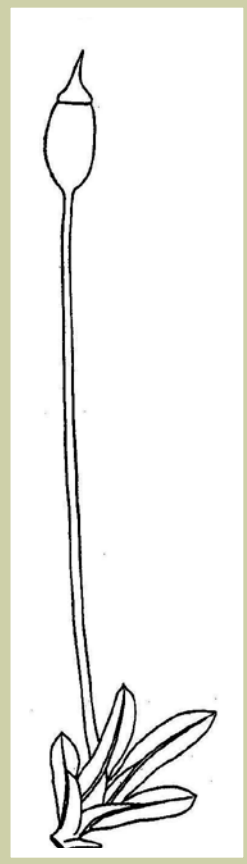
Species at Risk Act
Management Plan Series

Management Plan for the Pygmy Pocket Moss (*Fissidens exilis*) in Canada

Pygmy Pocket Moss



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For copies of the management plan, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry[1].

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[1] http://www.registrelep-sararegistry.gc.ca

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[2] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of management plans for listed species of special concern and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change is the competent minister under SARA for the Pygmy Pocket Moss and has prepared this management plan as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the British Columbia, Ontario, Quebec and Nova Scotia governments.

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this plan and will not be achieved by Environment and Climate Change Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this management plan for the benefit of the Pygmy Pocket Moss and Canadian society as a whole.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

[2] http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2

Acknowledgments

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Executive Summary

Pygmy Pocket Moss (*Fissidens exilis*) is very small and is difficult to identify without the aid of a microscope. The species is found in moist soil substrate and appears as unidentifiable velvety green filaments (protonemata), until favorable conditions allows for the growth of tiny leafy stems (1.0 – 2.0 mm tall) and reproductive organs.

Pygmy Pocket Moss has been listed as Special Concern on Schedule 1 of the *Species at Risk Act* (SARA) (S.C. 2002, ch. 29) since 2006. In Canada, it has been collected from at least 18 localities: two in British-Columbia, seven in southern Ontario, four in Quebec and at least five in Nova-Scotia. The small stature and peculiar life cycle of Pygmy Pocket Moss makes it hard to detect and identify, creating uncertainty regarding the species' abundance and range in Canada.

The species' suitable habitat characteristics as well as the environmental conditions at the Canadian known occurrences are not well-described. Knowledge gaps on the threats to the species are significant to the extent that they cannot be well assessed. Intrinsic factors limiting the species are also largely unknown.

The management objective for the Pygmy Pocket Moss is to maintain the presence of all known extant occurrences located in natural habitat in Canada during the 5 years following the final publication of this management plan on the Species at Risk Public Registry.

Broad strategies and conservation measures designed to achieve this objective are set out in section 6.2. This management plan outlines a number of recommended measures addressing knowledge gaps about the Canadian population, management and conservation of the species and its habitat, and outreach and communication.

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1. COSEWIC* Species Assessment Information

Date of Assessment: May 2005

Common Name (population)[3]: Pygmy Pocket Moss

Scientific Name: *Fissidens exilis*

COSEWIC Status: Special Concern

Reason for Designation: A moss with a limited distribution in eastern North America, but which is widespread in Europe. Few populations have been documented in Canada, primarily in Ontario where it occurs in heavily populated and developed areas where natural habitats are widely known to be at serious risk. Although cryptic in habit, the species often grows with other small species that have well documented ranges. The species prefers woodlands, where it is usually found on bare clay or disturbed soil. Most locations are in areas benefiting from some level of conservation protection.

Canadian Occurrence[4]: Ontario, Quebec

COSEWIC Status History: Designated Special Concern in May 2005.

* COSEWIC – Committee on the Status of Endangered Wildlife in Canada. The information presented in this box, including the Canadian occurence, reflects the state of knowledge at the time the species was assessed.

