Recovery Strategy for the Rusty Cord-moss (*Entosthodon rubiginosus*) in British Columbia

Prepared by the British Columbia Bryophyte Recovery Team

BRITISH COLUMBIA
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Ministry of Environment

November 2008

About the British Columbia Recovery Strategy Series

This series presents the recovery strategies that are prepared as advice to the Province of British Columbia on the general strategic approach required to recover species at risk. The Province prepares recovery strategies to meet its commitments to recover species at risk under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada – British Columbia Agreement on Species at Risk*.

What is recovery?

Species at risk recovery is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

A recovery strategy represents the best available scientific knowledge on what is required to achieve recovery of a species or ecosystem. A recovery strategy outlines what is and what is not known about a species or ecosystem; it also identifies threats to the species or ecosystem, and what should be done to mitigate those threats. Recovery strategies set recovery goals and objectives, and recommend approaches to recover the species or ecosystem.

Recovery strategies are usually prepared by a recovery team with members from agencies responsible for the management of the species or ecosystem, experts from other agencies, universities, conservation groups, aboriginal groups, and stakeholder groups as appropriate.

What's next?

In most cases, one or more action plan(s) will be developed to define and guide implementation of the recovery strategy. Action plans include more detailed information about what needs to be done to meet the objectives of the recovery strategy. However, the recovery strategy provides valuable information on threats to the species and their recovery needs that may be used by individuals, communities, land users, and conservationists interested in species at risk recovery.

For more information

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

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

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Disclaimer

This recovery strategy has been prepared by the British Columbia Bryophyte Recovery Team, as advice to the responsible jurisdictions and organizations that may be involved in recovering the species. The British Columbia Ministry of Environment has received this advice as part of fulfilling its commitments under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada – British Columbia Agreement on Species at Risk*.

This document identifies the recovery strategies that are deemed necessary, based on the best available scientific and traditional information, to recover the rusty cord-moss populations in British Columbia. Recovery actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and recovery approaches may be modified in the future to accommodate new objectives and findings.

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

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

RECOVERY TEAM MEMBERS

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RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment is responsible for producing a recovery strategy for the rusty cord-moss under the *Accord for the Protection of Species at Risk in Canada*. Environment Canada's Canadian Wildlife Service participated in the preparation of this recovery strategy.

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EXECUTIVE SUMMARY

The rusty cord-moss (*Entosthodon rubiginosus)* was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as endangered in November 2004, and listed on the federal *Species at Risk Act* (SARA) Schedule 1 in November 2006. Its current known Canadian range consists of 5 scattered populations in south-central British Columbia. The rusty cord-moss is a tiny plant that grows as individuals or in small patches in semi-arid regions of the province. It is restricted to open mineral soil alongside seasonally wet, alkaline ponds, lakes, and sloughs, and on seepage slopes or narrow gullies.

Potential threats to the survival of the population include the degradation or destruction of the habitat through livestock damage, invasive alien plants, and ATV use.

Recovery Goal

The goal of the rusty cord-moss recovery strategy is to protect and maintain known populations in Canada.

Recovery Objectives

The recovery strategy has the following objectives for the next five years:

I. To secure long-term protection for the known populations and habitats of the rusty cord-moss;
II. To determine the level of real and potential threats to this species and its habitat and to mitigate their effects;
III. To determine the precise habitat requirements of the populations of the rusty cord-moss; and
IV. To determine sizes and population trends of the known populations.

No critical habitat can be identified for rusty cord-moss in Canada at this time, but it may be identified at a later date in a federal addendum by Environment Canada, or in a future action plan. It is expected that critical habitat will be proposed following the completion of outstanding work required to quantify specific habitat and area requirements for the species, further research on the biology of the species, and monitoring of the populations to determine population trends. Consultation with affected landowners and organizations will also be necessary.

An action plan will be completed by 2012.

