

Management Plan for the Peacock Vinyl Lichen (*Leptogium polycarpum*) in Canada

Peacock Vinyl Lichen



2021



Government
of Canada

Gouvernement
du Canada

Canada

4 **Recommended citation:**
5

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13 **Official version**

14 The official version of the recovery documents is the one published in PDF. All
15 hyperlinks were valid as of date of publication.

16
17 **Non-official version**

18 The non-official version of the recovery documents is published in HTML format and all
19 hyperlinks were valid as of date of publication.

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22
23 For copies of the management plan, or for additional information on species at risk,
24 including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
25 Status Reports, residence descriptions, action plans, and other related recovery
26 documents, please visit the [Species at Risk \(SAR\) Public Registry](#)¹.

27
28
29
30 **Cover illustration:** © Timothy B. Wheeler

31
32
33 Également disponible en français sous le titre
34 « Plan de gestion du leptogé à quatre spores (*Leptogium polycarpum*) au Canada
35 [Proposition] »

36
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38 Environment and Climate Change, 2021. All rights reserved.

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45 *credit to the source.*
46

¹ www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

47 MANAGEMENT PLAN FOR THE PEACOCK VINYL LICHEN
48 (*Leptogium polycarpum*) IN CANADA

49
50 2021

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52
53 Under the Accord for the Protection of Species at Risk (1996), the federal, provincial,
54 and territorial governments agreed to work together on legislation, programs, and
55 policies to protect wildlife species at risk throughout Canada.

56
57 In the spirit of cooperation of the Accord, the Government of British Columbia has given
58 permission to the Government of Canada to adopt the *Management Plan for the*
59 *Peacock Vinyl (Leptogium polycarpum) in British Columbia (Part 2)* under Section 69 of
60 the *Species at Risk Act (SARA)*. Environment and Climate Change Canada has
61 included a federal addition (Part 1) which completes the SARA requirements for this
62 management plan.

63
64
65 The federal management plan for the Peacock Vinyl Lichen² in Canada consists of
66 two parts:

67
68 Part 1 – Federal Addition to the *Management Plan for the Peacock Vinyl (Leptogium*
69 *polycarpum) in British Columbia*, prepared by Environment and Climate Change
70 Canada.

71
72 Part 2 – *Management Plan for the Peacock Vinyl (Leptogium polycarpum) in*
73 *British Columbia*, prepared by the British Columbia Ministry of Environment.

74

² This species is listed under SARA as the Peacock Vinyl Lichen (*Leptogium ploycarpum*) and is referred to as the Peacock Vinyl (*Leptogium polycarpum*) provincially. Both names refer to the same species.

75 **Table of Contents**

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78 *polycarpum*) *in British Columbia*, prepared by Environment and Climate Change
79 Canada

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89 *Columbia*, prepared by the British Columbia Ministry of Environment

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Part 1 – Federal Addition to the *Management Plan for the Peacock Vinyl (Leptogium polycarpum) in British Columbia*, prepared by Environment and Climate Change Canada

107 **Preface**

108
109 The federal, provincial, and territorial government signatories under the [Accord for the](#)
110 [Protection of Species at Risk \(1996\)](#)³ agreed to establish complementary legislation and
111 programs that provide for effective protection of species at risk throughout Canada.
112 Under the *Species at Risk Act* (S.C. 2002, c. 29) (SARA), the federal competent
113 ministers are responsible for the preparation of management plans for listed species of
114 special concern and are required to report on progress within five years after the
115 publication of the final document on the SAR Public Registry.

116
117 The Minister of Environment and Climate Change and Minister responsible for the Parks
118 Canada Agency is the competent minister under SARA for the Peacock Vinyl Lichen
119 and has prepared the federal component of this management plan (Part 1), as per
120 section 65 of SARA. To the extent possible, it has been prepared in cooperation with
121 the British Columbia (B.C.) Ministry of Environment as per section 66(1) of SARA.
122 SARA section 69 allows the Minister to adopt all or part of an existing plan for the
123 species if the Minister is of the opinion that an existing plan relating to wildlife species
124 includes adequate measures for the conservation of the species. The Province of B.C.
125 provided the attached management plan for the Peacock Vinyl (Part 2) as science
126 advice to the jurisdictions responsible for managing the species in British Columbia. It
127 was prepared in cooperation with Environment and Climate Change Canada.

128
129 Success in the conservation of this species depends on the commitment and
130 cooperation of many different constituencies that will be involved in implementing the
131 directions set out in this plan and will not be achieved by Environment and Climate
132 Change Canada, Parks Canada Agency, or any other jurisdiction alone. All Canadians
133 are invited to join in supporting and implementing this plan for the benefit of the
134 Peacock Vinyl Lichen and Canadian society as a whole.

135
136 Implementation of this management plan is subject to appropriations, priorities, and
137 budgetary constraints of the participating jurisdictions and organizations.

138

³ www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding.html#2

139 **Additions and Modifications to the Adopted Document**

140
141 The following sections have been included to address specific requirements of the
142 federal *Species at Risk Act* (SARA) that are not addressed in the *Management Plan for*
143 *the Peacock Vinyl* (*Leptogium polycarpum*) in *British Columbia* (Part 2 of this document,
144 referred to henceforth as “the provincial management plan”) and/or to provide updated
145 or additional information. The species is listed under SARA as the Peacock Vinyl Lichen
146 (*Leptogium polycarpum*) and is referred to as the Peacock Vinyl (*Leptogium*
147 *polycarpum*) provincially. Both names refer to the same species.

148
149 Under SARA, prohibitions regarding the protection of species and their habitat do not
150 apply to species of special concern. Conservation measures in the provincial
151 management plan dealing with the protection of individuals and their habitat are still
152 adopted to guide conservation efforts but would not result in federal legal protection.

153 **1. Species Status Information**

154
155 This section replaces information on the SARA legal designation for Peacock Vinyl
156 Lichen in Canada in Section 2 of the provincial management plan.