2. Species Status Information

The Canadian proportion of the global population has not been assessed, but it is likely less than five percent (COSEWIC 2005). The species has been listed as Special Concern[5] on Schedule 1 of the federal *Species at Risk Act* (SARA) (S.C. 2002, ch. 29) since 2006 and is listed as Special Concern[6] in Ontario under the *Endangered Species Act, 2007* (ESA) since 2008. The species is not listed in Quebec because, until recently, Quebec bryophyte specialists, as well as some other specialists in North America, questioned the species' status as native to North America. It is not listed either in Nova-Scotia nor British-Columbia where it has only recently been discovered. However, it is also the opinion of local British-Columbia bryologists that it might be introduced.

[3] In French, the common name is *fissident pygmée*, however, in Québec, the French common name was revised and is now *fissident mince* (http://www.societequebecoisedebryologie.org/Carnets/Carnets_6_Lavoie_noms_mousses.pdf)

[4] Since 2005, new occurrences have been discovered in Nova Scotia (in 2010) and British Columbia (in 2012).

[5] A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

[6] A species that lives in the wild in Ontario and that may become threatened or endangered because of a combination of biological and identified threats.

As mentioned above, some variation in opinion exists regarding the nativity of Pygmy Pocket Moss in North America. Some recent authors (Allen et al. 2004, Bryophyte Flora of North America 2007, Faubert 2007) suggest that the species is introduced from Europe, based on its relatively recent discovery in regions of the continent that are densely populated, subject to human disturbance, and relatively well-botanized. However, other indigenous species with low detectability were only recently recorded in Canada [e.g. Schleicher's Silk Moss (*Entodon schleicheri*) (Buck and Crum 1978); new bryophytes species and genera in British Columbia (McIntosh 1989)], suggesting that recent discovery is not clear evidence of introduction. Furthermore, the Pygmy Pocket Moss is not clustered neatly around ports, in urban settings, or on anthropogenic linear disturbances as many introduced (Schofield 1988) or rapidly expanding (Hassel and Söderström 1998) bryophytes species tend to be. Both natural areas and developed urban or recreational settings are represented in the Canadian range. This is why COSEWIC is considering the Pygmy Pocket Moss as a species native to Canada.

NatureServe (2014) considers the global populations of the Pygmy Pocket Moss to be Vulnerable (G3). The species is considered Critically Imperiled (N1) in Canada and Unranked (NNR) in the United States. Table 1 provides further details on other conservation ranks in Canada, while Appendix B provides definitions of the aforementioned NatureServe rankings.

Table 1. Conservation Status Ranks for the Pygmy Pocket Moss in Canada (NatureServe 2014).

Region	Nature Serve[a]
British Columbia	NA
Ontario	Critically Imperiled (S1)
Quebec	NA
Nova Scotia	NA

[a] Conservation status ranks: NA: Not Applicable. For subnational ranks (by state) in the United States, refer to NatureServe's website http://explorer.natureserve.org/

3. Species Information

3.1. Species Description

Pygmy Pocket Moss is a minute, brown or dark green moss that is sometimes found with leafy stems ranging from 1 – 2 mm tall (COSEWIC 2005). These plants usually exist as a carpet of very small undifferentiated (and unidentifiable) velvety filaments (protonemata) in or on the soil (Flora of North America 2007; Jennifer Doubt, pers. comm. 2014). When there is a sustained rise in moisture, such as spring and fall, protonemata initiate the growth of leafy stems and stalked spore-filled capsules (sporophytes) which vary in length from 2 to 5 mm (COSEWIC 2005). Plants are easier to detect and identify when they are in this state.

3.2. Population and Distribution

Pygmy Pocket Moss is known from the British Isles, central and northern Europe, Scandinavia and Japan (COSEWIC 2005). It also occurs in New Zealand where it may be introduced (Beever 1999) as well as in Algeria and South America (NatureServe 2013). The first discovery of the species in North America was made in 1947, in Cleveland, Ohio (Steere 1950). The species extends through the eastern United States and until recently, was believed to reach its northern range limit in North America in the southern parts of Ontario and Quebec (Figure 1). However, recent discoveries show its presence in Nova-Scotia, in British-Columbia and in the Côte-Nord region, Quebec (see Appendix A).