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BACKGROUND

Species Assessment Information from COSEWIC

Date of assessment: November 2004
Common name (population): Rusty Cord-moss
Scientific name: *Entosthodon rubiginosus*
COSEWIC status: Endangered
Reason for designation: This species is endemic to western North America where it occurs in southern British Columbia, and has been reported from Montana, Arizona, and New Mexico. This moss has a highly restricted distribution in south-central British Columbia where only four populations have been found. Of these, three populations are extant, and one was not relocated; the species is not abundant at any known site. The species' habitat is a narrow band of shoreline dominated by grasses and other mosses in seasonally wet, alkaline habitats. Two populations have been affected by horses or cattle, and all sites examined have been impacted to varying degrees by domestic animals. At least a portion of one population has been lost as result of trampling by domestic animals.
Canadian occurrence: British Columbia
COSEWIC status history: Designated Endangered in November 2004. Assessment based on a new status report.

Description of the Species[1]

The rusty cord-moss grows as inconspicuous, 2–3 mm tall plants, either as individuals or in small patches. Mature plants have their leaves crowded at the summit of an erect stem. The leaf mid-rib in the upper leaves often extends from the leaf tip, forming a short point. It has male and female structures on the same plant, helping to ensure annual production of sporophytes (comprised of a stalk and a spore-bearing capsule). The sporophytes of the rusty cord-moss grow from the tops of the leafy stems. They mature in the late winter and into the spring, range in height from 4 to 7 mm, and usually remain obvious into the summer (Figure 1), even though the leaves wither. This species has relatively large and distinct calyptrae (hoods) that protect the developing sporophyte by nearly completely covering the maturing capsules (Figure 2). Mature capsules are erect; red- to yellow-brown' and, when dry, usually contracted below the mouth and wrinkled at the base. The walls of the capsule are comprised of distinctive elongate and thick-walled cells. Although considered an annual species, the rusty cord-moss may be a perennial or a short-lived perennial (COSEWIC 2004). Persistent, small buds are present on some of its underground stems and they may act as a means of vegetative reproduction.

Because of its tiny size, the rusty cord-moss is usually difficult to observe in the field. Also, it might be confused with another small species, *Pterygoneurum ovatum* (common wing-nerved moss), which also has erect, reddish-brown capsules. However, this species has capsules that are usually wrinkled to near the top, and has leaves with long hair-points and flaps along the mid-rib of the leaves. Also, it is only occasionally found near

[1] This description is based on COSEWIC (2004), Lawton (1971), and Miller and Miller (2007).

the alkaline habitats where the rusty cord-moss grows.

Figure 1. Patch of the rusty cord-moss showing dried capsules (photograph by Ole Westby).

Figure 2. Plants and young sporophytes of the rusty cord-moss (photograph by Ole Westby).

Populations and Distribution

The rusty cord-moss is endemic to western North America where it has a widely scattered distribution. It has been reported from southern B.C., Montana (this population is probably extirpated; NatureServe Explorer 2008), Texas, and New Mexico (Miller and Miller 2007; Figure 3). Five populations of the rusty cord-moss have been reported for Canada, all from south-central B.C. Two populations are in the White Lake basin in the southern Okanagan Valley, with single populations reported from southeast of Princeton, northwest Kamloops, and just south of Riske Creek west of Williams Lake (Figure 4). Table 1 lists observation dates for all occurrences. Over the past three decades, Terry McIntosh (pers. comm., 2008) has investigated hundreds of alkaline wetlands and seepage slopes that have potential habitat for this species in B.C. (McIntosh 1986; COSEWIC 2004), and he confirmed the presence of this species at only the five sites. However, the edges of many of these ponds and the potential habitat for this species are extensive, covering hectares at some sites; this species could have been overlooked at some of the sample sites.

Globally, this species is listed as G1G3 (critically imperiled to vulnerable to extirpation or extinction) by NatureServe Explorer (2008) and it is Red-listed (S1; critically imperiled) by the B.C. Conservation Data Centre (B.C. Conservation Data Centre 2008). The Montana Natural Heritage Program (2008) ranks it SH for the state (H = Historical, known only from records over 50 year ago). It is not listed for New Mexico (Natural Heritage New Mexico 2008). NatureServe does not list this species as being in Texas (NatureServe Explorer 2008), and the Texas Natural Heritage Program has been discontinued.

