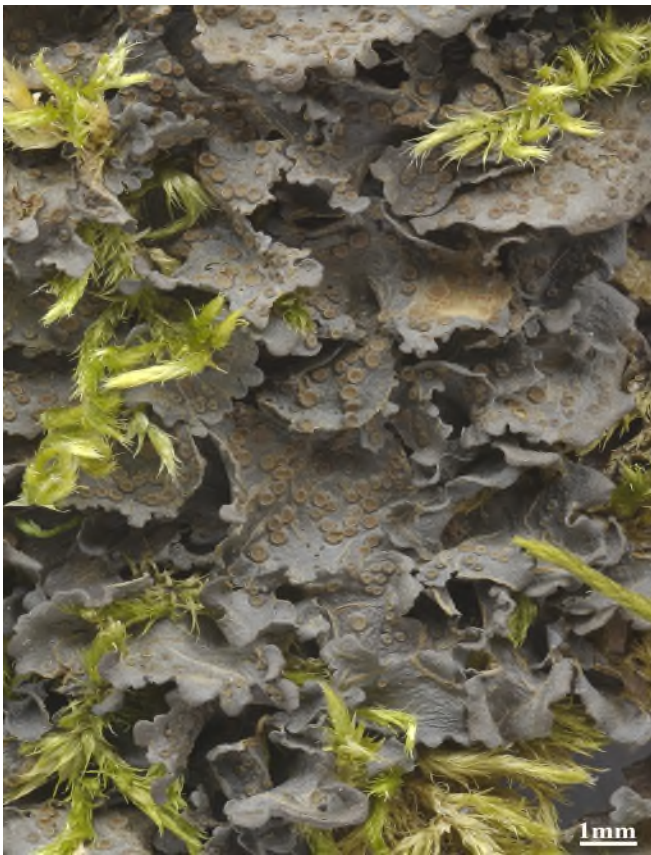


Management Plan for the Peacock Vinyl Lichen (*Leptogium polycarpum*) in Canada

Peacock Vinyl Lichen



2021



Government
of Canada

Gouvernement
du Canada

Canada

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Official version

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

Non-official version

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

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](https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html)¹.

Cover illustration: © Timothy B. Wheeler

Également disponible en français sous le titre
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¹ www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

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

2021

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

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

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

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

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

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.

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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

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

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)³ 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 and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Peacock Vinyl Lichen and has prepared the federal component of this management plan (Part 1), as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the British Columbia (B.C.) Ministry of Environment as per section 66(1) of SARA. SARA section 69 allows the Minister to adopt all or part of an existing plan for the species if the Minister is of the opinion that an existing plan relating to wildlife species includes adequate measures for the conservation of the species. The Province of B.C. provided the attached management plan for the Peacock Vinyl (Part 2) as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared in cooperation with Environment and Climate Change Canada.

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, Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Peacock Vinyl Lichen 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.

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

Additions and Modifications to the Adopted Document

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

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

1. Species Status Information

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

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

2. 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](#)⁴. 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 any of the [Federal Sustainable Development Strategy's](#) (FSDS)⁵ 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 also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the management plan itself, but are also summarized below in this statement.

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/

The provincial management plan for Peacock Vinyl Lichen contains a section describing the effects of management activities on other species (i.e., Section 8). Environment and Climate Change Canada adopts this section of the provincial management plan as the statement on effects of management activities on the environment and other species. Conservation planning activities for Peacock Vinyl Lichen will be implemented with consideration for all co-occurring species at risk, such that there are no negative impacts to these species or their habitats. Some management actions for Peacock Vinyl Lichen (e.g., inventory and monitoring, threat mitigation, habitat conservation, education, and research) may promote the conservation of other species at risk that overlap in distribution and rely on similar habitat attributes.

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

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



Prepared by the B.C. Ministry of Environment



September 2015

About the British Columbia Management Plan Series

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

What is a management plan?

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

What's next?

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

For more information

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

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

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

Prepared by the B.C. Ministry of Environment

September 2015

Recommended citation

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Cover illustration/photograph

Curtis Bjork

Additional copies

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

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

Disclaimer

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

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

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

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

ACKNOWLEDGEMENTS

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

EXECUTIVE SUMMARY

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

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

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

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

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

The following are the management objectives:

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

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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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.

* Committee on the Status of Endangered Wildlife in Canada.

**Common and scientific names reported in this management plan follow the naming conventions of the B.C. Conservation Data Centre, which may be different from names reported by COSEWIC.

2 SPECIES STATUS INFORMATION

Peacock vinyl ^a			
Legal Designation:			
FRPA: ^b N/A		B.C. Wildlife Act: ^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		

^a Data source: B.C. Conservation Data Centre (2014) unless otherwise noted.

^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 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 on Crown land under the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008).

^c No = not designated as wildlife under the B.C. *Wildlife Act* (Province of British Columbia 1982).