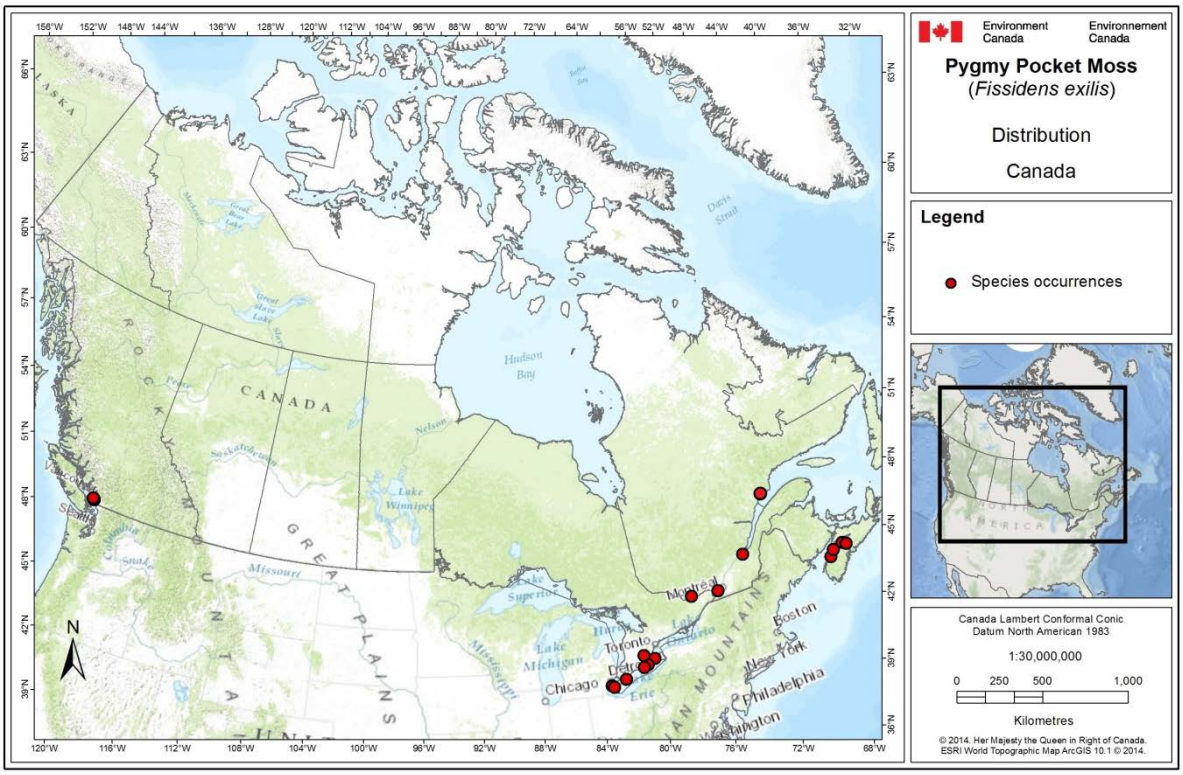

Figure 1. Canadian distribution of Pygmy Pocket Moss.

In Canada, Pygmy Pocket Moss has been collected from 18 localities: two in British-Columbia, seven in southern Ontario, four in Quebec and at least five in Nova-Scotia (Figure 1, Appendix A)[7]. Eight of these occurrences benefit from habitat conservation measures (see Appendix A for details). The Canadian area of occupancy is thought to be less than 1 km^2 (COSEWIC 2005).

[7] When it was first assessed by COSEWIC in 2005, it was reported from only seven localities in Ontario and Quebec.