The original White Lake population has been observed seven times since its discovery in 1980 (McIntosh 1986, 1989). The second White Lake population was discovered about 2 km west of the original site in 2006. A few plants of the rusty cord-moss were observed in a small, seasonally wet depression southeast of Princeton in 2002 (COSEWIC 2004), but not at its original 1981 location (about 100 m from the 2002 observation), which had been heavily trampled by livestock. Subsequent examination of the Princeton site in 2004 and 2006 showed that livestock trampling across the area where this species was observed appeared to have increased, and no plants were found at either location. This population of the rusty cord-moss may be extirpated. The Riske Creek population has not been revisited since 2002. The population of the rusty cord-moss near Kamloops was not relocated during 2002 surveys (COSEWIC 2004).

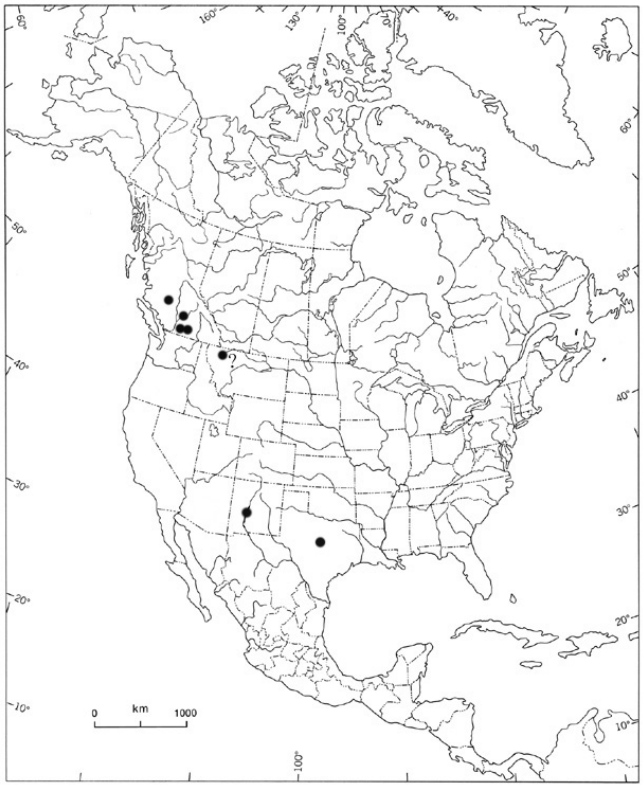

Figure 3. North American distribution of the rusty cord-moss.

Figure 4. Canadian distribution (B.C.) of the rusty cord-moss (White Lake populations are represented by one dot only).

Table 1 lists population data for the known occurrences of this species in B.C. Three of the occurrences of the rusty cord-moss (Kamloops, Princeton, and Riske Creek) are represented by a few small (< 1 cm) patches or as scattered individual plants and are apparently restricted to relatively small areas at each site. The two larger populations in the White Lake basin represent, to date, the largest known global concentrations for this species. In 2006, a detailed survey for this species was completed at White Lake (by T. McIntosh and J. Cameron) and numerous patches were observed at the original site and marked for follow-up observations.

The Canadian populations of the rusty cord-moss probably represent over 95% of its global distribution and abundance. Because populations were not estimated through time, the population trends of the rusty cord-moss cannot be assessed. However, the following is currently known about some populations: one population (Princeton) is probably extirpated because of livestock trampling, and a second (Kamloops) may also be extirpated as housing developments have spread into the area. The White Lake basin populations appear relatively stable, and the Riske Creek population, although not revisited, is also probably stable as the site appears not to have changed significantly since 2002 (F. Knezevich, pers. comm., 2007).

Table 1. Population data for the rusty cord-moss in Canada.