157
158 The legal designation of Peacock Vinyl Lichen on SARA Schedule 1 is Special Concern
159 (2017).
160

161 **2. Effects on the Environment and Other Species**

162
163 A strategic environmental assessment (SEA) is conducted on all SARA recovery
164 planning documents, in accordance with the [Cabinet Directive on the Environmental](#)
165 [Assessment of Policy, Plan and Program Proposals](#)⁴. The purpose of a SEA is to
166 incorporate environmental considerations into the development of public policies, plans,
167 and program proposals to support environmentally sound decision-making and to
168 evaluate whether the outcomes of a recovery planning document could affect any
169 component of the environment or any of the [Federal Sustainable Development](#)
170 [Strategy's](#) (FSDS)⁵ goals and targets.

171
172 Conservation planning is intended to benefit species at risk and biodiversity in general.
173 However, it is recognized that implementation of management plans may also
174 inadvertently lead to environmental effects beyond the intended benefits. The planning
175 process based on national guidelines directly incorporates consideration of all
176 environmental effects, with a particular focus on possible impacts upon non-target
177 species or habitats. The results of the SEA are incorporated directly into the
178 management plan itself, but are also summarized below in this statement.
179

⁴ www.canada.ca/en/environmental-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html

⁵ www.fsds-sfdd.ca/index.html#/en/goals/

180
181 The provincial management plan for Peacock Vinyl Lichen contains a section describing
182 the effects of management activities on other species (i.e., Section 8). Environment and
183 Climate Change Canada adopts this section of the provincial management plan as the
184 statement on effects of management activities on the environment and other species.
185 Conservation planning activities for Peacock Vinyl Lichen will be implemented with
186 consideration for all co-occurring species at risk, such that there are no negative
187 impacts to these species or their habitats. Some management actions for Peacock Vinyl
188 Lichen (e.g., inventory and monitoring, threat mitigation, habitat conservation,
189 education, and research) may promote the conservation of other species at risk that
190 overlap in distribution and rely on similar habitat attributes.
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Part 2 – *Management Plan for the Peacock Vinyl (Leptogium polycarpum) in British Columbia*, prepared by the British Columbia Ministry of Environment

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Management Plan for Peacock Vinyl (*Leptogium polycarpum*) in British Columbia



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Prepared by the B.C. Ministry of Environment



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September 2015

15 **About the British Columbia Management Plan Series**

16 This series presents the management plans that are prepared as advice to the Province of British
17 Columbia. Management plans are prepared in accordance with the priorities and management
18 actions assigned under the British Columbia Conservation Framework. The Province prepares
19 management plans for species that may be at risk of becoming endangered or threatened due to
20 sensitivity to human activities or natural events.
21

22 **What is a management plan?**

23 A management plan identifies a set of coordinated conservation activities and land use measures
24 needed to ensure, at a minimum, that the target species does not become threatened or
25 endangered. A management plan summarizes the best available science-based information on
26 biology and threats to inform the development of a management framework. Management plans
27 set goals and objectives, and recommend approaches appropriate for species or ecosystem
28 conservation.
29

30 **What's next?**

31 Direction set in the management plan provides valuable information on threats and direction on
32 conservation measures that may be used by individuals, communities, land users,
33 conservationists, academics, and governments interested in species and ecosystem conservation.
34

35 **For more information**

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

38
39 <<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>>
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**Management Plan for Peacock Vinyl (*Leptogium polycarpum*)
in British Columbia**

Prepared by the B.C. Ministry of Environment

September 2015

62 **Recommended citation**

63

64 B.C. Ministry of Environment. 2015. Management plan for peacock vinyl (*Leptogium*
65 *polycarpum*) in British Columbia. B.C. Ministry of Environment, Victoria, BC. 10 pp.

66

67 **Cover illustration/photograph**

68 Curtis Bjork

69 **Additional copies**

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

72

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

74

75 Disclaimer

76 The B.C. Ministry of Environment has prepared this management plan, as advice to the
77 responsible jurisdictions and organizations that may be involved in managing the species.

78

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

85

86 The responsible jurisdictions have had an opportunity to review this document. However, this
87 document does not necessarily represent the official positions of the agencies.

88

89 Success in the conservation of this species depends on the commitment and cooperation of many
90 different constituencies that may be involved in implementing the directions set out in this
91 management plan. The B.C. Ministry of Environment encourages all British Columbians to
92 participate in the conservation of peacock vinyl.

93

94

95 ACKNOWLEDGEMENTS

96 Brenda Costanzo (B.C. Ministry of Environment [MOE]) prepared this management plan.
97 Additional assistance was provided by Trevor Goward (Enlivened Consulting), Jenifer Penny
98 and Marta Donovan (B.C. Conservation Data Centre), Peter Fielder (MOE), Leah Westereng,
99 (MOE), and Byron Woods (B.C. Ministry of Forests, Lands and Resource Operations).
100 Additional comments by Joanne Hirner, (B.C. Parks), Wendy Dunford (Environment Canada-
101 Canadian Wildlife Service-National Capital Region), Kella Sadler (EC-CWS-Pacific Yukon
102 Region), Matt Huntley (EC-CWS-PYR). The Land Based Investment Strategy funded the
103 technical review and threats assessment.
104
105

106 EXECUTIVE SUMMARY

107 Peacock vinyl (*Leptogium polycarpum*) is a leafy, gelatinous (jellyskinned) lichen forming
108 patches 2–5 cm in diameter. Lobes are rounded to orbicular in shape. The upper surface is pale to
109 dark greyish or brown, shiny, hairless with partly sunken spore-bearing bodies, and wrinkled
110 when dry. The lower surface is paler than the upper surface, and can either be naked or with tufts
111 of white hairs.

112
113 Peacock vinyl was designated as Special Concern by the Committee on the Status of Endangered
114 Wildlife in Canada (COSEWIC) owing to its restricted distribution and population size. It occurs
115 only in the coastal forests of southwestern British Columbia and in one isolated location in Haida
116 Gwaii, where it is found growing on the mossy branches of deciduous trees, especially Bigleaf
117 Maple and Red Alder.

118
119 The species is not yet listed on Schedule 1 of the *Species at Risk Act* (SARA). In British
120 Columbia, peacock vinyl is ranked S1S2 (critically imperiled to imperiled) by the B.C.
121 Conservation Data Centre and is on the provincial Red list. The B.C. Conservation Framework
122 ranks peacock vinyl as a priority 1 under goals 1 and 3 (1 = contribute to global efforts for
123 species and ecosystem conservation; 3 = maintain the diversity of native species and
124 ecosystems).

