Species at Risk Act
Management Plan Series
Adopted under Section 69 of SARA

Management Plan for the Cryptic Paw Lichen (*Nephroma occultum*) in Canada

Cryptic Paw Lichen

2012

Canada

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For copies of the management plan, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, recovery strategies, action plans, and other related recovery documents, please visit the Species at Risk Public Registry (www.sararegistry.gc.ca).

Cover illustration: Stephen Sharnoff

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MANAGEMENT PLAN FOR THE CRYPTIC PAW LICHEN (*Nephroma occultum*) IN CANADA

2012

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 Cryptic Paw (*Nephroma occultum*) in British Columbia" under section 69 of the *Species at Risk Act.* Environment Canada has included an addition which completes the SARA requirements for this management plan.

This management plan is the management plan of the Minister of the Environment of Canada for this species.

2012

The Federal Management Plan for the Cryptic Paw Lichen in Canada consists of:

PART 1: Federal Addition to the "Management Plan for Cryptic Paw (*Nephroma occultum*) in British Columbia", prepared by Environment Canada.

PART 2: "Management Plan for Cryptic Paw (*Nephroma occultum*) in British Columbia", prepared by the British Columbia Ministry of Environment.

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PART 1: Federal Addition to the “Management Plan for Cryptic Paw (*Nephroma occultum*) in British Columbia”, prepared by Environment Canada

PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) 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 Special Concern species and are required to report on progress within five years.

SARA section 65 requires the competent Minister, which is the federal Minister of the Environment in this case, to prepare a management plan for all listed special concern species. 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 a wildlife species includes adequate measures for the conservation of the species.

The attached provincial management plan (Part 2 of this document) for the species was provided as science advice to the jurisdictions responsible for managing the species in British Columbia. Environment Canada has prepared this federal addition to meet the requirements of SARA.

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 management plan and will not be achieved by Environment Canada or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Cryptic Paw 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.

SPECIES STATUS INFORMATION

In 2006, Cryptic Paw Lichen was assessed as Special Concern by the Committee on the Status of Endangered Wildlife in Canada. In 2007, it was listed in SARA Schedule 1. The Canadian populations of Cryptic Paw Lichen probably represent less than 50% of its global distribution and abundance.

SPECIES AT RISK ACT REQUIREMENTS

The following sections address specific requirements of SARA that are either not addressed in the "Management Plan for Cryptic Paw (*Nephroma occultum*) in British Columbia" (see Part 2 of this document, referred to hereafter as the "provincial document"), or that need to be highlighted.

1. Management Goal and Objectives

Environment Canada supports and adopts the provincial management goals and objectives for the Cryptic Paw Lichen. The goals and objectives outlined in section 5 of the provincial document, and provided here for reference, are as follows:

Goal: to maintain all known extant populations of Cryptic Paw Lichen in British Columbia.

Objectives:
1. To establish habitat protection for known extant populations of Cryptic Paw Lichen.
2. To inventory suitable habitat for additional populations of Cryptic Paw Lichen.
3. To mitigate threats associated with this species.
4. To clarify the population demographics and establish monitoring protocols for extant populations of Cryptic Paw Lichen in British Columbia.

2. Measuring Progress

As per SARA section 72, the Minister of Environment for Canada must place a report regarding the status of implementation of the management plan on the Species at Risk Public Registry every five years, until the objectives of the management plan have been met. The Minister will use the performance indicators outlined in section 7 of the provincial document, and provided here for reference, as a basis for this report.

Performance Measures relating to Objectives 1 through 4:

Objective 1: Land owners and land managers of 60% of the sites are contacted and have applied the appropriate tools for habitat protection by 2016. At least 40% of land owners or land managers within the species' potential range that are contacted and provided with education and outreach material for Cryptic Paw Lichen by 2016.

Objective 2: Suitable habitat has been surveyed for new populations, and the status of existing and new locations has been confirmed by 2016.

Objective 3: Impact of the threats to the populations at a minimum of 60% of the sites (Crown land, provincial parks) has been investigated by 2014 and threats have been reduced (population numbers remaining stable or increasing in size at these sites) by 2016.