Population number and locality	Dates observed	Estimated number of patches/individuals and extent	Habitat characteristics	Population trend	Land tenure
1. Kamloops	1980	At least 10 individuals (counted in the herbarium collection)	Extent and habitat not described in 1980 (unknown)	Unknown (possibly extirpated)	Crown land
2. White Lake Basin 1[a]	1980, 1992, 2002–2007	~20 patches and some individual plants > 500 m^2	Mainly on soil hummocks on gently sloping terrain; > 99% of this population is inside fenced areas that prohibit livestock access; only a few individual plants were found in the grazed area	Apparently stable	Federal (leased to The Nature Trust of British Columbia)
3. White Lake Basin 2	2006–2007	~30 patches and many individual plants > 400 m^2 area; the most extensive subpopulation is found as a series of ~20 patches in a ~2 × 3 m area	On soil alongside gullies or on hummocks in washed flats; there is occasional trampling and some horse dung covering some patches of the most extensive subpopulation in a shallow gulley; heavy livestock trampling is	Apparently stable	Federal

			present at two of the other microsites (the patches here are smaller than average)		
4. Princeton	1981–2002	2 patches (> 0.01 m^2) at the 1981 location and 1 patch at the 2002 location (> 0.01 m^2)	Very heavy livestock trampling present at the site	May be extirpated	Crown land
5. Riske Creek	2002	1 patch > 0.5 m^2	Moderate to low livestock trampling present across the site	Probably stable	Crown land

[a] According to B.C. CDC standards, the White Lake basin occurrences are considered separate populations as they are > 1 km apart and suitable habitat is lacking between the sites.

Needs of the Rusty Cord-moss

Habitat and biological needs

In B.C., the rusty cord-moss grows on naturally exposed mineral soil alongside late autumn and spring wet, alkaline ponds, lakes, and sloughs; and on seepage slopes or narrow gullies in the hottest portions of the dry interior. Frequent associated plants include saltgrass (*Distichlis stricta*) and field sedge (*Carex praegracilis*), as well as several mosses: *Pterygoneurum ovatum, Pterygoneurum lamellatum, Bryum* spp., *Tortula acaulon,* and *Drepanocladus* sp. (the latter moss taxa have no common names). The general topography at most sites is flat to very slightly sloping. In these habitats, bare soil is available through small-scale erosion, mainly caused by runoff following rains or snowmelt, or through the digging of pocket gophers (*Thomomys talpoides*) that produce mounds of open soil. The rusty cord-moss appears to take advantage of the open soil on these mounds, avoiding litter buildup and competition from vascular plants. On seepage slopes and gullies, bare soil is produced through small-scale erosion and not by pocket gophers (T. McIntosh, pers. comm., 2008).

Alkaline habitats where this species can potentially occur are relatively common in low elevation, open areas in the south-central portions of the province, as well as in the Rocky Mountain Trench. Alkaline wetlands where this moss has been found occur in grassland habitats mainly in the Ponderosa Pine but also in the Bunchgrass and dry Interior Douglas-fir biogeoclimatic ecological zones (M. Ryan., pers. comm., 2008).

There is little published information about the general biology and reproductive capacity of the rusty cord-moss. However, some field observations on microhabitat and spore production are available (T. McIntosh, pers. comm., 2008). The primary means of dispersal and reproduction of most mosses in this type of habitat is by spores, and the rusty cord-moss appears to produce spores regularly. There are no data on spore dispersal distances, viability, or germination success for this species, although moss spores in this type of habitat are likely dispersed by water or wind, as well as possibly by insects. Also, this species appears to reproduce asexually via buds along underground stems.

Ecological role

Because this species is a colonizer of open soils, it may have a role in soil stability, although this would be minor due to the size of this species and its limited distribution. No other ecological role is known.

Limiting factors

The rusty cord-moss's small size may be a competitive disadvantage when growing among other mosses and vascular plants. Also, it may easily be buried by vascular plant litter. Habitat specificity, such as soil type and moisture, may also be a limiting factor. Long periods of drought may also be a limiting factor for this species, however, it is unknown whether drought has caused a population decline (COSEWIC 2004).