Accurate determinations of the species' distribution and abundance are very difficult as shown by the following information provided in COSEWIC 2005:

- During fieldwork carried out in 2002, none of the three previously recorded populations in Ontario were re-discovered. Difficulty in finding previously recorded populations does not necessarily indicate decline or extirpation, because very little detail concerning the population locations was available to direct field searches. Furthermore, the species' persistent protonemata, which are presumably more common than the shorter-lived mature gametophytes, cannot be reliably identified, even at the family level, and populations lacking distinguishable leafy gametophytes at the time of the field work would not have been recorded. It is also possible that the 2002 collecting failed to detect mature Pygmy Pocket Moss at the sites, because other small moss species abound on muddy substrates in southern Ontario and species tend to intermingle with other ephemeral mosses. In the absence of characters for field recognition, collectors must gather a representative sample for lab identification. Long-term persistence at narrowly defined sites is probably not in the nature of Pygmy Pocket Moss, although it may be expected to persist in a general area in which patches of suitable substrate predictably recur. Additional field work involving extensive sampling throughout the suspected Canadian range of the species is likely to result in the (re)discovery of more populations (Wilf Schofield, pers. comm. 2004).

There is no evidence for decline of the population, and Allen (2004) suspects an ongoing population increase in North America.

3.3. Needs of the Pygmy Pocket Moss

Little is known about the biology of Pygmy Pocket Moss[8] (e.g. life cycle and ecological needs). The species prefers riparian habitats (COSEWIC 2005) however, suitable habitat characteristics of the species as well as the environmental conditions at the known Canadian occurrences have not been studied.

Species of *Fissidens* reflect the preference of many bryophytes for specific micro-environmental conditions (Beever, 1999). Pygmy Pocket Moss (*F. exilis)* occurs primarily on bare, moist, often clay-based soil of shaded banks and seepage areas (Crum & Anderson 1981; Flora of North America 2007), typically in woodlands, but also on roadsides and floodplains, where the soil has been disturbed by natural events or human activities (Crum & Anderson 1981; COSEWIC 2005).The species' dependence on bare, clay mineral soil makes it vulnerable to successional changes in its habitat (COSEWIC 2005). In places exposed to a natural disturbance regime (e.g. stream and river banks, floodplains), soil may be kept bare, or new patches may open as old ones are covered with vegetation. In other cases where the disturbance is not repeated, however, the species may be eliminated over time (COSEWIC 2005).

[8] A brief summary of the generalized moss life cycle is provided in COSEWIC (2005).

Pygmy Pocket Moss can be found growing on bare soil substrate with other species of pocket moss (*Fissidens s*p.) (Steere 1950; Molnar 1975) and with ephemeral mosses such as *Ephemerum* and *Micromitrium* (Crum & Anderson 1981), which are known to prefer small temporary habitat patches.

Pygmy Pocket Moss needs moisture for growth and reproduction. The persistent protonemata embedded in the substrate allow plants to persist through unfavourable environmental conditions, but also to proliferate quickly when opportunities arise[9] (COSEWIC 2005). Spores are probably the main mode of dispersal. Colonies may also expand when disturbances, such as flooding, dislodge plant fragments which then become re-established elsewhere (COSEWIC 2005). If this latter form of dispersal is important, riparian corridors would provide significant dispersal routes.

Intrinsic factors limiting Pygmy Pocket Moss in Canada are largely unknown. The species appears to reach the northern limit of its North American range in southern Canada, which suggests that it may be limited by climate and that the known distribution may be susceptible to change associated with long-term climate change (COSEWIC 2005). However, the recent discovery of a new occurrence in the municipality of Franquelin (Côte-Nord region, Quebec) (see Appendix A) questions this hypothesis.

4. Threats

Threats to the Canadian occurrences of Pygmy Pocket Moss are unknown to the extent that they cannot be well assessed. General information on threats is found in the 2005 COSEWIC status report[10]:

- Canadian occurrences of Pygmy Pocket Moss fall within a highly populated region of the country, where air and water pollution, habitat destruction, and habitat fragmentation have affected the survival of many plant species (e.g. Argus & Pryer 1990, Klinkenberg et al. 1990, Lamb & Rhynard 1994, Maycock 1963, Oldham 1990).
- To provide some indication of the possible extent of the above threats, the Ontario occurrences, in particular, are known to occur in heavily populated and developed areas where natural habitats are widely known to be at serious risk (COSEWIC 2005). The majority of Ontario population records, however, are within areas benefiting from habitat conservation measures (see Appendix A).
- Human activities, including recreation and conservation management, have the potential to affect the species' survival even at sites that benefit from

[9] Allen et al. (2004) report a significant shift in local distribution of Pygmy Pocket Moss after just nine days.