Objective 4: Research projects on population demographics have been initiated along with the establishment of monitoring protocols by 2016.

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*. 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.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that 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 plan itself, but are also summarized below.

This management plan will clearly benefit the environment by promoting the conservation of the Cryptic Paw Lichen. The potential for the plan to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this plan will clearly benefit the environment and will not entail any significant adverse effects. Habitat protection for this species will also protect other flora and fauna that reside in the same old-growth habitat with Cryptic Paw Lichen including the numerous vascular and non-vascular plants, and wildlife that reside in the two biogeoclimatic zones (BEC zones) where Cryptic Paw Lichen is found.

REFERENCES

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: December 7, 2010)

British Columbia Ministry of Environment. 2010. Management Plan for Cryptic Paw (*Nephroma occultum*) in British Columbia. Victoria, BC. 21 pp.

PART 2: “Management Plan for Cryptic Paw (*Nephroma occultum*) in British Columbia”, prepared by the British Columbia Ministry of Environment

Management Plan for Cryptic Paw (*Nephroma occultum*) in British Columbia

Prepared by the Ministry of Environment

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Environment

February 2011

About the British Columbia Management Plan Series

This series presents the management plans that are prepared as advice to the Province of British Columbia. 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 target species do not become threatened or endangered. A management plan outlines what is and what is not known about a species or ecosystem, identifies threats to the species or ecosystem, and what should be done to mitigate those threats. 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 to the species and their conservation needs that may be used by individuals, communities, land users, conservationists, academics, and governments interested in implementing species 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 Cryptic Paw (*Nephroma occultum*) in British Columbia

Prepared by the Ministry of Environment

February 2011

Recommended citation

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Cover illustration/photograph

Photograph by Stephen Sharnoff (with permission)

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>

Publication information

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Disclaimer

This management plan has been prepared by B.C. Ministry of Environment 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 cryptic paw 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 recovery 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 or the personal views of all individuals.

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 Ministry of Environment encourages all British Columbians to participate in the conservation of cryptic paw.

RESPONSIBLE JURISDICTIONS

The B.C. Ministry of Environment is responsible for producing a management plan for cryptic paw under the *Accord for the Protection of Species at Risk in Canada*. Parks Canada Agency and Environment Canada's Canadian Wildlife Service participated in the preparation of this management plan.

ACKNOWLEDGEMENTS

We thank Terry McIntosh, Ph.D., for his expertise in developing the first draft of this management plan. Brenda Costanzo of the B.C. Ministry of Environment provided further review and revisions. Funding for this management strategy was provided by the B.C. Ministry of Environment.

EXECUTIVE SUMMARY

Cryptic paw (*Nephroma occultum*) is a medium-sized, foliose lichen that grows most often on living branches, usually near the branch tips among the conifer needles, in old-growth forests characterized by high humidity and stable environmental conditions. Cryptic paw is endemic to western North America. Cryptic paw was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Special Concern in Canada in April, 2006. It was listed on the federal *Species at Risk Act* (SARA) Schedule 1 in 2007. In British Columbia, cryptic paw is ranked S2S3 (imperiled to special concern, vulnerable to extirpation or extinction) by the Conservation Data Centre and is on the provincial Blue list. The B.C. Conservation Framework ranks cryptic paw as a priority 2 under goal 3 (maintain the diversity of native species and ecosystems). Its current Canadian distribution consists of 45 populations in coastal and eastern British Columbia.

Threats to the survival of cryptic paw populations include biological resource use (forest harvesting) and natural system modifications. Other potential threats include energy production and mining, and climate change and severe weather.

Management Goal

The management goal is to maintain all known extant populations of cryptic paw in British Columbia.

Management Objectives

1. To establish habitat protection[1] for known extant populations of cryptic paw.
2. To inventory habitat for additional populations of cryptic paw.
3. To mitigate threats associated with this species.
4. To clarify the population demographics and establish monitoring protocols for all known populations of cryptic paw in British Columbia.