^d No = not on any Schedules under the *Species at Risk Act* (SARA). This species was recently reassessed by COSEWIC as Special Concern. This assessment will be reviewed by the Governor in Council (GIC) who may, on the recommendation of the Minister, amend the List to reclassify this species as Special Concern on Schedule 1 of SARA. If the GIC does not make a decision within nine months of receiving the COSEWIC assessment, the Minister shall by order amend the List according to COSEWIC's assessment.

^e S = subnational; N = national; G = global; T = refers to the subspecies level; B = breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable.

^f Data source: NatureServe (2015).

^g Data source: B.C. Ministry of Environment (2010).

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

3 SPECIES INFORMATION

3.1 Species Description

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

3.2 Populations and Distribution

3.2.1 Distribution

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

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

3.2.2 Population size

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

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

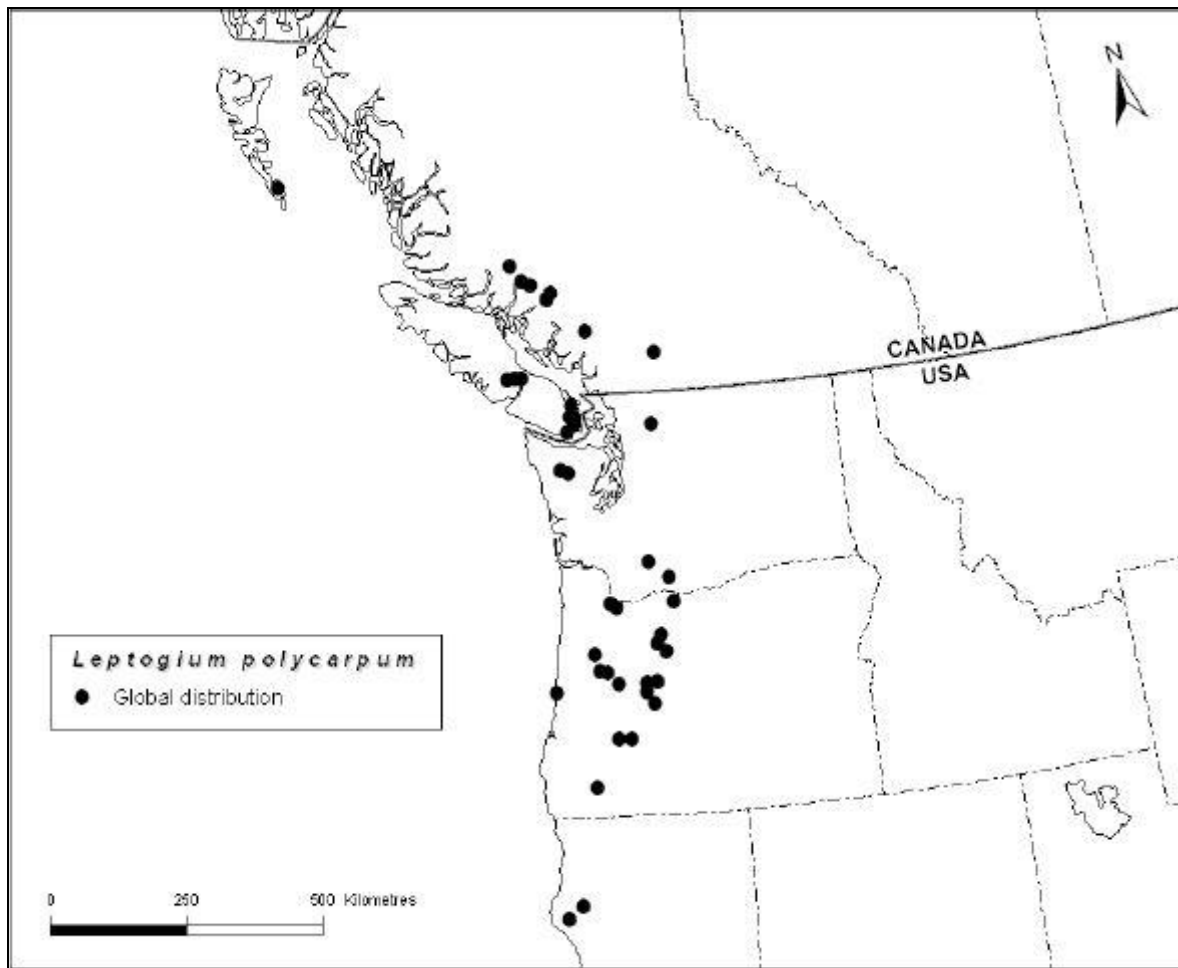


Figure 1. Peacock vinyl distribution in North America (COSEWIC 2011).

