

Action Plan for the Porsild's Bryum (*Mielichhoferia macrocarpa*) in Canada

Porsild's Bryum



2017



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16 For copies of the action plan, or for additional information on species at risk, including
17 the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status
18 Reports, residence descriptions, recovery strategies, and other related recovery
19 documents, please visit the [Species at Risk \(SAR\) Public Registry](http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)¹.

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23 **Cover illustration:** © René J. Belland 2005

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¹ <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

38 Preface

39

40 The federal, provincial, and territorial government signatories under the [Accord for the](#)
41 [Protection of Species at Risk \(1996\)](#)² agreed to establish complementary legislation and
42 programs that provide for effective protection of species at risk throughout Canada.
43 Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent
44 ministers are responsible for the preparation of action plans for species listed as
45 Extirpated, Endangered, and Threatened for which recovery has been deemed feasible.
46 They are also required to report on progress within five years after the publication of the
47 final document on the SAR Public Registry.

48

49 Under SARA, one or more action plan(s) provides the detailed recovery planning that
50 supports the strategic direction set out in the recovery strategy for the species. The plan
51 outlines what needs to be done to achieve the population and distribution objectives
52 (previously referred to as recovery goals and objectives) identified in the recovery
53 strategy, including the measures to be taken to address the threats and monitor the
54 recovery of the species, as well as the proposed measures to protect critical habitat that
55 has been identified for the species. The action plan also includes an evaluation of the
56 socio-economic costs of the action plan and the benefits to be derived from its
57 implementation. The action plan is considered one in a series of documents that are
58 linked and should be taken into consideration together. Those being the COSEWIC
59 status report, the recovery strategy, and one or more action plans.

60

61 The Minister of Environment and Climate Change and the Parks Canada Agency is the
62 competent minister under SARA for the Porsild's Bryum and has prepared this action
63 plan to implement the recovery strategy, as per section 47 of SARA. To the extent
64 possible, it has been prepared in cooperation with the provinces of British Columbia,
65 Alberta, and Newfoundland and Labrador and Nunavut Territory, as per section 48(1) of
66 SARA.

67

68 Success in the recovery of this species depends on the commitment and cooperation of
69 many different constituencies that will be involved in implementing the directions and
70 actions set out in this action plan and will not be achieved by Environment and Climate
71 Change Canada and the Parks Canada Agency, or any other jurisdiction alone. All
72 Canadians are invited to join in supporting and implementing this action plan for the
73 benefit of the Porsild's Bryum and Canadian society as a whole.

74

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

77

78 The recovery strategy sets the strategic direction to arrest or reverse the decline of the
79 species, including identification of critical habitat to the extent possible. It provides all

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

80 Canadians with information to help take action on species conservation. When critical
81 habitat is identified, either in a recovery strategy or an action plan, SARA requires that
82 critical habitat then be protected.

83

84 In the case of critical habitat identified for terrestrial species including migratory birds
85 SARA requires that critical habitat identified in a federally protected area³ be described
86 in the *Canada Gazette* within 90 days after the recovery strategy or action plan that
87 identified the critical habitat is included in the public registry. A prohibition against
88 destruction of critical habitat under ss. 58(1) will apply 90 days after the description of
89 the critical habitat is published in the *Canada Gazette*.

90

91 For critical habitat located on other federal lands, the competent minister must either
92 make a statement on existing legal protection or make an order so that the prohibition
93 against destruction of critical habitat applies.

94

95 If the critical habitat for a migratory bird is not within a federal protected area and is not
96 on federal land, within the exclusive economic zone or on the continental shelf of
97 Canada, the prohibition against destruction can only apply to those portions of the
98 critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies
99 as per SARA ss. 58(5.1) and ss. 58(5.2).

100

101 For any part of critical habitat located on non-federal lands, if the competent minister
102 forms the opinion that any portion of critical habitat is not protected by provisions in or
103 measures under SARA or other Acts of Parliament, or the laws of the province or
104 territory, SARA requires that the Minister recommend that the Governor in Council make
105 an order to prohibit destruction of critical habitat. The discretion to protect critical habitat
106 on non-federal lands that is not otherwise protected rests with the Governor in Council.