[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

Date of Assessment: April 2006.
Common Name (population): Cryptic Paw
Scientific Name: *Nephroma occultum*
COSEWIC Status: Special Concern
Reason for Designation: This foliose lichen is endemic to western North America where it is known in Canada from 45 locations, however there are likely more undiscovered locations. The Canadian sites account for more than 50% of the global range with only 5 locations protected from forest harvesting. The species has restricted habitat requirements and grows in mid to lower canopy of old growth coastal and interior humid cedar-hemlock forest. It reproduces only by vegetative propagules with limited dispersal distance. The species is vulnerable to forest harvesting, changes in understory humidity, insect defoliation (hemlock looper), and fire.
Canadian Occurrence: British Columbia
COSEWIC Status History: Designated Special Concern in April 1995 and in April 2006. Last assessment based on a new status report and an update status report.

2 SPECIES STATUS INFORMATION

Cryptic paw[a]		
Legal Designation		
Identified Wildlife:[b] No	*B.C. Wildlife Act*:[c] No	SARA Schedule: 1 (2007)
Conservation Status[d]		
BC Rank: S2S3 (2007)	BC List: Blue	Global Rank: G4 (2007)
Subnational Ranks:[e] SNR in AK, S1 in WA, and S3 in OR		
B.C. Conservation Framework[f]		
Goal 1: Contribute to global efforts for species and ecosystem conservation.		Priority:[g] 3 (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: 2 (2009)
Action Groups:	Monitor Trends, Compile Status Report; Send to COSEWIC; Planning; Habitat Protection; Private Land Stewardship; Species and Population Management.	

[a] Data source: B.C. Conservation Data Centre (2010) unless otherwise noted.
[b] Identified Wildlife under the *Forest and Range Practices Act* which includes the categories of species at risk, ungulates and regionally important wildlife (Province of British Columbia 2002).
[c] Listed as Endangered or Threatened under the *Wildlife Act* (Province of British Columbia 1982).
[d] S = subnational; N = national; G = global; 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.
[e] Data source: NatureServe (2009).
[f] Data source: Ministry of Environment (2010).
[g] Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

Cryptic paw is a broadly lobed, loosely appressed (flattened), foliose, or leaf, lichen whose thalli (main bodies) are 2–7 cm broad. Its lobes range from 4 to 12 mm wide and their margins are rounded (Brodo *et al*. 2001). Its upper surface is dull and pale yellowish grey to greenish or bluish grey, and it is covered with a series of low, uneven ridges. Its lower surface is also dull, but is finely wrinkled and smooth, varying in colour from pale tan to creamy yellow near the margins to darker and brown towards the centre. Coarse, granular soredia (powdery asexual reproductive structures) are present along the margins of the lobes, developing on the upper thallus ridges with age. The photobiont (photosynthetic partner of the main fungal component of a lichen) of cryptic paw is a cyanobacterium. The net-ridged upper surface, sorediate lobes and ridges, which are pale yellowish grey to bluish grey, and the smooth lower surface help to identify this species in the field. Figure 1 and the cover photo show thalli of cryptic paw.

Figure 1. Thalli of Cryptic paw lichen (P. Williston).

3.2 Populations and Distribution

Cryptic paw is a North American endemic known from Alaska, Oregon, Washington, and British Columbia. In 2004, 6 populations had been documented from Alaska, 182 from Oregon, 8 from Washington, and 45 (43 extant, 2 extirpated) from British Columbia. More populations will likely be found in old-growth forests of British Columbia with increased lichen surveys (COSEWIC 2006). Figure 2 shows the North American and global distribution of cryptic paw and Figure 3 shows its B.C. distribution.

An assessment of cryptic paw population trends is not possible at this time although a few populations are considered stable because they are in protected areas where threats are minimal. Its B.C. populations probably represent under 50% of its global distribution and abundance. (There are no reported estimations of global distribution and abundance for this lichen).

According to COSEWIC (2006), this species appears to be regenerating at extant sites, but is limited by the availability of suitable humid old-growth forest habitats across its range in B.C. and by its poor dispersal efficiency. Three of the 43 extant populations occur within protected areas (Table 1), but the cumulative effects of forest harvesting, changes in understory humidity, insect defoliation, and fire are expected to have a negative influence on remaining habitat (COSEWIC 2006).