[10] This information applies only to the occurences that were known at the time (total of seven, in Ontario and Quebec). No information is available at the moment for the newly discovered occurences in Nova-Scotia and British-Columbia.

conservation measures, particularly if managers are unaware of the species presence.

Pygmy Pocket Moss' association with soil that is disturbed to some degree makes it difficult to classify many local disturbances (e.g. trampling, clearing) as clear threats (J. Doubt, pers. comm. 2014).

Addressing knowledge gaps on the threats to the species in Canada is considered a priority (see Table 3. Conservation Measures and Implementation Schedule).

Table 2. Threat Assessment Table

Threat	Level of Concern[b]	Extent	Occurrence	Frequency	Severity[c]	Causal Certainty[d]
Habitat Loss and Degradation						
Development in heavily populated areas	Unknown	Widespread	Current	Continuous	Unknown	Unknown
Pollution						
Water and air pollution in heavily populated areas	Unknown	Widespread	Current	Continuous	Unknown	Unknown
Changes in Ecological Dynamics or Natural Processes						
Management of Natural Areas	Unknown	Localized	Unknown	Unknown	Unknown	Unknown
Disturbance or Harm						
Recreational Activities	Unknown	Localized	Unknown	Unknown	Unknown	Unknown

[b] Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the conservation of the species, consistent with the management objectives. This criterion considers the assessment of all the information in the table.
[c] Severity: reflects the population-level effect (high: very large population-level effect, moderate, low, unknown).
[d] Causal certainty: reflects the degree of evidence that is known for the threat (high: available evidence strongly links the threat to stresses on population viability; medium: there is a correlation between the threat and population viability e.g., expert opinion; low: the threat is assumed or plausible).

5. Management Objective

The management objective for the Pygmy Pocket Moss is to maintain the presence of all known extant occurrences located in natural habitat in Canada during the five years following the final publication of this management plan on the Species at Risk Public Registry.

To meet this objective, it is considered an essential prerequisite to address the important knowledge gaps previously identified, namely knowledge gaps about the Canadian population and distribution and on the threats to the species and its habitat.

The management objective is to maintain, as opposed to increase, the presence of Pygmy Pocket Moss because the Canadian population of the species is currently unknown. The fact that the number of known occurrences has increased from seven to eighteen since the species was first assessed by COSEWIC in 2005 is clear evidence of this lack of knowledge. Furthermore, as mentioned in section 3.2, there is no evidence of decline in the population, there might even be a population increase.

Considering the characteristics of the species (see section 3.2), the presence of an occurrence is the best possible criterion to measure its maintenance. Indeed, the species might be present part of the year without any visible plants. Furthermore, when plants are present, an accurate estimate of abundance is impossible as the numbers of colonies, as well as the area occupied by each of them, tend to vary between years, and even within a single year (J. Doubt, pers. comm. 2014).

Most Pygmy Pocket Moss occurrences are in natural habitat. Some, located in natural habitat are exposed to a disturbance regime from natural or human sources (e.g. stream and river banks or along pedestrian trails). These occurrences should persist without further human intervention. Others located in natural habitat without any disturbance regime are, due to the transient nature of the species, unlikely to persist without periodic human interventions. The species also occurs in non-natural[11] habitat (e.g. farm field) where it has been accidentally introduced by human activities, however, the management objective is targeting only occurrences in natural habitat.

The 5-year time frame is deemed appropriate at this time as there is a limited number of occurrences and most of the conservation measures required to meet the objective can be implemented simultaneously (see table 3).

This objective will be reviewed during the development of the report required five years after this management plan is posted on the Species at Risk Public Registry to assess the implementation of this plan and the progress towards meeting its objectives. It may also be revised at an earlier time in light of new information, if deemed appropriate for the species conservation.