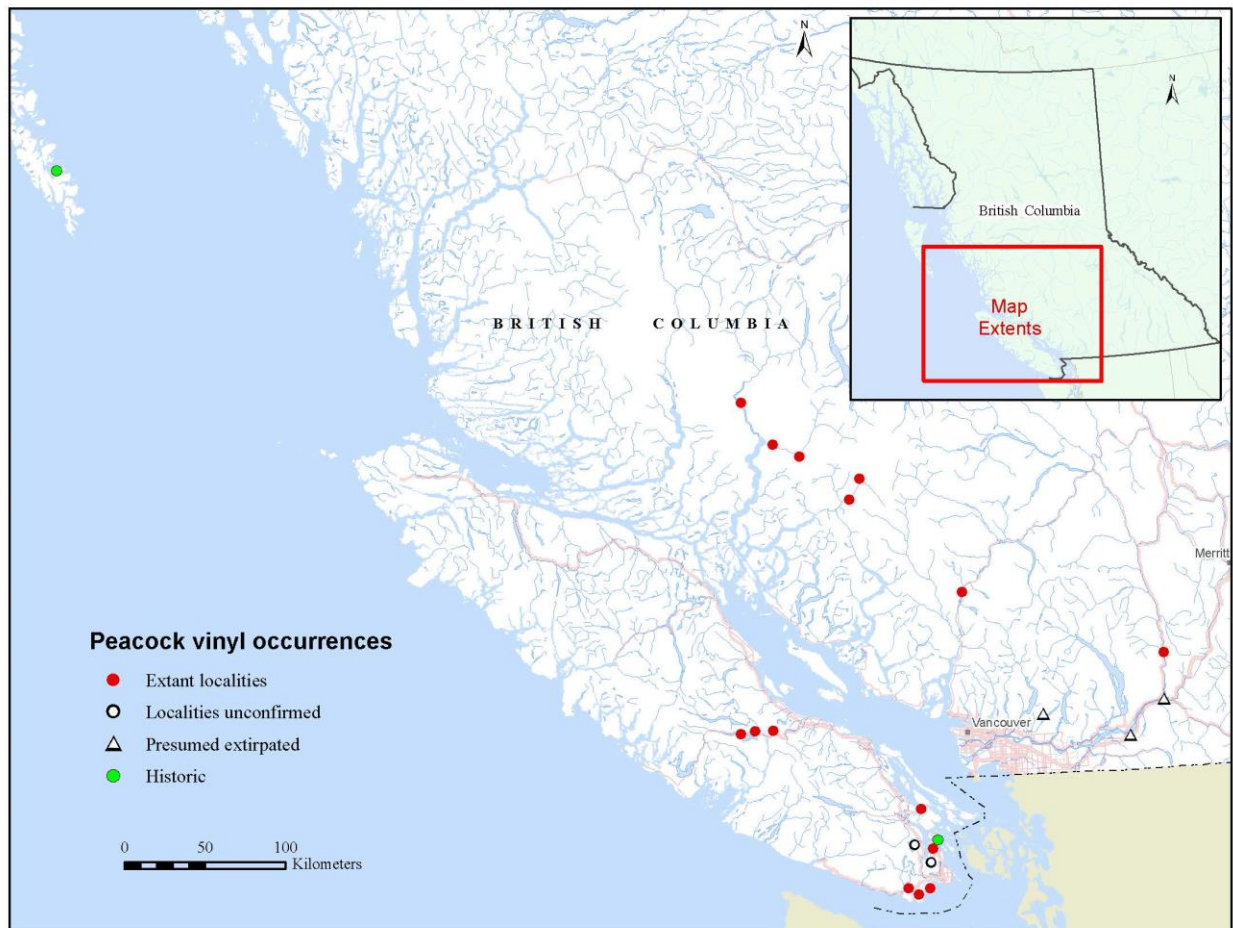


Figure 2. Peacock vinyl distribution in British Columbia (adapted from COSEWIC 2011).

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; ⁴	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

^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).

3.3 Habitat and Biological Needs of Peacock Vinyl

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

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

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

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

3.4 Ecological Role

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

3.5 Limiting Factors

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

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

4 THREATS

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

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).

4.1 Threat Assessment

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

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

^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 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 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 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 (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.

^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. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).

^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 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 = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

^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 (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.

4.2 Description of Threats

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

4.2.1 Threats with Impacts to Peacock Vinyl

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

5.3 Logging & wood harvesting

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

IUCN-CMP Threat 9. Pollution (impact low)

9.5 Air-borne pollutants

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

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

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

11.2 Droughts (impact low)

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

11.4 Storms & flooding (impact low)

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

4.2.2 Threats with Unknown Impacts or outside Assessed Timeframe

IUCN-CMP Threat 11. Climate change & severe weather

11.1 Habitat shifting & alteration (not scored)

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

5 MANAGEMENT GOAL AND OBJECTIVES

5.1 Management Goal

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

5.2 Rationale for the Management Goal

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

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

5.3 Management Objectives

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

6 APPROACHES TO MEET OBJECTIVES

6.1 Actions Already Completed or Underway

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

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.

Inventory (completed)

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

6.2 Recommended Management Actions**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

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

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

7 MEASURING PROGRESS

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

Measurable(s) for Objective 1

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

Measurable(s) for Objective 2

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

Measurable(s) for Objective 3

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

8 EFFECTS ON OTHER SPECIES

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

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Personal Communications

- Trevor Goward, Enlivened Consulting Ltd., Clearwater, BC.
- Joanne Hirner, Conservation Specialist, BC Parks, South Coast Region, Surrey, BC.