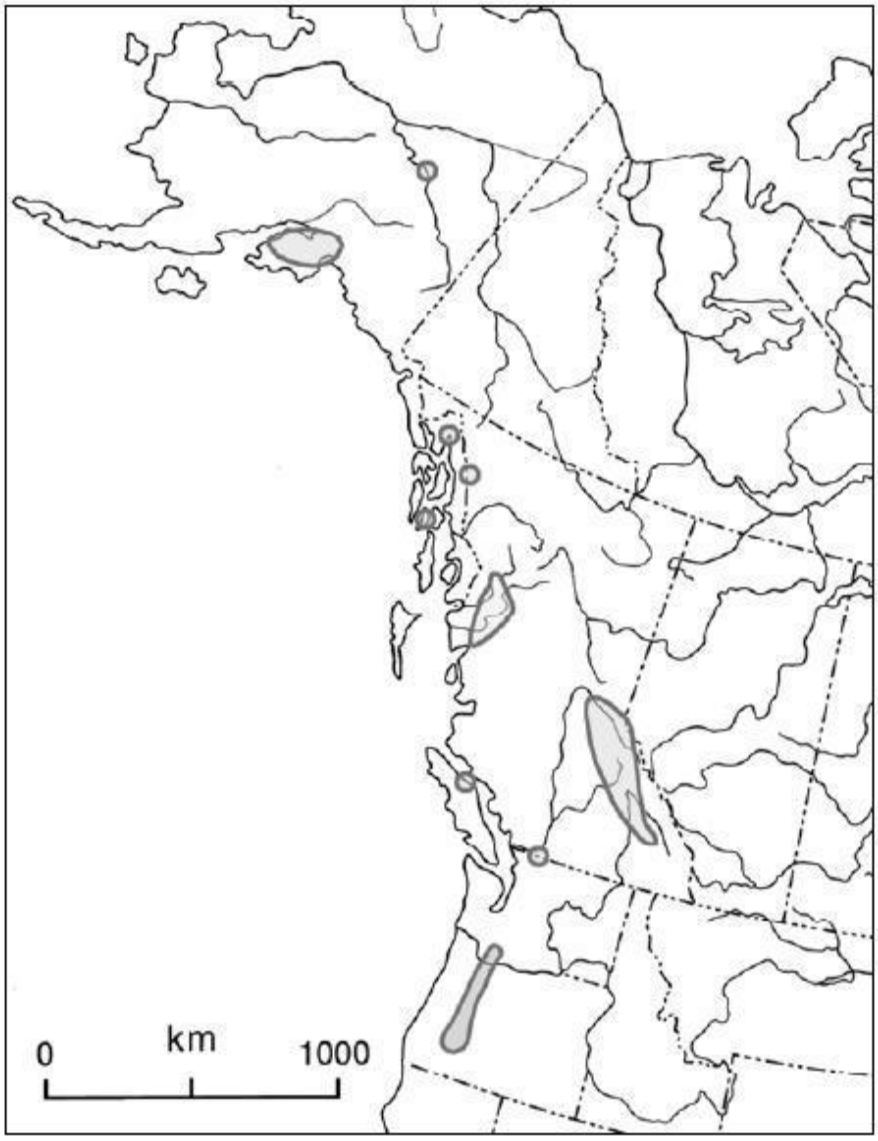

Figure 2. North American and global distribution of cryptic paw (COSEWIC 2006).