107

108

109

110

³ These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

111 **Acknowledgments**

112

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120 Environment) and Chris Pasztor (British Columbia Ministry of Natural Gas
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122

123 **Executive Summary**

124

125 Porsild's Bryum (*Mielichhoferia macrocarpa*) is a small brilliant green moss, often
126 associated with waterfalls and calcareous rock and known to occur in at least 17
127 populations throughout Canada. It was listed as Threatened on the *Species at Risk Act*
128 (SARA) Schedule 1 in 2011.

129

130 This action plan complements the *Recovery Strategy for the Porsild's Bryum in Canada*
131 (Environment and Climate Change Canada 2016) and will be implemented in British
132 Columbia, Alberta, Nunavut and Newfoundland. The proposed recovery measures in
133 this action plan address the objective set out in the recovery strategy for the entire
134 population and distribution of Porsild's Bryum in Canada.

135

136 No additional critical habitat is identified in this action plan, but it is expected that as the
137 Schedule of Studies is completed, additional critical habitat may be identified and
138 presented in an updated recovery strategy or action plan(s). Critical habitat identified in
139 the species' recovery strategy is located on non-federal land and a federal protected
140 area and proposed measures to protect this critical habitat are presented in section 1.4
141 of this action plan.

142

143 The recovery measures included in this action plan are required to implement the
144 recommended recovery approaches outlined in the recovery strategy. Recovery
145 measures proposed for the Porsild's Bryum are related to five broad strategies:
146 (1) inventory and monitoring, (2) research, (3) outreach / stewardship, (4) habitat
147 management, and (5) reintroduction and/or population augmentation.

148

149 The socio-economic evaluation was completed and it was determined that the direct
150 and indirect costs of implementing this action plan are anticipated to be low over the
151 short term (2017-2021) and the long term (2021 onwards). The implementation will
152 benefit other species, habitat and ecosystems.

153

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199 1. Recovery Actions

200 201 1.1 Context and Scope of the Action Plan

202
203
204 The taxonomic designation of Porsild's Bryum has changed over time. At the time of the
205 2003 COSEWIC assessment, it was considered to be in the genus *Mielichhoferia*
206 (*Mielichhoferia macrocarpa* (Hooker) Bruch & Schimper ex Jaeger & Sauerbeck). It was
207 then placed in the genus *Bryum* (*Bryum porsildii* (I Hagen) Cox & Hedderson) and more
208 recently in the genus *Haplodontium* (*Haplodontium macrocarpum* (Hooker) Spence).
209 The currently accepted name of the species is *Haplodontium macrocarpum*. These
210 names are synonymous and all refer to the Porsild's Bryum.

211
212 Porsild's Bryum was assessed as Threatened by the Committee on the Status of
213 Endangered Wildlife in Canada (COSEWIC) in 2003, then subsequently listed as such
214 on Schedule 1 of the *Species at Risk Act* (SARA) in 2011 using the name *Mielichhoferia*
215 *macrocarpa*. As such, this is the name used for the purposes of this action plan.
216

217
218 Porsild's Bryum is a small brilliant green moss associated with shaded calcareous cliffs
219 or rock outcrops and continuous or intermittent seepage (COSEWIC 2003; Environment
220 and Climate Change Canada 2016). The distribution extent has changed little since it
221 was assessed by COSEWIC. It is known to occur in at least 17 populations in Canada:
222 1 in British Columbia, 6 in Alberta, 7 in Newfoundland and Labrador, and 3 in Nunavut
223 (Environment and Climate Change Canada 2016). There is limited information available
224 to determine reliable trends in the population though loss of individuals and colonies,
225 and a decline in habitat quality, has been noted at some locations (COSEWIC 2003).
226 Porsild's Bryum has slow regeneration, limited dispersal ability, and narrow substrate
227 requirements that likely make recovering from threats such as drought, temperature
228 extremes, recreational activities, or stochastic events difficult (COSEWIC 2003;
229 Belland and Limestone Barrens Species at Risk Recovery Team 2006).
230