Threats

Threat classification

Table 2. Threat classification table for rusty cord-moss.

1	**Livestock**		**Threat attributes**	
Threat category	Habitat loss or degradation, accidental mortality		**Extent**	
			Local	**Range-wide**
General threat	Loss of habitat and populations	**Occurrence**	Anticipated at four populations	Unknown
		Frequency	Recurrent	Unknown
Specific threat	Destruction, removal, or burial of species and alteration of habitat through trampling of plants and habitat, and soil compaction	**Causal certainty**	High	Unknown
		Severity	High	Unknown
Stress	Fragmentation or destruction of habitat; increased mortality, reduced population size, or local extirpation.	**Level of concern**	High	

2	**Invasive alien vascular plants**		**Threat attributes**	
Threat category	Habitat loss or degradation		**Extent**	
			Local	**Range-wide**
General threat	Loss of habitat and populations	**Occurrence**	Potentially at two sites	Unknown
		Frequency	Recurrent	Unknown
Specific threat	Burial of species and alteration of habitat	**Causal certainty**	Low	Unknown
		Severity	Low	Unknown
Stress	Fragmentation or destruction of habitat;	**Level of concern**	Low	

	increased mortality, reduced population size, or local extirpation			
3	**ATV or other vehicle use**		**Threat attributes**	
Threat category	Habitat loss or degradation, accidental mortality		**Extent**	
			Local	**Range-wide**
General threat	Traversing through habitat near plants in known habitats	**Occurrence**	Potentially at least at one site	Unknown
		Frequency	Unknown/recurrent	Unknown
Specific threat	Habitat compaction by tires and killing of species	**Causal certainty**	Low	Unknown
		Severity	Low	Unknown
Stress	Destruction of habitat; increased mortality, reduced population size, or local extirpation	**Level of concern**	Low	

Description of threats

Livestock

Livestock, in particular cattle but occasionally horses, are the major threat to both the survival and recovery of the rusty cord-moss and its habitat. In most cases, this threat is from the trampling and compaction of the soil on which this species grows. There is a reduction of available habitat, for example, animal hooves destroy soil mounds produced by pocket gophers. Direct mortality through trampling is also a threat. Cattle are present in all of the areas where the rusty cord-moss has been found and heavy trampling disturbance is common in the habitats where most populations are found. The Princeton population may have been lost because of extensive trampling by cattle. In the White Lake basin, the highest density of patches and most vigorous populations of the rusty cord-moss are found in sites where livestock trampling is either prevented through fencing or reduced because part of the population is in a gulley that cattle avoid (T. McIntosh, pers. comm., 2008). In contrast, potential habitats (habitat that is potentially suitable for the species, but which is currently unoccupied) in the White Lake basin that have been heavily grazed and trampled either lack this species or contain only a few small patches. Horse feces have covered a few patches of the rusty cord-moss in the White Lake basin. Feces have the potential to bury and kill the moss as well as alter its habitat, possibly through chemical changes.

Invasive alien vascular plants

Invasive alien vascular plants may threaten this species. A few species, in particular a sow-thistle (*Sonchus* spp.), are common across some of the flats where the rusty cord-moss is found, especially in the protected area in the White Lake basin. Although not confirmed, increased litter buildup from these species may cover the moss or prevent its colonization. Also, invasive species may compete for habitat by growing on the bare soil that is required by the rusty cord-moss. No threats of this type have been observed from native plants. As well, not only can habitats be strongly modified by the hooves of

livestock, alien plants sometimes increase following habitat disturbance (T. McIntosh, pers. comm., 2008).

ATV or other vehicle use
At the White Lake site, ATV use may also be a threat. In 2006, an ATV twice crossed near populations of this species in the fenced, protected area. ATVs have the potential to either alter the habitat by compacting or otherwise disturbing the soil or they can destroy portions of the populations of the rusty cord-moss.