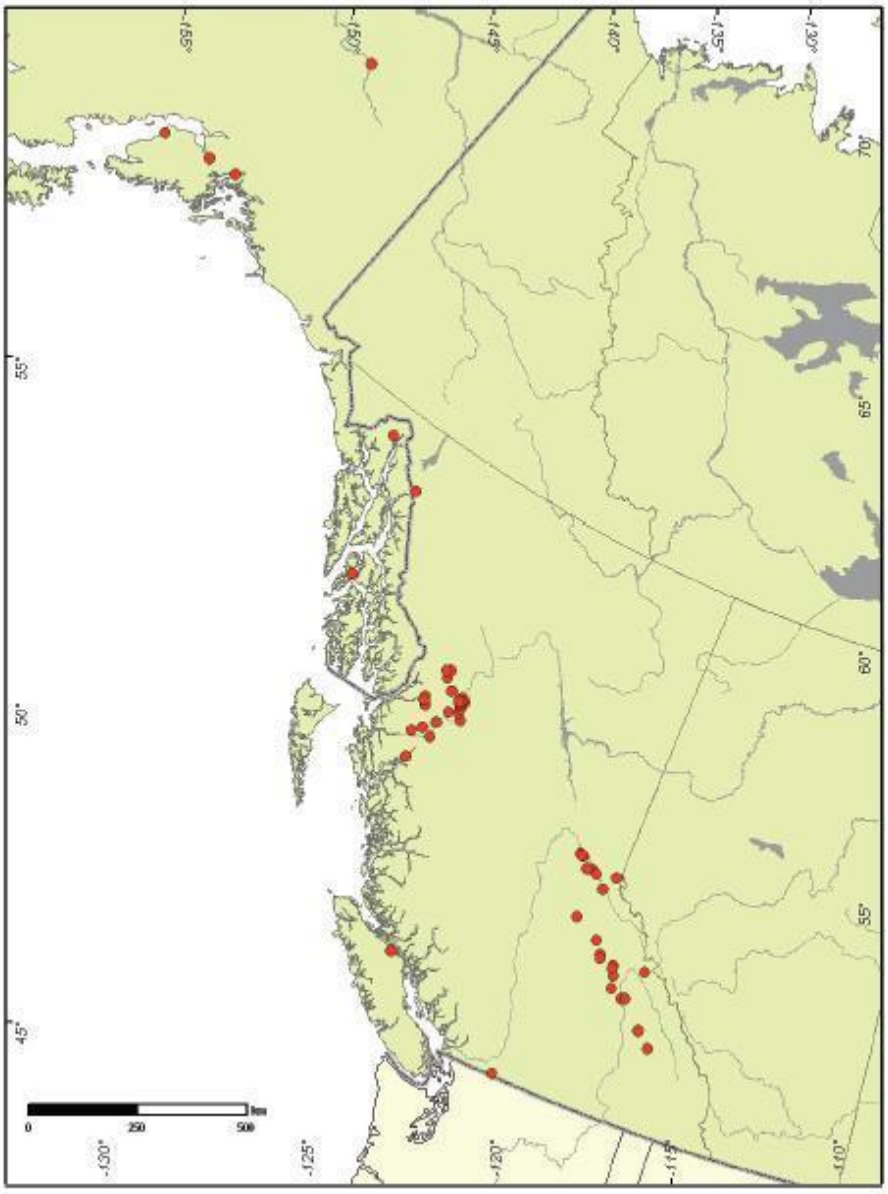

Figure 3. B.C. distribution of cryptic paw (COSEWIC 2006).

Table 1. Population information for cryptic paw in B.C. (COSEWIC 2006).[a]