231 The recovery strategy identifies the following population and distribution objective for
232 Porsild's Bryum:

233 "To maintain or increase the number of colonies, and sub-populations for
234 all known extant populations of Porsild's Bryum, while also maintaining or
235 increasing the distribution of colonies and sub-populations within each
236 population, and, where feasible, to reestablish the species to locations
237 where it has been extirpated and previously known to exist."
238 (Environment and Climate Change Canada 2016)
239

240 This action plan addresses all populations of Porsild's Bryum in Canada and should be
241 considered along with the *Recovery Strategy for Porsild's Bryum in Canada*
242 (Environment and Climate Change Canada 2016). The recovery strategy provides more
243 details on the strategic direction and approaches for recovery of Porsild's Bryum, critical
244 habitat information, and background information on the species and its threats.

245

246 Provincial recovery documents for Porsild's Bryum have been developed in Alberta
247 (Alberta Porsild's Bryum Recovery Team 2010) and Newfoundland and Labrador
248 (Belland and Limestone Barrens Species at Risk Recovery Team 2006). These
249 documents summarize provincial-specific distribution and habitat patterns, threats,
250 recovery initiatives, etc.

251

252

253

254

255

256 **1.2 Measures to be Taken and Implementation Schedule**

257

258 **Table 1. Implementation Schedule**

#	Recovery Measures	Priority ^a	Threats or objectives addressed	Timeline
Broad Strategy: Inventory and Monitoring				
1	Conduct field surveys to locate Porsild's Bryum populations and subpopulations, both within and adjacent to the species' known range and in other potential locations deemed to have suitable habitat, to determine the species complete population size and distribution. Alberta Porsild's Bryum Recovery Team (2010), Belland and Limestone Barrens Species at Risk Recovery Team (2006), and Environment and Climate Change Canada (2016) identify areas of particular interest.	High	Knowledge gaps	Ongoing to 2021
2	Survey all sites to determine baseline population sizes, and identify threats and their impacts.	High	Knowledge gaps; All threats	Ongoing to 2019
3	Develop and implement a long-term monitoring program which examines population sizes and dynamics, colony numbers, threats, habitat trends (e.g., air temperature, relative humidity, and water quality), and microclimate trends at selected sites throughout the species' range.	High	Knowledge gaps; All threats	By 2019, then regularly (frequency dependent on location)
Broad Strategy: Research				
4	Develop and implement a research plan to determine the detailed biological needs of the species (e.g., physiological tolerances to light and temperature, water chemistry and substrate requirements, and resilience to disturbance), and habitat conditions.	High	Knowledge gaps; All threats	Ongoing to 2019
5	Further identify limiting factors and natural threats not already presented in the <i>Recovery Strategy for the Porsild's Bryum in Canada</i> (Environment and Climate Change Canada 2016).	High	Knowledge gaps	By 2019

6	Create a habitat model to predict species presence at potential sites.	Low	Knowledge gaps	Ongoing to 2020
7	Develop minimum viable population estimates.	Low	Knowledge gaps	By 2026
Broad Strategy: Outreach / Stewardship				
8	Develop educational material (e.g., brochures, displays at interpretative centres, and signage within protected areas) and other outreach initiatives to increase public understanding of threats to the species and promote stewardship.	Medium	Recreational activities	Ongoing to 2019
9	Work with various levels of government, stakeholders, and the general public to identify solutions for minimizing known threats (e.g., preventing campfires at Whitehorse Creek, Alberta, or preventing recreational use of cliffs at Ribbon Creek, Alberta).	Medium	Recreational activities; Industrial activity	Ongoing to 2019
10	Where appropriate, collaborate with industrial partners to minimize the effects of industrial activities (e.g., road dust in Mountain Park, Alberta). Avenues for collaboration include (but are not limited to) regular meetings / discussions, the development of beneficial management practices, and reviewing work procedures.	Medium	Industrial activity	Ongoing to 2019
11	Encourage the involvement of the public and industrial stakeholders in implementation efforts, including monitoring (where feasible) (e.g., through <i>Adopt-a-Plant Alberta</i> program).	Medium	Recreational activities; Industrial activity; Knowledge gaps	By 2019
Broad Strategy: Habitat Management				
12	Ensure critical habitat for extant populations on federal lands is legally protected.	High	Recreational activities; Industrial activity	By 2017
13	Work with provinces and landowners to secure effective protection of critical habitat for extant populations on non-federal lands.	High	Recreational activities; Industrial activity	By 2018
14	Install and maintain fencing, signage, etc. in strategic locations to conserve subpopulations vulnerable to recreational activities	Medium	Recreational activities	Ongoing to 2019, then as required