125
126 Threats to this sensitive lichen include air pollution from industrial and agricultural activities,
127 forestry and associated infrastructure, as well as drought and storms and flooding due to climate
128 change.

129
130 The management goal is to maintain all known extant populations and any future populations of
131 peacock vinyl that may be found in British Columbia.

132
133 The following are the management objectives:

- 134
- 135 1. to secure long-term protection¹ for the known populations and habitats of peacock vinyl;
 - 136 2. to determine the levels of real and potential threats to this species and its habitat and to
137 mitigate their effects;
 - 138 3. to confirm the distribution of peacock vinyl (including new locations) and to reliably
139 determine population trends.

140

¹ Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

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 179
 180

181 **1 COSEWIC* SPECIES ASSESSMENT INFORMATION**

Assessment Summary: May 2011
Common Name:*Peacock Vinyl Lichen
Scientific Name:** *Leptogium polycarpum*
Status: Special Concern
Reason for Designation: This jellyskin lichen, endemic to western North America, reaches the limit of its northern distribution in Canada where it is known from only 13 locations in the coastal forests of southwestern British Columbia with one isolated location in Haida Gwaii. This lichen grows on deciduous trees, especially bigleaf maple and red alder. Almost 1000 individuals of this lichen are known but confined to only 67 trees. In addition to stochastic events, threats to this sensitive lichen include air pollution from industrial and agricultural activities, forestry and associated infrastructure, as well as seasonal drought due to climate change.
Occurrence: British Columbia
Status History: Designated Special Concern in May 2011.

182 * Committee on the Status of Endangered Wildlife in Canada.
 183 **Common and scientific names reported in this management plan follow the naming conventions of the B.C. Conservation Data Centre, which
 184 may be different from names reported by COSEWIC.
 185

186 **2 SPECIES STATUS INFORMATION**

Peacock vinyl^a		
Legal Designation:		
FRPA: ^b N/A	B.C. <i>Wildlife Act</i> : ^c No	SARA: ^d Schedule 1 – No
OGAA: ^b N/A		
Conservation Status^e		
B.C. List: Red	B.C. Rank: S1S2 (2010)	National Rank: N1N2 (2011)
		Global Rank: GNR (2000)
Subnational Ranks: ^f WA (SNR)		
B.C. Conservation Framework (CF)^g		
Goal 1: Contribute to global efforts for species and ecosystem conservation.		Priority: ^h #1 (2009)
Goal 2: Prevent species and ecosystems from becoming at risk.		Priority: #6 (2009)
Goal 3: Maintain the diversity of native species and ecosystems.		Priority: #1 (2009)
CF Action Groups: ^f	Inventory	

187 ^a Data source: B.C. Conservation Data Centre (2014) unless otherwise noted.
 188 ^b No = not listed in one of the categories of wildlife that requires special management attention to address the impacts of forest and range activities
 189 on Crown land under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002) and/or the impacts of oil and gas activities
 190 on Crown land under the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008).
 191 ^c No = not designated as wildlife under the B.C. *Wildlife Act* (Province of British Columbia 1982).
 192 ^d No = not on any Schedules under the *Species at Risk Act* (SARA). This species was recently reassessed by COSEWIC as Special Concern. This
 193 assessment will be reviewed by the Governor in Council (GIC) who may, on the recommendation of the Minister, amend the List to reclassify this
 194 species as Special Concern on Schedule 1 of SARA. If the GIC does not make a decision within nine months of receiving the COSEWIC
 195 assessment, the Minister shall by order amend the List according to COSEWIC's assessment.
 196 ^e S = subnational; N = national; G = global; T = refers to the subspecies level; B = breeding; X = presumed extirpated; H = possibly extirpated; 1 =
 197 critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably
 198 widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable.
 199 ^f Data source: NatureServe (2015).
 200 ^g Data source: B.C. Ministry of Environment (2010).
 201 ^h Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).
 202

203 3 SPECIES INFORMATION

204 3.1 Species Description

205 Peacock vinyl is a leafy, gelatinous (jellyskinned) lichen forming patches 2–5 cm in diameter.
206 The thallus lobes are rounded to orbicular in shape, 5–10 mm wide, and translucent when wet.
207 The upper surface is pale to dark greyish or brown, shiny, hairless with partly sunken spore-
208 bearing bodies 0.2–0.5 mm across (apothecia). The upper surface is wrinkled when dry. The
209 lower surface is paler than the upper surface, and can either be naked or with tufts of white hairs.
210 The inner sections of the thallus contain fungal strands and olive-green cyanobacterial cells
211 (*Nostoc* spp.) (COSEWIC 2011).
212

213 3.2 Populations and Distribution

214 3.2.1 Distribution

215 Peacock vinyl is endemic to western North America, where it occurs along the Pacific coast
216 eastward to the foot of the coastal mountain ranges (Figure 1). Within this area, peacock vinyl is
217 distributed from northern British Columbia to northern California (COSEWIC 2011). In Canada,
218 bigleaf maple (*Acer macrophyllum*) is frequently its host tree species.
219