[11] These occurrences can be identified based on habitat characteristics that are clearly not representative of the natural habitat of the species.

6. Broad Strategies and Conservation Measures

6.1. Actions Already Completed or Currently Underway

Many land managers of provincially-owned sites and sites owned by conservation authorities where the species has been detected are aware of its potential presence. No other action to conserve this species is known.

6.2. Broad Strategies

The broad strategies to achieve the objective of this management plan are as follows:

- Improve knowledge of the Canadian population, including its size, distribution, threats, habitat, life cycle and other ecological needs
- Manage and conserve the species and its habitat,
- Develop and implement outreach and communication programs.

6.3. Conservation Measures

Table 3. Conservation Measures and Implementation Schedule

Conservation Measure	Priority[e]	Threats or Concerns Addressed	Timeline
1. Improve knowledge of the Canadian population, including its size, distribution, threats, habitat, life cycle and other ecological needs			
Develop and implement standardized protocols for inventories, monitoring and data collection	High	Knowledge gap	2016-2021
Search for new occurrences	High	Knowledge gap	2016-2021
Monitor known occurrences on a regular basis	High	Knowledge gap	2016-2021
Inform survey and management efforts with results from research on the species conducted in the United States	Low	Knowledge gap	Ongoing
Encourage research on the life cycle and ecological needs of the species	Low	Knowledge gap	2016-2021
2. Manage and conserve the species and its habitat			
Provide information to landowners and land managers associated with species' occurrences	High	All threats	2016-2021
Develop and implement stewardship programs and incorporate the needs of the species into land use planning	High	All threats	2016-2021
Intervene to disturb habitat in natural habitat not submitted to a distrurbance regime, where and when required	High	All threats	2016-2021

3. Develop and implement outreach and communication programs			
Inform and encourage amateur and professional bryologists in the detection of populations, and promote reporting and verification mechanisms	Medium	Knowledge gap	2016-2021
Promote national cooperation to fill knowledge gaps, and to eliminate, reduce or mitigate threats, if needed	Medium	Knowledge gap	2016-2021

[e] *"Priority" reflects the degree to which the measure contributes directly to the conservation of the species or is an essential precursor to a measure that contributes to the conservation of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the management objective for the species. Medium priority measures may have a less immediate or less direct influence on reaching the management objective, but are still important for the management of the population. Low priority conservation measures will likely have an indirect or gradual influence on reaching the management objective, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.*

6.4. Narrative to Support Conservation Measures and Implementation Schedule

Improve knowledge of the Canadian population, including its size, distribution, threats, habitat, life cycle and other ecological needs

There are important knowledge gaps on the Pygmy Pocket Moss and the need to address these is considered an essential prerequisite for the conservation of the species. Developing and implementing standardized protocols is considered a top priority. This should be done for inventories as well as for monitoring and data collection to ensure the quality of data but also, as different knowledge gaps should be addressed, in the interest of efficiency. These standardized protocols will manage data collection at each occurrence; particularly on the location of the species, habitat characteristics, local threats to the species and its habitat, and local environmental conditions. The most appropriate methods for the search of new occurrences and for the monitoring of known occurrences will also be determined.

Searching for new occurrences is essential to improve knowledge of the population size and distribution of this species. Regular monitoring of currently known and new occurrences will ascertain the presence of the species and allow the collection of appropriate data (e.g. environmental conditions, disturbances).

Informing survey and management efforts in Canada with results from research on the species conducted in the United States will contribute to the improvement of approaches and methods used in conservation measures related to survey and management.

Research on life cycle and other ecological needs of the Pygmy Pocket Moss will improve knowledge of the species and its needs. Results will contribute to the conservation of the species.

Manage and conserve the species and its habitat

Informing concerned landowners and land managers is a key element for the conservation of the occurrences. They will be informed of occurrence locations in order to avoid any inadvertent destruction of occurrences and to prevent actions that would have a negative impact on the species and/or its habitat.