	(e.g., Ribbon Creek Lower and Upper, Whitehorse Creek 2, and Whitehorse Creek Boulder), if deemed necessary for population survival and recovery.			
15	When feasible, restore habitat at damaged locations. The necessity, extent and type of restoration will be site specific.	Medium	Recreational activities; Industrial activity; Stochastic events	As required
Broad Strategy: Reintroduction and Population Augmentation				
16	Develop reintroduction protocols.	Medium	All threats	By 2020
17	Determine the feasibility of reintroduction and population augmentation and identify priority sites for implementation.	Medium	All threats	By 2021
18	Re-introduce plants to restored habitat and/or implement population augmentation, if deemed feasible.	Medium	All threats	As required
19	Monitor effectiveness of reintroductions.	Medium	All threats	For at least 5-10 years post reintroduction

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

265 **1.3 Critical Habitat**

266

267 **1.3.1 Identification of the Species' Critical Habitat**

268

269 Critical habitat of Porsild's Bryum was partially identified in section 7 and Appendix A of
270 the federal recovery strategy (Environment and Climate Change Canada 2016). The
271 recovery strategy also contains details about the identified critical habitat including its
272 geospatial extent and biophysical attributes (section 7.1) (Environment and Climate
273 Change Canada 2016). Please refer to that document for details.

274

275 Given the best available information, no additional critical habitat for Porsild's Bryum
276 can be identified in this action plan. Critical habitat will be updated in an amended
277 recovery strategy or additional action plan once the Schedule of Studies is completed.
278 Refer to section 7.2 of the federal recovery strategy for a Schedule of Studies
279 necessary to complete critical habitat identification (Environment and Climate Change
280 Canada 2016).

281

282 **1.3.2 Activities Likely to Result in Destruction of Critical Habitat**

283

284 Examples of activities likely to result in the destruction of critical habitat may be found in
285 section 7.3 of the federal recovery strategy (Environment and Climate Change Canada
286 2016).

287

288 **1.4 Proposed Measures to Protect Critical Habitat**

289

290 **1.4.1 Measures Proposed to Protect Critical Habitat on Federal Lands**

291

292 Critical habitat of Porsild's Bryum in Nunavut is identified within Quttinirpaaq National
293 Park of Canada and as such will be legally protected by the process outlined in
294 subsection 58(2) of SARA, as well as by the *Canada National Parks Act*. In addition, the
295 Parks Canada Agency may use existing management tools to prevent destruction of
296 critical habitat, such as posting notices, restricting access to the area, and educating
297 visitors.

298

299 **1.4.2 Measures Proposed to Protect Critical Habitat on Non-federal Lands**

300

301 With regard to the portions of critical habitat on non-federal lands, Environment and
302 Climate Change Canada will assess the protection currently in place. This involves first
303 working with the Governments of British Columbia, Alberta, Nunavut, and
304 Newfoundland and Labrador to determine which provincial/territorial laws and legal
305 instruments are in place to prevent destruction of critical habitat. If there are gaps in the
306 protection of critical habitat, provisions or measures in place under SARA or other
307 federal legislation will be reviewed to determine whether they prevent destruction of
308 critical habitat. The laws and legal agreements in place that protect critical habitat will
309 be monitored for efficacy at least every five years. Conservation measures, including

310 stewardship initiatives, that contribute to preventing critical habitat destruction will also
311 be considered and monitored.