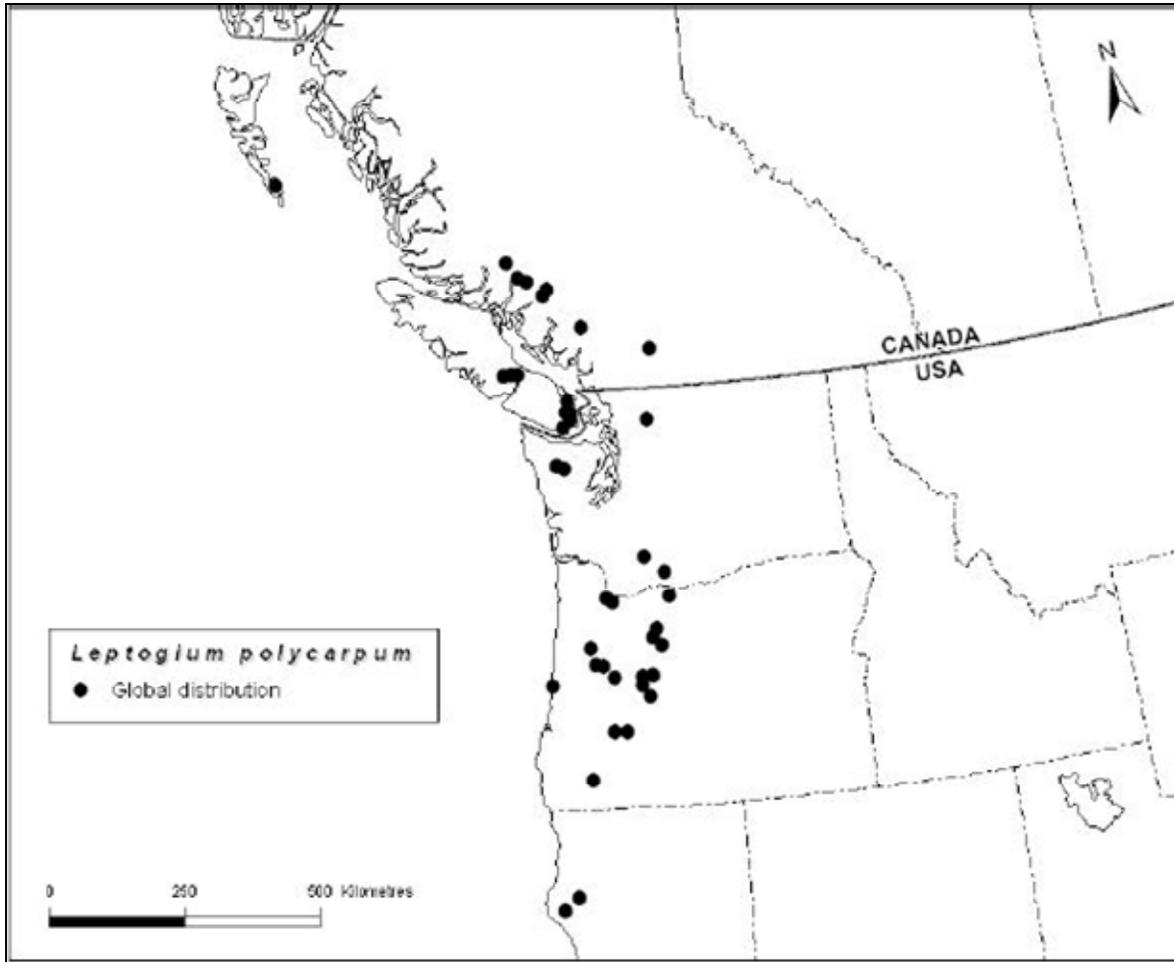
220 In British Columbia peacock vinyl occurs on southern Vancouver Island and along adjacent
221 mainland inlets northward to the Homathko Valley (Figure 2). Eastward, it is found in the main
222 valleys through the Coast Range where bigleaf maple is present. There is one outlying
223 population in Haida Gwaii on South Moresby Island outside the range of the bigleaf maple
224 (COSEWIC 2011).
225

226 3.2.2 Population size

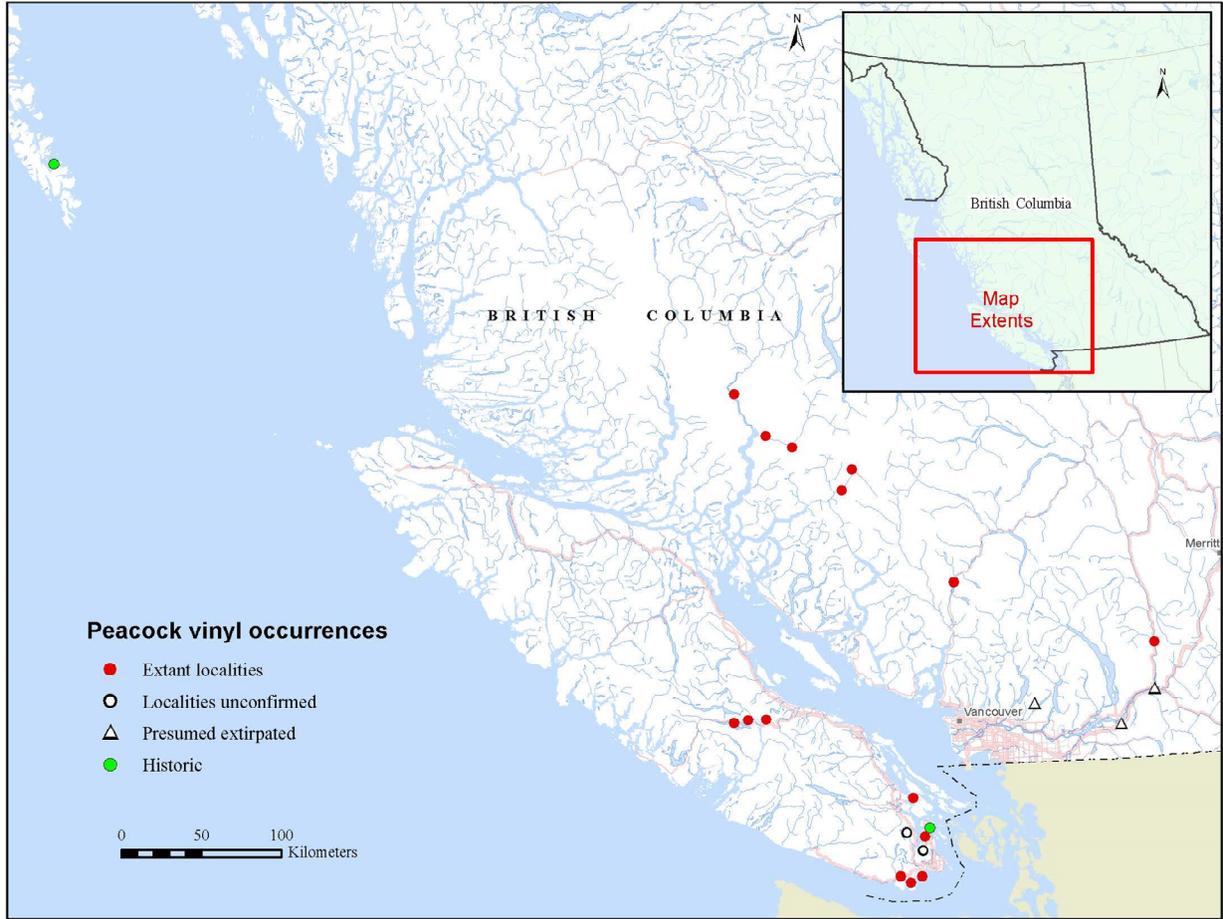
227 There are 22 known populations² of peacock vinyl in British Columbia, most consisting of 10 to
228 300 thalli on one or more deciduous trees (Table 1). Within patches of lichen, individual thalli
229 are counted as discrete units. Total thallus count from a range of years from 2007 - 2013 is
230 1139–1321. Of the 22 known populations, 15 are presumed extant. The presumed extant
231 populations include two new populations, which were discovered since the COSEWIC status
232 report (2011), at Victoria – Montreal Hill (E021) and Victoria – Albert Head (EO22), and
233 thirteen previously-known populations. Of the remaining seven populations, three are considered
234 presumed extirpated: Hope (E03), Chilliwack – Bridal Falls (E04), Haney – Evan’s Creek (EO8),
235 two are considered historical by the B.C. Conservation Data Centre: Haida Gwaii – South

