortality, reduced population size, or local extirpation	Level of concern	Moderate	
3 Recreational activities		Threat attributes		
Threat category	Habitat loss or degradation	Extent	Anticipated at 2 sites	
			Local	B.C. Range-wide
General threat	Walking/driving/bicycling through known habitat or directly on the plants	Occurrence	Anticipated at at least 2 sites	Unknown
		Frequency	Unknown/recurrent	Unknown
Specific threat	Trampling by humans; digging by dogs; compaction by tires; construction of trails or other infrastructure in parks	Causal certainty	Low	Unknown
		Severity	Medium	Unknown
Stress	Increased mortality, reduced population size, or local extirpation	Level of concern	Low	

1.6.2 Description of the threats

Housing development

The Channel Ridge population is in an area that may be threatened by housing development; if the development proceeds, it may destroy all or portions of the resident population. The Channel Ridge population is split by a large, pre-development excavated area, which has already destroyed part of the original habitat and possibly part of the population. The potential for further development also exists for other populations.

Road construction

The Malahat population is adjacent to a highway and may be affected at some point by roadwork activities. This is only a potential threat, since the population has not been documented since 1982.

Recreational activities

Most of the populations are protected either by natural features (e.g., outcrops) and/or are isolated and human-related threats are absent. The exception is in Uplands Park in the Municipality of Oak Bay (Victoria), which is extensively used for hiking and off-leash dog walking. The population is in an open, frequently used area. The BC range-wide frequency of these activities is unknown, but probably is recurrent at some sites. Associated with this threat is the potential for trail or other infrastructure construction within parks.

Other potential threats

Competition from invasive alien plant species may be a threat at some sites, but this has not been confirmed as the seasonally wet habitats favoured by this species appear to restrict invasion by alien and, possibly, native plants (McIntosh, pers. comm. 2008).

1.7 Actions Already Completed or Underway

Other than protection in ecological reserves and municipal parks, no specific actions are currently underway to protect banded cord-moss in British Columbia. The Salt Spring Island Conservancy has undertaken a biannual monitoring project and has made landowners aware of the conservation issues surrounding this and other rare plant species on the island. Three populations occur in provincial parks, protected areas or ecological reserves and are afforded protection by the *B.C. Park Act*, the *Protected Areas of British Columbia Act* and the *Ecological Reserve Act*. The two populations on federal lands are known to the land managers.

1.8 Knowledge Gaps

- Detailed biological attributes (e.g., reproduction, dispersal, conditions for reproduction) are not known.
- The status of the populations (e.g., tenure, population numbers/trends) is unknown.
- Detailed habitat requirements (e.g., geology, soil characteristics, moisture regime, aspect) are not known.
- The effects of competition from invasive plants, both native and non-native, are not known.
- Distribution of the species needs to be clarified.

2. MANAGEMENT

2.1 Management Goal

The management goal is to maintain known populations of banded cord-moss in British Columbia.

2.2 Rationale for the Management Goal

No quantitative management goal is possible for this species as basic population demographics are unknown for most occurrences and population trends are unknown for all populations. As

this species is restricted to small and specialized habitats, it is highly susceptible to being lost or destroyed. Therefore, to prevent banded cord-moss from becoming threatened or endangered, all known populations must be maintained. The initial management will be to maintain this species to ensure that its status does not become worse. Once the knowledge gaps have been filled, the goal can be refined.

2.3 Management Objectives

1. To initiate habitat protection² for known populations and habitats of banded cord-moss by 2016.
2. To mitigate threats associated with recreational activities and with invasive species by 2016.
3. To clarify the distribution of all populations of banded cord-moss in British Columbia and to update population and distribution objectives as needed by 2014.
4. To increase public awareness of the existence and conservation value of banded cord-moss by 2016.
5. To address knowledge gaps (e.g., biological attributes, habitat requirements, effects of invasive species) by 2016.

2.4 Recommended Management Actions

Table 3. Recommended management actions for banded cord-moss.