312
313 If it is determined that any portions of critical habitat are not protected, and steps are
314 being taken to protect those portions, those steps will be communicated via the Species
315 at Risk Public Registry through the reports referred to in section 63 of SARA.

316
317 The implementation of conservation measures is an important complementary strategy
318 for preserving this species' critical habitat. Environment and Climate Change Canada
319 will work with the applicable provinces, non-governmental organizations, and individuals
320 to facilitate the implementation of conservation measures.

321
322

323 **2. Evaluation of Socio-Economic Costs and of Benefits**

324
325 The *Species At Risk Act* requires that an action plan include an evaluation of the
326 socio-economic costs of the action plan and the benefits to be derived from its
327 implementation (SARA 49(1)(e), 2002). This evaluation addresses only the incremental
328 socio-economic costs of implementing this action plan from a national perspective as
329 well as the social and environmental benefits that would occur if the action plan were
330 implemented in its entirety, recognizing that not all aspects of its implementation are
331 under the jurisdiction of the federal government. It does not address cumulative costs of
332 species recovery in general nor does it attempt a cost-benefit analysis. Its intent is to
333 inform the public and to guide decision making on implementation of the action plan by
334 partners.

335
336 The protection and recovery of species at risk can result in both benefits and costs. The
337 Act recognizes that "*wildlife, in all its forms, has value in and of itself and is valued by*
338 *Canadians for aesthetic, cultural, spiritual, recreational, educational, historical,*
339 *economic, medical, ecological and scientific reasons*" (SARA 2002). Self-sustaining and
340 healthy ecosystems with their various elements in place, including species at risk,
341 contribute positively to the livelihoods and the quality of life of all Canadians. A review of
342 the literature confirms that Canadians value the preservation and conservation of
343 species in and of themselves. Actions taken to preserve a species, such as habitat
344 protection and restoration, are also valued. In addition, the more an action contributes to
345 the recovery of a species, the higher the value the public places on such actions
346 (Loomis and White 1996; Fisheries and Oceans Canada 2008). Furthermore, the
347 conservation of species at risk is an important component of the Government of
348 Canada's commitment to conserving biological diversity under the *International*
349 *Convention on Biological Diversity*. The Government of Canada has also made a
350 commitment to protect and recover species at risk through the Accord for the Protection
351 of Species at Risk. The specific costs and benefits associated with this action plan are
352 described below.

353

354 2.1 Policy Baseline

355

356 The provinces of British Columbia, Alberta, and Newfoundland and Labrador, the
357 Territory of Nunavut, and the federal government have access to many legislative,
358 regulatory, and management tools for the conservation and stewardship of Porsild's
359 Bryum (e.g., endangered species legislation, protected areas legislation, and
360 environmental assessments). For example, Porsild's Bryum is listed as Endangered
361 under Alberta's *Wildlife Act* and Threatened under Newfoundland and Labrador's
362 *Endangered Species Act*. In addition, the populations in Nunavut occur within a national
363 park and are subject to the *Canada National Parks Act* while the population in British
364 Columbia occurs within a provincial park subject to British Columbia's *Park Act*.

365

366 Both Alberta and Newfoundland and Labrador have published recovery strategies for
367 the species and recovery activities have been initiated in Alberta (AESRD 2013).
368 For example, microclimatic sensors were installed at the Mountain Park population in
369 Alberta (2011-12) to document key temperature and relative humidity conditions during
370 the growing season. In addition, baseline site characteristics, including water and rock
371 chemistry data, was obtained from several of the Alberta populations (AESRD 2013).
372 A sign was erected at one site in Alberta near a popular campground by to inform
373 campers about several plant species present, including Porsild's Bryum, and the
374 importance of protecting them. Nationally, field surveys have recently (ca. 2015) been
375 conducted at several of the populations of Porsild's Bryum in Canada in support of an
376 updated COSEWIC status report.