² Populations are defined in this report following element occurrence specification by NatureServe (2015), which defines populations being separated by at least 1 km from one another.

236 Moresby (E01) and Sidney (EO2), and two are of unconfirmed status: Victoria – Mount Work
237 (E06) and Shawnigan Lake – Old Baldy Mountain (EO7).
238



239
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241 **Figure 1.** Peacock vinyl distribution in North America (COSEWIC 2011).
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Figure 2. Peacock vinyl distribution in British Columbia (adapted from COSEWIC 2011).

247 **Table 1.** Summary and description of peacock vinyl populations in B.C.

Population name ^a	Population Status	Location description	B.C. CDC EO# ^b	COS EWI C site #	Collector/Dates observed	Number of thalli/host species	Land tenure
Haida Gwaii – South Moresby	Historical ³	Haida Gwaii, south Moresby Island near Jedway; along road to foot of Harriet Harbour;	EO1	2	I.M. Brodo July 1967	Unknown	Crown Land
Port Alberni – Sproat Lake	Extant	Port Alberni area, Sproat Lake	EO9	9	V. Miao Aug. 1997 T. Goward May 2009	Not documented in 1997; 10 thalli on 2 deciduous trees in 2009	Sproat Lake Provincial Park
Port Alberni – Clutesi Creek	Extant	Port Alberni, Sproat Lake (Clutesi Creek), Taylor Arm Park	EO16	16	T. Goward and C.R. Bjork May 2009	35 thalli on 3 <i>Acer macrophyllum</i>	Taylor Arm Provincial Park
Port Alberni – Meconella Ridge	Extant	Port Alberni, Meconella Ridge trail	EO17	17	T. Goward May 2009	15 thalli on 4 <i>Acer macrophyllum</i>	Crown land
Shawnigan Lake – Old Baldy Mountain	Unconfirmed – not revisited in 2009	Shawnigan Lake area, Old Baldy Mountain. (Hollings Creek);	EO7	7	W.J. Noble June 1975	Unknown	Unknown
Victoria – Mount Work	Unconfirmed – location not found in 2009	Victoria area (Mount Work), old farm;	EO6	6	W.J. Noble 1975	Unknown	Private
Victoria – Mount Newton	Extant	Victoria near summit Mount Newton	EO15	15	T. Goward May 2009	10 thalli on 2 <i>Quercus garryana</i>	John Dean Provincial Park
Victoria – Montreul Hill ^c	Extant	Victoria, Montreul Hill, Galloping Goose trail	EO21	N/A	R. Batten February 2013	1–50 thalli on <i>Acer macrophyllum</i>	Galloping Goose Trail Regional Park
Victoria – Albert Head ^c	Extant	Albert Head	EO22	N/A	C. Bjork October 2013	168–300 thalli on <i>Acer</i> , <i>Arbutus</i> , <i>Quercus</i>	Dept. of National Defence
Sidney	Historical	Vancouver Island, Sidney;	EO2	1	J. Macoun August 1914	Unknown	Private?
Sooke – Ayum Creek	Extant	Sooke area, Ayum Creek;	EO14	14	T. Goward May 2009	300 thalli on 10 <i>Acer macrophyllum</i>	Ayum Creek Regional Park Reserve

³ Historical: Presence has not been verified in the past 20-40 years; effort has been made to relocate occurrences (NatureServe 2015).

Population name ^a	Population Status	Location description	B.C. CDC EO# ^b	COS EWI C site #	Collector/Dates observed	Number of thalli/host species	Land tenure
Saltspring Island	Extant	Saltspring Island, along Cranberry Road to Mount Maxwell;	EO5	5	T. Tonsberg September 1989 T. Goward May 2009	Not documented in 1989; 50 thalli on 4 <i>Alnus rubra</i> in 2009	Unknown
Toba Valley – Dalglish Creek	Extant	Coast ranges, upper Toba Valley (Dalglish Creek);	EO10	10	C.R. Bjork June 2009	100 thalli on 1 <i>Populus trichocarpa</i>	Unknown
Toba Valley – Raccoon Creek	Extant	Coast ranges, upper Toba Valley, Toba logging camp (Raccoon Creek);	EO11	11	C.R. Bjork June 2007	10 thalli on 1 <i>Alnus rubra</i>	Unknown
Southgate Valley – Icewall Creek	Extant	Coast Ranges, Bute Inlet, Southgate Valley, near mouth of Icewall Creek;	EO12	12	C.R. Bjork August 2007	75 thalli on 1 <i>Tsuga heterophylla</i>	Crown land
Whistler – Brandywine Falls	Extant	Coast Ranges, Whistler area, southeast of Brandywine Falls;	EO18	18	C.R. Bjork May 2009	100 thalli on 5 <i>Acer macrophyllum</i>	Brandywine Falls Provincial Park
Southgate Valley – Southgate River	Extant	Coast Ranges, Bute Inlet, Southgate Valley; 4 km E of mouth of Southgate River;	EO19	19	C.R. Bjork September 2009	200 thalli on 20 <i>Alnus rubra</i> and <i>Acer glabrum</i>	Crown
Homathko Valley – White Mantle Creek	Extant	Coast Ranges, Bute Inlet, Homathko Valley (White Mantle Creek), east side of valley across from Brew Creek;	EO20	20	C.R. Bjork September 2009	50 thalli on 10 <i>Alnus rubra</i>	Crown
Haney – Evans Creek	Presumed extirpated	Haney area, Evans Creek;	EO8	8	W.B. Schofield February 1978	0	Golden Ears Provincial Park
Chilliwack – Bridal Falls	Presumed extirpated	Chilliwack area, Bridal Falls;	EO4	4	T. Goward September 1978	0	Provincial park
Hope	Presumed extirpated	Hope, east side of town;	EO3	3	I.M. Brodo September 1969	0	Private?
Yale – Spuzzum	Extant	Fraser Canyon, Yale Area (Spuzzum), north of Sailor Bar Tunnel;	EO13	13	T. Goward and C.R. Bjork, May 2009	15 thalli on 4 <i>Acer macrophyllum</i>	Crown land