Stewardship program development and implementation will contribute to the conservation of the species. It can, among other things, provide support to private landowners interested in managing their lands in a way that respects the conservation needs of the species, and include the needs of the species in any other land use planning.

The presence and persistence of the Pygmy Pocket Moss depends on regular disturbance of the substrate. Therefore, the maintenance of occurrences not located in habitat maintained by a disturbance regime will likely require regular interventions intended to reproduce the effects of natural perturbations.

Develop and implement outreach and communication programs

The participation of bryologists (amateur and professionals) will help to improve the knowledge of the Canadian population and distribution of the Pygmy Pocket Moss. To ensure the quality of the data that will be provided, it will be important to also promote the use of the standardized reporting and verification mechanisms.

Finally, sharing information at the national level will allow knowledge gaps on the Pygmy Pocket Moss to be addressed more efficiently, will help to implement measures, and to eliminate, reduce or mitigate large scale threats, if needed.

7. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the management objective. Success in implementing this management plan will be evaluated every five years on the basis of the following performance indicators:

- Knowledge of the Canadian population and distribution of the Pygmy Pocket Moss and knowledge of the threats to the species and its habitat have been improved;

- The presence of all known extant Canadian occurrences located in natural habitat has been maintained.

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Appendix A: Known Occurrences of Pygmy Pocket Moss in Canada

	Locality	Habitat	Date detected	Date of last visit	Specimen[†]	Note
	BRITISH-COLUMBIA					
1	British Columbia, Richmond, Sea Island, near Sea Island firehall	Clay bank of slough, under shrubs	17/03/2012	03/2012	UBC B212546	Anthropogenic site; patches small and localized
2	British Columbia, Vancouver, Point Grey, Wreck Beach, west of Trail #3 (Pacific Spirit Regional Park)	On lump of clay by edge of path behind beach	24/03/2010	09/2012	UBC B211597	Anthropogenic site; patches small and localized;
	ONTARIO					
3	Ontario, Essex County, Anderdon Township, "Canard River Kentucky Coffee Tree Woods" – Canard Valley Consevation Area	Floodplain woods, on lumps of clay	24/03/1984	08/2002 (not detected)	CANM 290756	Precise locality could not be pinpointed in 2002
4	Ontario, Essex County, Colchester South Township (Oldham 1983)	Mature deciduous woods, oak-dominated	26/03/1981	08/2002 (not detected)	CANM 275055	Precise locality could not be pinpointed in 2002
5	Ontario, Kent County, Municipality of Chatham-Kent. Sinclair's Bush Conservation Area (Lower Thames Conservation Authority)	Maple / Beech forest, on bare mud (no debris or herb cover).	16/08/2002	16/08/2002	ALTA-DBG	Abundance: three patches sparsely covering total area of about 860 cm^2 (COSEWIC 2005)
6	Ontario, Haldimand-Norfolk County, Walsingham Township, Deer Creek Conservation Area (Long Point Region Conservation Authority) south of Langton, Ontario	Dry – Fresh Hardwood – Hemlock Mixed Forest Type	22/06/1995	22/06/1995	ALTA-DBG	
7	Ontario, Waterloo County, North Dumfries Township, Sudden Tract (Region of Waterloo), south- west of	Fresh – Moist Sugar Maple – Hardwood Deciduous Forest Type	23/09/1995	23/09/1995	ALTA-DBG	