Priority	Obj. No.	Threat or concern addressed	Conservation Framework action group	Management action	Timeline (start date)
High	1,2,4	Habitat loss or degradation: housing development; road construction; recreational activities; invasive species	Habitat Protection; Private Land Stewardship	• Contact landowners and land managers at 14 unprotected properties and engage their cooperation to steward and manage private lands for persistence of the species	2011
			Habitat Protection; Private Land Stewardship	• Develop best management practices for the above 14 properties to be used by the landowners and land managers	2012
			Habitat Protection; Private Land Stewardship	• Provide best management practices to the landowners to implement through stewardship agreements and activities at the above 14 sites to mitigate threats of recreation and invasive species	2013
			Habitat Protection; Private Land Stewardship	• Develop site management plans with the municipal, provincial, and federal land	2012

² Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

Priority	Obj. No.	Threat or concern addressed	Conservation Framework action group	Management action	Timeline (start date)
			Habitat Protection; Private Land Stewardship	managers <ul style="list-style-type: none"> Establish appropriate habitat protection mechanism using tenure-appropriate tools for habitat protection 	Ongoing
			Monitor Trends	<ul style="list-style-type: none"> Establish monitoring protocols to assess threats 	2011
			Monitor Trends	<ul style="list-style-type: none"> Monitor sites to assess the effects of mitigation actions and protection measures 	2012
Medium	2, 4	Recreational activities; housing development; road construction	Habitat Protection; Private Land Stewardship	<ul style="list-style-type: none"> Increase public awareness of the existence and conservation value of the species through public outreach, potentially by a non-government organization 	2012
			Private Land Stewardship	<ul style="list-style-type: none"> At least six land owners or land managers within the species' potential range (but where the species is not known to occur) have been contacted and provided with education and outreach material 	2012
			Habitat Protection	<ul style="list-style-type: none"> Survey for new occurrences in recreation areas (by the Garry Oak Ecosystems Recovery Team) 	2012
Medium	5	Knowledge gaps	Monitor Trends	<ul style="list-style-type: none"> Develop and implement standardized habitat survey and monitoring protocol 	2011
			Monitor Trends	<ul style="list-style-type: none"> Initiate the monitoring of the extant populations annually to ensure populations are maintained at current levels 	2012
			Monitor Trends	<ul style="list-style-type: none"> Report monitoring results annually and assess trends in populations, area of occupancy, and habitat condition 	2013
			Compile Status Report	<ul style="list-style-type: none"> Engage academics in research to determine the biological attributes and habitat requirements of the species 	2012
Medium	3	Knowledge gaps	Compile Status Report	<ul style="list-style-type: none"> Determine areas of suitable habitat to be surveyed for new occurrences 	2011

Priority	Obj. No.	Threat or concern addressed	Conservation Framework action group	Management action	Timeline (start date)
			Compile Status Report	<ul style="list-style-type: none"> Prioritize and inventory suitable habitats to confirm distribution of the species 	2012
			Compile Status Report	<ul style="list-style-type: none"> Re-survey all known locations including the Kootenay region, to reconfirm distribution and population counts. 	2011
Medium-Low	2	Knowledge gaps: Invasive alien plant species	Monitor Trends	<ul style="list-style-type: none"> Monitor populations to assess the effects of invasive species 	2012
			Habitat Restoration	<ul style="list-style-type: none"> Manage invading vegetation to protect the species occurrences as appropriate 	2013

2.5 Performance Measures

Objective 1: Land owners and land managers of at least five of the 14 unprotected sites have been contacted and have applied the appropriate tools for habitat protection by 2016.

Objective 2: Impacts of the threats of recreational activities (one site) and of invasive species (potentially at all sites) have been investigated by 2014, and best management practices or specific site management plans are established to decrease the impact of these threats by 2016.

Objective 3: Re-surveys of all the known locations have been conducted to reconfirm distribution and population counts and documented by 2014. 60% of suitable habitat in Garry oak ecosystems on southern Vancouver Island and the Gulf Islands has been surveyed by 2016.

Objective 4: At least six land owners or land managers within the species' potential range (but where the species is not known to occur) have been contacted and provided with education and outreach material for banded cord-moss by 2016.

Objective 5: Scientific studies to investigate knowledge gaps (biological attributes, habitat requirements, effects of invasives) have been initiated by 2014.

2.6 Effects on Other Species

Habitat protection for this species will also protect other flora and fauna that reside in the same habitat as banded cord-moss.

2.7 Recommended Approach for Implementation

Land managers and the public should be made aware of the species and engaged in its conservation, which can partially be accomplished by directed land owner contact programs with suggestions for protection and management (Table 3). The Salt Spring Island Conservancy could potentially work with BC Parks to survey and monitor the species at the Mount Maxwell Ecological Reserve site. The Garry Oak Ecosystems Recovery Team (GOERT) land owner contact program could potentially work with private land owners to protect this species. Additionally, GOERT could work with the Department of National Defence on surveys and monitoring at the Nanoose site, with the federal government at the Observatory Hill site, and with Parks Canada Agency on Saturna Island (if the site is found to be in the Southern Gulf Islands National Park Reserve). Naturalists, amateur botanists, and bryologists could contribute to further surveys for this species on lower Vancouver Island and in the Kootenays.

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