248
249
250
251

^a Refer to BC Species and Ecosystem Explorer mapped occurrences website at: <http://a100.gov.bc.ca/pub/eswp/eoMap.do?id=28112>. NOTE: not all occurrences are necessarily mapped or available on this site.

^b Element occurrence numbers from the B.C. Conservation Data Centre. Refer to the BC Species and Ecosystem Explorer webpage at: <http://www.env.gov.bc.ca/atrisk/toolintro.html>.

^c Population discovered since status report was written.

⁴ Possibly extirpated: The species is believed to be extirpated as it has not been located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered (NatureServe, 2015).

252 **3.3 Habitat and Biological Needs of Peacock Vinyl**

253 Peacock vinyl occurs in maritime regions mostly in a Mediterranean-type climate characterized
254 by warm, dry summers and mild, wet winters (COSEWIC 2011). However, the known
255 occurrences are within both the Coastal Douglas-Fir (CDF) and Coastal Western Hemlock
256 (CWH) biogeoclimatic zones (Meidinger and Pojar 1991), the latter being outside of this
257 Mediterranean-type climate. At the northern part of its range, the population in Haida Gwaii in
258 the CWH zone is characterized by a cool mesothermal climate having cool summers and mild
259 winters (Meidinger and Pojar 1991). The one location for peacock vinyl is situated in an area that
260 is not exposed to heavy summer rainfall (COSEWIC, 2011).

261
262 Peacock vinyl occurs at low elevations, between sea level and about 400 m, on the mossy
263 branches of deciduous trees, usually bigleaf maple (*Acer macrophyllum*) and red alder (*Alnus*
264 *rubra*), although it has also been found on Douglas maple (*Acer glabrum* var. *douglasii*), arbutus
265 (*Arbutus menziesii*), black cottonwood (*Populus trichocarpa*), western hemlock (*Tsuga*
266 *heterophylla*) and Garry oak (*Quercus garryana*). These trees usually occur in young to mid-
267 seral forests over nutrient-rich soils, and are assumed to have a bark pH above 5.0 which is
268 required by “jellyskin” lichens. This basic pH is found on deciduous trees, conifer bark being too
269 acidic. As well, the colonization of tree bark only occurs in humid microsites, and in many
270 locations, peacock vinyl does not grow on the actual bark of the tree, but instead it colonizes
271 epiphytic moss mats. These moss mats may contribute to its establishment and maintenance –
272 presumably by slowing rates of drying after rain (COSEWIC 2011).

273
274 Lichens are a symbiotic relationship between a fungal and an algal component. In peacock vinyl,
275 the latter component is a cyanobacterium (blue-green algae). A strain of Nostoc is the most
276 common cyanobacterial component in species of jelly lichens (Brodo *et al.* 2001). As with other
277 cyanobacterial lichens, peacock vinyl requires liquid water (not water vapour) for
278 photosynthesis. Peacock vinyl requires habitats that are subject to frequent wetting by rain or
279 heavy dew, at least during the cool period suitable for growth (COSWIC 2011).

280
281 The fungal component of lichens have an exclusive reliance on sexual reproduction through
282 producing spore-bearing structures (apothecia) which are found on the surface of the lichen
283 thallus. Lichen dispersal is complex and requires the fungal spores encountering a suitable host
284 as well as a suitable lichen alga (Goward 2011). Some cyanolichens are very specific with
285 respect to the strains of cyanobacteria that are required for successful thallus formation (Myllys
286 *et al.* 2007).

287

288 **3.4 Ecological Role**

289 Peacock vinyl may contribute very locally to the nitrogen cycle due to the nitrogen-fixing
290 cyanobacteria within it; the nitrogen released from this lichen is likely to benefit organisms
291 growing in the immediate vicinity (COSEWIC 2011).

292 **3.5 Limiting Factors**

293 Limiting factors are generally not human induced and include characteristics that make the
294 species or ecosystem less likely to respond to recovery/conservation efforts.
295

296 Once the fungal spores are dispersed (e.g., by wind or insects), they must then find a compatible
297 photosynthetic partner (cyanobacteria) with which to form a new lichen. Successful re-
298 establishment is likely to occur only under a rather specific range of environmental conditions,
299 for the cyanobacteria these are liquid water and pH above 5 (COSEWIC 2011), and where
300 suitable host trees are available for its development. Peacock vinyl is vulnerable to any
301 environmental change which affects reproduction, and could result in the demise of the species
302 within one or two generations (COSEWIC 2011).
303

304 **4 THREATS**

305 Threats are defined as the proximate activities or processes that have caused, are causing, or may
306 cause in the future the destruction, degradation, and/or impairment of the entity being assessed
307 (population, species, community, or ecosystem) in the area of interest (global, national, or
308 subnational) (Salafsky *et al.* 2008). For purposes of threat assessment, only present and future
309 threats are considered.⁵ Threats do not include limiting factors, which are presented in Section
310 3.5.⁶
311
312
313

⁵ Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are taken into consideration when determining long- and/or short-term trend factors (Master *et al.* 2012).

⁶ It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species or ecosystem less likely to respond to recovery/conservation efforts (e.g., inbreeding depression, small population size, and genetic isolation; or likelihood of regeneration or recolonization for ecosystems).