Actions Already Completed or Underway

1. T. McIntosh assisted by J. Cameron (supported by the Environment Canada's Canadian Wildlife Service) initiated a monitoring survey for the rusty cord-moss at White Lake in 2006.

2. Recommendations for fencing and protection in the White Lake basin have been proposed to the Nature Trust of British Columbia, which leases the land from the federal government. Most of one population of the rusty cord-moss in the White Lake basin is protected within a cattle exclosure.

Knowledge Gaps

1. Physical habitat requirements of the rusty cord-moss (e.g., soil moisture, chemistry, and texture; site characteristics including relation to seasonal moisture regimes).

2. Potential role of pocket gophers in the life cycle and survival of this moss species.

3. Degree of threat of invasive alien vascular plant species.

4. Population distribution and occurrence and population sizes and trends.

RECOVERY

Recovery Feasibility

Overall, recovery is considered to be biologically and technically feasible. An assessment of the criteria for technical and biological feasibility for recovery of the rusty cord-moss is found in Table 3.

Table 3. Technical and biological feasibility for recovery of the rusty cord-moss; criteria from Environment Canada *et al.* (2005).

	Feasibility criteria	
1.	Are individuals capable of reproduction currently available to improve the population growth rate or population abundance?	Yes
2.	Is sufficient suitable habitat available to support the species or could it be made available through habitat management or restoration?	Yes
3.	Can significant threats to the species or its habitat be avoided or mitigated through recovery actions?	Yes
4.	Do the necessary recovery techniques exist and are they demonstrated to be effective?	Yes

Recovery Goal

To protect and maintain the known populations of the rusty cord-moss in Canada.

Rationale for Recovery Goal

As with many other rare plant species, we lack adequate information about the historical distribution of the rusty cord-moss. There is no evidence to indicate that this species was previously more abundant or widespread in the arid central interior of British Columbia, therefore, recovery with respect to this species should focus on improving its probability of persistence in the wild. Although the biology and ecology of the rusty cord-moss are not completely understood, field observations suggest that regular recruitment is occurring at some sites. Successful recovery, however, will depend on a combination of scientific investigation, habitat protection and management activities and long-term population monitoring.

Recovery Objectives

The objectives for the next five years are:

I. To secure long-term protection for the known populations and habitats of the rusty cord-moss.
II. To determine the level of real and potential threats to this species and its habitat and to mitigate their effects.
III. To determine the precise habitat requirements of the populations of the rusty cord-moss.
IV. To determine sizes and population trends of the known populations.

Approaches Recommended to Meet Recovery Objectives

Table 4. Recovery planning table for rusty cord-moss.

Priority	Obj. No.	Broad approach/ strategy	Threat addressed	Specific steps	Outcomes or deliverables
High	I	Habitat protection	All threats	• Investigate and document protection in place, if any • Establish appropriate protection mechanisms (e.g., stewardship agreements) depending on land tenure • Communicate with property owners about the presence of the species and the importance of protecting habitat	• Securement and protection of populations and habitats • Increased awareness and assistance by the public in the protection and recovery of this species.
High	II	Site management	All threats	• Research and document threats to habitat at each of the known sites • Determine negative effects of threats and manage for mitigation	• Stewardship plans or covenants • Reduced threats
High	IV	Population monitoring	All threats	• Develop and implement standardized protocols for monitoring population and habitat trends • Report monitoring results and assess trends in populations, area of occupancy and habitat condition every 5 years • Document population sizes and trends	• Standardized monitoring protocol • Periodic assessment of recovery progress for better improved management • Data on population sizes, reproduction status, and health, and determination of population trends
Medium	III	Research: ecology and habitat requirements of the populations	All threats	• Design and prioritize a research program • Analyze habitat requirements • Investigate the importance of pocket gophers in the distribution of this species • Analyze dispersal and colonization strategies of this moss	• Precise information on habitat requirements • Ecological information relevant to management is determined
Medium	I	Inventory		• Inventory for new subpopulations at known sites	• Additional known sites to protect and monitor

Performance Measures

I. Population monitoring indicates that the numbers of plants at active sites are stable or increasing by 2012 (Objectives I and IV).
II. Effects of the two main threats to the populations have been investigated and reduced through mitigative actions at all known sites by 2012 (Objective II).
III. Priority scientific studies have been completed by 2012 (Objective III).