	Cambridge, Ontario					
8	Ontario, Haldimand County, Dunnville. Ruigrok Tract Conservation Area (Niagara Peninsula Conservation Authority)	On clay in transition from upland deciduous woods to track of swampy humic thicket	18/11/2012	11/2012	CANM (not yet accessioned)	Very sparse and localized
9	Ontario, Norfolk County, near town of Port Dover	On clay encrusted upturned root mass of fallen white pine	23/11/2011	11/2011	CANM 331159	
	QUEBEC					
10	Quebec, Gatineau County, Gatineau Park	Not recorded	Not recorded		CANM 291533	Specimen was identified in 1982
11	Quebec, west end of the Island of Montréal, Macdonald campus of McGill University, Morgan Arboretum	In a planted spruce-tamarack association on clay soil	Fall/1973	08/2002 (not detected)	Specimen not found	
12	Quebec, Quebec City, Sainte-Foy (Laval University Campus)	Bare soil, deciduous forest	03/06/1987	03/06/1987	Jean Faubert private herbarium 7965	
13	Québec, Côte-Nord, Manicouagan RCM, Franquelin	Eroded clay stream bank in the woods	12/10/2014	12/10/2014	Stéphane Leclerc private herbarium	Specimen found in protected area
	NOVA-SCOTIA[g]					
14	Nova Scotia, Hants County, Teare Brook	Slope to brook	26/04/2012	04/2012	CANM 331676	
15	Canada, Nova Scotia, Hants County, White Head	On soil behind gypsum bluff	07/05/2010	05/2010	CANM 331674	
16	Canada, Nova Scotia, Hants County, Herbert River	Stream bank	03/04/2012	04/2012	CANM 331675	
17	Canada, Nova Scotia, Annapolis County, Phinney Mt. Road, 2.4 km E of Belle Isle.	Second-growth spruce-fir forest; clayey moist soil in forest	16/07/1987	07/1987	UBC B114963	
18	Canada, Nova Scotia, King's County, Bishop Brook	On soil, slope under alders, willow	15/01/2014	01/2014	CANM (not yet accessioned)	

[f] As substantiated by herbarium specimens and COSEWIC (2005). UBC = University of British Columbia Herbarium, CANM = National Herbarium of Canada bryophyte collection, ALTA-DBG = University of Alberta Devonian Botanic Garden, ACAD = Acadian Universtiy Herbarium.

[g] The species expert, Jennifer Doubt, came across data that indicate Pygmy Pocket Moss might occur in two additional sites in Nova Scotia. However, this information still needs to be confirmed (Jennifer Doubt, personal communications 2014).

Appendix B: NatureServe ranks and Definitions

The table below lists the conservation status ranks used by NatureServe and their definitions. The numbers and letters are appended to G (global rank, for the whole range), N (national rank for within a nation), or S (sub-national rank, for a province or state). A range rank (e.g. S1S2) is used to indicate a range of uncertainty about the status of the species or community.

Rank	Definition
1	Critically Imperiled – Critically imperiled in the jurisdiction because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation.
2	Imperiled – Imperiled in the jurisdiction because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines or other factors making it vulnerable to extirpation.
3	Vulnerable – Vulnerable in the jurisdiction due to a very restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
4	Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors.
5	Secure – common, widespread and abundant in the jurisdiction.
B	Breeding – breeding population of the species in the nation or state/province.
N	Non-breeding – non-breeding population of the species in the nation or state/province.
M	Migrant – occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregate transient population of the species in the nation or state/province.
NR	Unranked – status not yet assessed
NA	Not Applicable – species is not a suitable target for conservation activities.
?	Inexact Numeric Rank—Denotes inexact numeric rank

Appendix C: 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*[12]. 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 and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement of any of the Federal Sustainable Development Strategy's[13] (FSDS) goals and targets.

Conservation planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of management plans may 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 management plan itself, but are also summarized below in this statement.

The proposed conservation measures, which focus on inventories, monitoring and public awareness, are non-intrusive and are not expected to affect non-target species, natural communities, or ecological processes. In addition, the species' occurrences are known to occupy a very small area reducing the risk of affecting large portions of habitat. Furthermore, reducing threats to Pygmy Pocket Moss habitat should benefit all species. Finally, public awareness initiatives for Pygmy Pocket Moss are expected to raise awareness of, and therefore benefit, all bryophyte species at risk.

Therefore, the potential for the plan to inadvertently lead to adverse effects on other species was considered but, for the reasons listed above, the SEA concluded that this plan will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to the following section of the document in particular: Conservation Measures (6.3).

[12] http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[13] www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1