314 **4.1 Threat Assessment**

315 The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified
 316 threats classification system and is consistent with methods used by the B.C. Conservation Data Centre. For a detailed description of
 317 the threat classification system, see the Open Standards website (Open Standards 2014). Threats may be observed, inferred, or
 318 projected to occur in the near term. Threats are characterized here in terms of scope, severity, and timing. Threat “impact” is
 319 calculated from scope and severity. For information on how the values are assigned, see *Master et al.* (2012) and table footnotes for
 320 details. Threats for the peacock vinyl were assessed for the entire province (Table 2)
 321
 322

Table 2. Threat classification table for peacock vinyl.

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Population(s) or location(s) or site(s)
5	Biological resource use	Low	Small	Slight	High	
5.3	Logging & wood harvesting	Low	Small	Slight	High	All
9	Pollution	Low	Small	Extreme	High	
9.5	Air-borne pollutants	Low	Small	Extreme	High	One locality in the Yale – Spuzzum (EO13)
11	Climate change & severe weather	Low	Pervasive	Slight	High	
11.2	Droughts	Low	Restricted	Slight	High	South eastern Vancouver Island
11.4	Storms & flooding	Low	Pervasive	Slight	High	All

323 ^a **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating
 324 and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area
 325 decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when
 326 impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment time (e.g., timing is insignificant/negligible
 327 (past threat) or low (possible threat in long term)); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.
 328 ^b **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species’ population in the area of interest.
 329 (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).
 330 ^c **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or 3-generation timeframe. For this species a
 331 generation time of 15 years (COSEWIC 2011) was used resulting in severity being scored over a 45-year timeframe. Usually measured as the degree of reduction of the species’ population. (Extreme =
 332 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).
 333 ^d **Timing** – High = continuing; Moderate = only in the future (could happen in the short term < 10 years or 3 generations) or now suspended (could come back in the short term); Low = only in the future
 334 (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.
 335

336 4.2 Description of Threats

337 Taken together, the cumulative impacts of multiple threats on peacock vinyl are negligible;
 338 hence the overall province-wide Threat Impact is Low⁷. Threats identified include; logging and
 339 wood harvesting, agricultural aerosols, and increased intensity of storms and flooding due to
 340 climate change (Table 2). Details of threats are discussed below.
 341

342 4.2.1 Threats with Impacts to Peacock Vinyl

343 IUCN-CMP Threat 5. Biological resource use (impact low)

344

345 5.3 Logging & wood harvesting

346 Logging and removal of host trees is a potential threat. Loss of host trees would lead to peacock
 347 vinyl's disappearance at particular locations. Even if the host trees remained intact after logging,
 348 altered microsite conditions beyond the ecological tolerance of peacock vinyl (e.g., due to
 349 increased exposure to sunlight or more rapid drying) could similarly lead to its local extirpation.
 350 (T. Goward, pers. comm., 2014). As well, tree removal does occur in parks and protected areas.
 351 Hazard tree assessment and removal occurs near park recreational facilities such as washrooms,
 352 picnic areas, viewpoints, trails, etc. Because this lichen may be limited to as little as one tree at a
 353 site, even localized removal of one hazard tree could have a significant impact if the tree
 354 removed is one with the lichen. In addition, larger scale tree removal sometimes occurs in parks
 355 associated with development/redevelopment of facilities, or utility right of way (ROW)
 356 construction and maintenance (J. Hirner, pers. comm., 2015).
 357

358 IUCN-CMP Threat 9. Pollution (impact low)

359

360 9.5 Air-borne pollutants

361 Nitrogenous aerosols from intensive agriculture in the Fraser Valley have likely resulted in the
 362 disappearance of peacock vinyl from the Chilliwack – Bridal Falls (EO4) location. Large pig and
 363 poultry farms near Chilliwack have created a nitrogenous plume favourable to some nutrient-
 364 demanding lichens, but detrimental to peacock vinyl and other lichen species in which the
 365 symbiont partner is a cyanobacterium. Peacock vinyl would be unable to re-establish via spores
 366 as the optimal chemical conditions for algal growth would be compromised (T. Goward, pers.
 367 comm., 2014), as cyanolichens are intolerant of extraneous nitrogenous enrichment (T. Goward,
 368 pers. comm., 2015). Ammonia from agricultural sources, including livestock production and
 369 spreading of manure in the Lower Fraser Valley, is one of two main nitrogen sources. As such,
 370 the increased levels of nitrogen in the Fraser Valley are probably causing nitrogen stress to
 371 lichen communities in low-elevation areas (Raymond *et al.* 2010). Future eastward expansion of

⁷ The overall threat impact was calculated following Master *et al.* (2009) using the number of Level 1 Threats assigned to this species where Timing = High or Moderate. This includes 3 Low (Table 2). The overall threat considers the cumulative impacts of multiple threats.

372 this activity could possibly cause the further extirpation of this species near Yale – Spuzzum
373 (EO13). This need not happen through die-off of mature thalli, but could result through attrition
374 owing to a chemically mediated inability of this lichen to establish from spores. In this scenario,
375 peacock vinyl could conceivably persist for the next 10 years at this location, but would die out
376 within 45 years (three generations).

377 **IUCN-CMP Threat 11. Climate change & severe weather (impact low)**

378

379 11.2 Droughts (impact low)

380 Peacock vinyl is a maritime lichen essentially restricted to Mediterranean-type climates where
381 summer rainfall is low. Climate change in coastal areas is projected to bring warmer, drier,
382 summers and heavier winter rains (COSEWIC 2011). As peacock vinyl requires liquid water for
383 establishment during the growth period, a prolonged summer drought would affect establishment
384 and growth and thereby causing a decline in the abundance of the species (COSEWIC 2011). As
385 well, if a warming or drying trend occurs, this could cause peacock vinyl to inhabit higher
386 elevations for the cooler and more humid climate. These higher elevations (above 400m) would
387 be outside the optimal nutrient-rich soils required for the host trees that peacock vinyl lives on
388 (COSEWIC 2011). A combination of loss of liquid water and nutrients could lead to a decreased
389 capacity to establish (T. Goward, pers. comm., 2014).

390

391 11.4 Storms & flooding (impact low)

392 In general, climate models project an increased risk for more frequent extreme precipitation in
393 the Northwest, but it is unknown what the patterns and level of intensity will be. If there are
394 more frequent winter storms occurring due to climate change, host trees could be blown down
395 and lichens ripped from trees in high wind events. This lichen grows on smaller branches, near
396 the tips, and is therefore vulnerable to wind events (T. Goward, pers. comm., 2014).