Critical Habitat

No critical habitat can be identified for rusty cord-moss in Canada at this time, but it may be identified at a later date in a federal addition by Environment Canada, or in a future action plan. It is expected that critical habitat will be proposed following the completion of outstanding work required to quantify specific habitat and area requirements for the species, further research on the biology of the species, and monitoring of the populations to determine population trends. Consultation with affected landowners and organizations will also be necessary.

The known ecological attributes of rusty cord-moss habitat include:

1. Along the edges of seasonally wet, alkaline areas where bare soil is available, such as late autumn and spring wet, alkaline ponds, lakes, and sloughs, and on seepage slopes or narrow gullies;
2. On flat to very gentle slopes within a low-growing vegetation zone above, but not in, a zone defined by a complete alkaline-deposit crust; the low-growing vegetation is often defined by the presence of two graminoid species: black-footed sedge and saltgrass as well as associated moss species; and
3. In exposed areas at relatively low elevations in sagebrush or grassland habitats.

Recommended schedule of studies to identify critical habitat

Table 5. Timeline for completion of studies to identify critical habitat for the rusty cord-moss.

Description of study	Outcome/rationale	Completion date
Inventory for undocumented patches of this moss at the known localities	Confirm current area of occupancy of known localities	2011
Identify biotic and abiotic habitat attributes (including microhabitats) of known populations	Qualitate habitat variables	2011
Using established survey and mapping techniques, delineate the boundaries of all occupied habitats	Delineate habitat	2011

Existing and Recommended Approaches to Habitat Protection

Most of one population of the rusty cord-moss in the White Lake basin is protected within a cattle exclosure, although a few patches have been found outside the exclosure. Historically, in the White Lake basin, cattle and horses used the area around the lake. However, in 2000, The Nature Trust of British Columbia signed a 99-year lease to establish a study area on federal lands at White Lake in accordance with its 2000 Biodiversity Ranch Management Plan. As part of this plan, many areas, including some patches of the rusty cord-moss, have been permanently excluded from grazing and other potential large-scale disturbances through the construction and maintenance of a fence. The habitat in fenced areas is expected to improve or at least be protected from degradation, although data are lacking on how changes will affect the population of this species.

Recommended approaches to protection of the rusty cord-moss include stewardship on private land, and incorporation of management for this species in Range Stewardship Plans.

Effects on Other Species

Impacts to other species or ecological processes are not anticipated during the initial stages of the recovery process for the rusty cord-moss. It is anticipated that some actions regarding the recovery of the rusty cord-moss, such as the maintenance and the establishment of protected sites, may benefit other species, and this will be assessed as work is undertaken. The alkaline wing-nerved moss *(Pterygoneurum kozlovii*) (Endangered on Schedule 1 of SARA) is present at the White Lake site, as are two CDC Red-listed mosses: *Pterygoneurum lamellatum* and *Pottia nevadensis*. In both cases, the White Lake site is one of two known locations for these species in B.C. A SARA-listed (Endangered) vascular plant showy phlox (*Phlox speciosa* ssp. *occidentalis*) grows near one of the White Lake populations of the rusty cord-moss.

Socioeconomic Considerations

The socioeconomic impact is considered low at some sites for the rusty cord-moss, as fencing may be required to protect this species from livestock damage. Benefits include protecting other species at risk present at the White Lake site, including two other Red-listed mosses (see above).

Recommended Approach for Recovery Implementation

This recovery strategy should be considered for integration within other conservation efforts, such as the South Okanagan–Similkameen Conservation Program.

Statement on Action Plans

An action plan for rusty cord-moss will be completed by December 31, 2012.

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