377

378 Industrial policies and work procedures already in place may also contribute to the
379 implementation of this action plan and thus the conservation of Porsild's Bryum.
380 For example, dust levels along a haul road servicing a coal mine site adjacent to
381 Mountain Park, Alberta, have been monitored to inform potential mitigative measures to
382 reduce any impact to the species (Alberta Government 2014).

383

384 Additionally, many recovery measures can be carried out by federal or provincial
385 species at risk funding programs, contributions by recovery biologists, or research by
386 university partners.

387

388 2.2 Socio-economic Profile and Baseline

389

390 The measures outlined in this action plan relate primarily to inventory and monitoring,
391 research, outreach and education and habitat management. Populations of Porsild's
392 Bryum occur primarily within federal and provincial protected areas and parks. There
393 are few communities or individuals that would be affected by the implementation of the
394 measures identified in the action plan for Porsild's Bryum.

395

396 Within British Columbia, Porsild's Bryum is only known to occur within Muncho Lake
397 Provincial Park and in Nunavut all populations are currently known from Quttinirpaaq
398 National Park. Quttinirpaaq National Park is within the Nunavut Land Claims Agreement
399 and is an area particularly important to Inuit from Grise Fiord and Resolute Bay.

400 However, the implementation of this action plan (i.e., inventory and monitoring,
401 research, outreach and education and habitat management) is expected to have little to
402 no effects on these communities.

403
404 Although Porsild's Bryum is found outside of federal or provincial protected areas in
405 Newfoundland and Labrador, a non-governmental organization is actively involved with
406 conservation and stewardship initiatives in the nearby limestone barrens. This recovery
407 and conservation partnership has been ongoing in the area for several years in an effort
408 to restore habitat and promote the long term protection and conservation of Porsild's
409 Bryum and other species at risk in the area.

410
411 In Alberta, most of the recovery measures for the species will take place in various
412 provincial protected areas with varying levels of protection. Potential affected
413 stakeholders include transmission and telecommunication companies with dispositions
414 on provincial lands and the mining industry. Porsild's Bryum is found within traditional
415 territories of numerous First Nations in Alberta, but the implementation of the action plan
416 (i.e., inventory and monitoring, research, outreach and education and habitat
417 management) is expected to have little to no effects on these communities.

418

419 **2.3 Socio-economic Costs of Implementing this Action Plan**

420

421 Costs are those directly associated with the implementation of the recovery measures
422 identified in the implementation schedule (Table 1), as well as those encountered as a
423 result of that implementation. Only the incremental costs are considered and therefore
424 do not include ongoing actions or initiatives discussed in section 2.1 (Policy Baseline).
425 The direct and indirect costs of implementing the action plan are expected to be low
426 (between \$0 and \$5 million) over the short term (2017-2021). Costs at the regional or
427 provincial scale are expected to be minimal. Long-term (2021 onwards) costs are also
428 expected to be minimal.

429

430 Social costs are the potential costs associated with implementing the action plan, which
431 may have an impact on various stakeholders. Because there are a small number of
432 known occurrences, the majority of occurrences are in protected areas, and there is
433 lack of human-use associated with this species, the social costs anticipated from the
434 implementation of this action plan are low.

435

436 **2.4 Benefits of Implementing this Action Plan**

437

438 **2.4.1 Value of biodiversity to Canadians**

439

440 It is anticipated that this action plan will contribute to the recovery of Porsild's Bryum
441 and lead to the achievement of the population and distribution objective and the
442 conservation and protection of habitat for the species.

443

444 Biodiversity is essential for healthy ecosystems, human health, prosperity, security, and
445 wellbeing. Canadians derive many benefits from biodiversity including recreational,

446 aesthetic, educational, cultural benefits as well as ecological goods and services
447 essential to human survival. Care for the environment is consistently ranked as one of
448 Canada's top priorities in public opinion polls⁴. A recent opinion poll found that
449 three quarters of Canadian respondents feel that preserving natural areas and the
450 variety of native plant and animal life in Canada is important to them⁵.