Population number and locality	Dates observed	Land tenure
1. Hazelton area (extirpated)	1981	Crown land
2. New Aiyansh area	1981	Crown land
3. Tulsequah River, north of Taku River	1982	Crown land
4. Sayward area	1991	Crown land
5. Kispiox area	1991	Crown land
6. Terrace area	1991	Crown land
7. Terrace area	1991	Crown land
8. Kitimat Village	1991	Crown land
9. Shames Creek	1991	Crown land
10. Kispiox area	1992	Crown land
11. Azure Lake	1992	Wells Gray Provincial Park
12. Upper Fraser River north of McBride	1992	Crown land
13. Upper Fraser River north of McBride	1992	Crown land
14. Upper Fraser River north of McBride	1992	Crown land
15. Upper Fraser River north of McBride	1992	Crown land
16. Chilliwack Lake area	1992	Crown land
17. Murtle Lake	1992	Wells Gray Provincial Park
18. Murtle Lake	1992	Wells Gray Provincial Park
19. Upper Adams River	1992	Crown land
20. Upper Adams River	1992	Crown land
21. Upper Adams River	1992	Crown land
22. Robson Valley	1995	Crown land
23. Kispiox area, near Carrigan Creek	1995	Crown land
24. Kispiox area, near Skeena River	1995	Crown land
25. Kispiox area, near Helen Lake	1995	Crown land
26. Cranberry Junction, near Octopus Lake	1995	Crown land
27. White Swan Lake area	1995	Crown land
28. Cranberry Junction, near Octopus Lake	1995	Crown land
29. Meziadin Lake area	1995	Crown land
30. Meziadin Lake area	1995	Crown land
31. Mt. Bell-Irving area	1995	Crown land
32. Hazelton area	1995	Crown land
33. Seymour River near Blais Creek	1995	Crown land
34. Seven Sisters area	1996	Crown land
35. Cummins River Valley	1997	Crown land
36. Selkirk Mountains, along Incomappleux River	2002	Crown land adjacent to Glacier National Park
37. Selkirk Mountains, near upper end of Duncan Lake	2002	Crown land adjacent to Glacier National Park
38. Kispiox area, Date Creek Forest Service Road	2004	Crown land
39. Kispiox area, Date Creek Forest Service Road	2004	Crown land
40. Kispiox area, Date Creek Forest Service Road	2004	Crown land
41. Kispiox area, Botrychium Basin Sensitive Area, Date Creek Forest Service Road	2004	Crown land
42. Kispiox area, Helen Lake Forest Service Road	2004	Crown land
43. Kispiox area, Helen Lake Forest Service Road	2004	Crown land
44. Kispiox area, Helen Lake Forest Service Road (extirpated)	2004	Crown land
45. Kispiox area, Helen Lake Forest Service Road	2004	Crown land

[a] Before 2003, lichen surveys were conducted for the collection of data for location and distribution records only.

3.3 Needs of Cryptic Paw

3.3.1 Habitat and biological needs

Cryptic paw is confined to moist forested regions at elevations below 1200 m, mainly between about 400 and 800 m (COSEWIC 2006). In B.C., all populations occur where the mean annual temperature is between 4 and 10°C, with an annual mean temperature range of about 15–26°C in the Coastal Western Hemlock zone and the Interior Cedar–Hemlock zone of the British Columbia biogeoclimatic ecosystem classification system. Cryptic paw occurs on trees of all age classes in old-growth forests characterized by high humidity and stable environmental conditions. Old-growth forests provide protection from summer drought, one of the distribution constraints of this species. Cryptic paw most often grows on living branches, usually near the branch tips among the conifer needles. It is less common or absent over large branches or on the trunks of trees. It is an acidophytic (does well in an acidic environment) species that colonizes a broad range of trees. Further habitat details for cryptic paw are found in COSEWIC (2006).

3.3.2 Ecological role

Because of its association with cyanobacteria (a bacteria that photosynthesizes), cryptic paw, at least in a limited way because of its rarity, contributes to the nitrogen cycle in the forest ecosystem by converting atmospheric nitrogen into nitrates. Nitrates are leached from both living and dead lichens and become available to plant life in the immediate areas. It also contributes decayed organic matter to ecosystem.

3.3.3 Limiting factors

Cryptic paw is limited by its poor dispersal capabilities and lack of suitable habitat, namely humid old-growth cedar–hemlock forests. It is particularly susceptible to summer drought.

4 THREATS

Threats are defined as the proximate (human) activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of biodiversity and natural processes. Threats can be past (historical), ongoing, and/or likely to occur in the future. Threats do not include intrinsic biological features of the species or population such as inbreeding depression, small population size, and genetic isolation — all of which are considered limiting factors.

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 British Columbia Conservation Data Centre and the Conservation Framework. For a detailed description of the threat classification system, see the IUCN-CMP website (IUCN and CMP 2006) and Master *et al*. (2009). Threats for the cryptic paw were assessed for the entire province (Table 2).

Table 2. Threat classification table for cryptic paw (derived from Master *et al.* 2009).