397

398 **4.2.2 Threats with Unknown Impacts or outside Assessed Timeframe**

399 **IUCN-CMP Threat 11. Climate change & severe weather**

400

401 11.1 Habitat shifting & alteration (not scored)

402 Peacock vinyl occurs on bigleaf maple and other deciduous and coniferous trees that are in turn
403 rooted in nutrient-rich ancient Pleistocene marine bottom sediments (COSEWIC 2011).
404 Presumably the cations absorbed from these sediments maintain the relatively elevated bark pH
405 required for this species' establishment. The upper range of these sediments occurs at about
406 400 m, and above this elevation conditions are likely too acidic to support peacock vinyl (T.
407 Goward, pers. comm., 2014). If the changes in the biogeoclimatic zones due to climatic warming
408 or drying trends are as predicted (Hamann and Wang 2006), the environmental conditions (liquid
409 water; correct cation exchange and subsequent pH) may limit species establishment.

410

411 **5 MANAGEMENT GOAL AND OBJECTIVES**

412 **5.1 Management Goal**

413 The management goal is to maintain all known extant populations and any future populations of
414 peacock vinyl that may be found in British Columbia.
415

416 **5.2 Rationale for the Management Goal**

417 The overall goal is to maintain all known extant populations of the species within British
418 Columbia. This includes the current extant populations as well as any populations that are found
419 in the future. No quantitative management goal is possible for peacock vinyl as basic population
420 demographics and trends are unknown for all populations. As with many other rare plant species,
421 we lack adequate information about the historical distribution of peacock vinyl and it is unknown
422 whether this species was once more widespread than it is now (T. Goward, pers. comm., 2015).
423

424 Recovery of this species should focus on improving the probability that it will persist in the wild.
425 However, to prevent peacock vinyl from becoming threatened or endangered, all known extant
426 populations should be maintained. Once the knowledge gaps have been fulfilled, the goal can be
427 refined.
428

429 **5.3 Management Objectives**

- 430 1. To secure long-term protection⁸ for the known populations and habitats of peacock vinyl.
- 431 2. To determine the levels of real and potential threats to this species and its habitat and to
432 mitigate their effects.
- 433 3. To confirm the distribution of peacock vinyl (including new locations) and to reliably
434 determine population trends.
435

436 **6 APPROACHES TO MEET OBJECTIVES**

437 **6.1 Actions Already Completed or Underway**

438 The following actions have been categorized by the action groups of the B.C. Conservation
439 Framework (B.C. Ministry of Environment 2010). Status of the action group for this species is
440 given in parentheses.
441

⁸ Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

442 **Inventory (completed)**

- 443 • Inventory undertaken in 2007–2009 for the COSEWIC status report (COSEWIC 2011).
- 444 • Additional population found by Ryan Batten in Victoria, along the Galloping Goose
- 445 Regional Trail Park in 2013.
- 446 • Additional population found by Curtis Bjork at Albert Head in 2013.

447 **6.2 Recommended Management Actions**448 **Table 3.** Recommended management actions and suggested implementation schedule for peacock vinyl.

Recovery objective	Actions to meet objectives	Threat^a or concern addressed	Priority^b
1	Obtain more precise location data and land tenure for each population and inform land managers of the species location.	3.3; 5.3	Essential
	Assess impacts of threats at all sites.	All threats	Essential
	Determine appropriate measure to protect habitat at an ecosystem-level approach. When the species is recorded on Crown lands, initiate protection measures under existing legislation and government policy.	3.3; 5.3	Essential
	Develop and implement a strategy for communicating with land users/stakeholders about recovery activities as required.	3.3; 5.3	Essential
	Develop or refine site-specific management plans for protected areas, and municipal and federal lands to reduce or remove threats to populations and habitat.	3.3; 5.3	Necessary
	Develop best management practices for mitigating threats.	3.3; 5.3	Necessary
	Manage known occurrences of the species in a way that minimizes impact.	3.3; 5.3; 9.3	Essential
2	Assess and monitor the threats to determine if they are potential or real.	All threats	Essential
2,3	Monitor locations to assess the status of populations and the effects of any management activities taken to protect habitat.	All threats	Beneficial
	Develop and implement a monitoring protocol that provides reliable estimates of population size and trends, and to detect human and natural threats at each known location.	All threats	Beneficial
	Monitor status of population and threats at extant locations every 10 years, or when land	All threats	Beneficial

management activities change.

3	Identify and map suitable habitat localities for targeted inventory.	3.3; 5.3	Necessary
	Prioritize areas for inventory and conduct inventory.	3.3; 5.3	Necessary
	Advise appropriate landowners of the potential for the species to be present on their lands and to conduct inventory for the species, in particular in Environmental Assessments for resource development.	3.3; 5.3	Necessary

449 ^a Threat numbers according to the IUCN-CMP classification (see Table 2 for details).

450 ^b Essential (urgent and important, needs to start immediately); Necessary (important but not urgent, action can start in 2–5 years); or Beneficial
 451 (action is beneficial and could start at any time that was feasible).

452

453 **7 MEASURING PROGRESS**

454 The performance indicators presented below provide a way to define and measure progress
 455 toward achieving the management goal and objectives. Performance measures are listed below
 456 for each objective with the target of achieving each stated measurable within the next five years.

457

458 **Measurable(s) for Objective 1**

- 459 • At least five locations have stewardship agreements established for protection.
- 460 • All parks have site-specific management plans in place for this species.

461

462 **Measurable(s) for Objective 2**

- 463 • The main threats (logging and wood harvesting; air pollution from agriculture and
 464 forestry effluents; storms and flooding) have been assessed and a plan developed to
 465 implement the mitigation of threats.

466

467 **Measurable(s) for Objective 3**

- 468 • Extant locations have been inventoried and monitored for population size and trend at
 469 least twice.

470

471 **8 EFFECTS ON OTHER SPECIES**

472 Recovery planning activities for peacock vinyl will be implemented with consideration for all
 473 co-occurring species at risk, such that there are no negative impacts to co-occurring species at
 474 risk or their habitats. Other species at risk include the blue-listed twisted oak moss (*Syntrichia*
 475 *laevipila*) which grows on Garry oak trees and is assessed as Special Concern by COSEWIC (BC
 476 CDC 2014).

477

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