451
452 The total value of endangered species consists of non-consumptive use values (such as
453 recreation, spiritual/cultural, research, and education), indirect use values (value of the
454 ecological role of a species in an ecosystem), and non-use values (i.e., preserving the
455 benefits of nature for future generations)⁶. Implementing the recovery measures of this
456 action plan will have a positive impact on society. The direct value of this
457 implementation, for the preservation or the enhancement of biodiversity, is not easily
458 estimated.

459

460 **2.4.2 Eco-tourism and cultural values**

461

462 Eco-tourism is the fastest-growing area of the tourism industry (Mastny 2001;
463 UNEP 2013). In 2004, this market grew three times faster than the industry as a whole
464 and the World Tourism Organization estimates that global spending on eco-tourism
465 is increasing by 20% a year, about six times the industry-wide rate of growth
466 (TEEB 2008). Many of the Porsild's Bryum subpopulations are already located in or
467 near parks (see Table 2 of the recovery strategy for details), but it is possible that
468 education and stewardship activities may lead to a small increase in eco-tourism
469 activity.

470

471 **2.5 Distributional Impacts**

472

473 Porsild's Bryum occurs on provincial, federal, and private properties, and the majority of
474 sites are within protected areas. Thus, private landowners are not expected to absorb
475 the direct incremental costs for the species' recovery. Any indirect incremental costs
476 resulting from the implementation of recovery measures will be shared. Should
477 additional populations of Porsild's Bryum be discovered on private land through
478 activities identified in this action plan, the distributional impacts will be re-assessed.

479

480

⁴ Canada's Fourth National Report to the United Nations Convention on Biological Diversity, 2010. Available online <http://www.cbd.int/doc/world/ca/ca-nr-04-en.pdf> Accessed December 3, 2010.

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⁶ Non-use values include bequest value (satisfaction of knowing that future generations will have access to nature's benefits), altruist value (satisfaction of knowing that other people have access to nature's benefits) and existence value (satisfaction of knowing that a species or ecosystem exists).

481 3. Measuring Progress

482
483 The performance indicators presented in the associated recovery strategy provide a
484 way to define and measure progress toward achieving the population and distribution
485 objectives.

486
487 Reporting on implementation of the action plan (under section 55 of SARA) will be done
488 by assessing progress towards implementing the broad strategies.

489
490 Reporting on the ecological and socio-economic impacts of the action plan (under s. 55
491 of SARA) will be done by assessing the results of monitoring the recovery of the species
492 and its long-term viability, and by assessing the implementation of the action plan.

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494

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543

544 **Appendix A: Effects on the Environment and Other Species**

545

546 A strategic environmental assessment (SEA) is conducted on all SARA recovery
547 planning documents, in accordance with the [Cabinet Directive on the Environmental](#)
548 [Assessment of Policy, Plan and Program Proposals](#)⁷. The purpose of a SEA is to
549 incorporate environmental considerations into the development of public policies, plans,
550 and program proposals to support environmentally sound decision-making and to
551 evaluate whether the outcomes of a recovery planning document could affect any
552 component of the environment or any of the [Federal Sustainable Development](#)
553 [Strategy](#)'s⁸ (FSDS) goals and targets.

554

555 Recovery planning is intended to benefit species at risk and biodiversity in general.
556 However, it is recognized that implementation of action plans may also inadvertently
557 lead to environmental effects beyond the intended benefits. The planning process
558 based on national guidelines directly incorporates consideration of all environmental
559 effects, with a particular focus on possible impacts upon non-target species or habitats.
560 The results of the SEA are incorporated directly into the action plan itself, but are also
561 summarized below in this statement.

562

563 The measures set out in this document are expected to have no negative effects on
564 other species. Many of the measures pertain to inventory / monitoring or research and
565 therefore should not adversely impact other species. Other actions pertaining to
566 outreach / stewardship and habitat management may create benefits for the
567 surrounding habitat and ecosystems.

568

⁷ www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1

⁸ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1