Threat #	Threat description	Impact[a]	Scope[b]	Severity[c]	Timing[d]	Stress
3	Energy production & mining	Low	Small	Moderate	Moderate	
3.2	Mining & quarrying	Low	Small	Moderate	Moderate	Increased mortality, reduced population size, loss of host species, local extirpation
5	Biological resource use	Low	Small	Slight	High	
5.3	Logging & wood harvesting	Low	Small	Slight	High	Increased mortality, reduced population size, loss of host species, local extirpation
7	Natural system modifications	Low	Small	Serious	Moderate	
7.1	Fire & fire suppression	Low	Small	Serious	Unknown	Reduced productivity, reduced fitness, increased incidence of disease or parasitism, loss of host species
7.2	Dams & water management/use	Low	Small	Moderate	Moderate	Increased mortality, reduced population size, loss of host species, local extirpation
8	Invasive and other problematic species and genes	Low	Small	Slight	High	
8.2	Problematic native species	Low	Small	Slight	High	Increased mortality, reduced population size, loss of host species

Threat #	Threat description	Impact[a]	Scope[b]	Severity[c]	Timing[d]	Stress
11	Climate change & severe weather	Low	Pervasive	Slight	Unknown	
11.2	Droughts: Severe lack of rain	Low	Pervasive	Slight	Unknown	Reduced productivity, reduced fitness, increased incidence of disease or parasitism, loss of host species
11.3	Temperature extremes	Low	Pervasive	Slight	Unknown	Reduced productivity, reduced fitness, increased incidence of disease or parasitism, loss of host species

[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 stress 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%).

[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%).

[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 10 year or three-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%)

[d] **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [less than 10 years or three 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 the Threats

The overall province-wide Threat Impact for this species is Medium. This was calculated using the number of Level 1 Threats assigned to this species, which include 5 Low Impacts (Table 2). Threats include energy production and mining, biological resource use, natural system modifications, and climate change and severe weather. The cumulative effects of forest harvesting climate change, along with a potential increase in insect defoliation and forest fires, are expected to negatively influence remaining habitat (COSEWIC 2006). Details are discussed below listed under the IUCN Level 1 and 2 headings (IUCN and CMP 2006).

4.2.1 Existing threats[2]

IUCN #5 Biological resource use (5.3 Logging and wood harvesting)

Loss or degradation of old-growth forests will have an effect on cryptic paw due to the loss of host trees as well as the surrounding habitat, which contributes to the microclimate necessary for support of this species. Forest harvesting has resulted in two documented extirpations (COSEWIC 2006). If part of the population was destroyed, it would lead to increased lichen mortality and a reduced population size through the loss of host tree species.

IUCN #8 Invasive and other problematic species and genes (8.2 Problematic native species)

A rise in mean annual temperature may also lead to an increase in hemlock looper (*Lambdina fiscellaria*) infestations such as those predicted along the south coast of British Columbia (McCloskey *et al*. 2009). Such infestations will destroy trees, which will then alter the humidity conditions that cryptic paw requires. If part of the population was destroyed, it would lead to increased mortality and a reduced population size through the loss of host tree species. Small populations of cryptic paw lichen could be extirpated through the loss of host trees from the combined effects of increased annual temperature and hemlock looper infestations.

4.2.2 Potential threats[3]

IUCN #3 Energy production & mining (3.2 Mining and quarrying)

Mining is increasing in British Columbia and may directly affect forests, including the removal of old-growth forests where this lichen occurs. If part of the population was destroyed, it would lead to increased mortality and a reduced population size through the loss of host tree species and could lead to local extirpation if all of the population was lost.

[2] This includes Level 2 Threats where value for Timing is High (Table 2; IUCN and CMP 2006).
[3] This includes Level 2 Threats where value for Timing is Medium, Low, or Unknown; or the Impact is Unknown (Table 2; IUCN and CMP 2006).

IUCN #7 Natural system modifications (7.1 Fire and fire suppression)

Natural forest fires may directly affect old-growth forests, particularly in the face of climate change and a potential increase in the number of successive drought years. Due to the difficult terrain, fire suppression in the range of cryptic paw may be difficult, if not impossible, and thereby increased mortality of host trees could occur. As a result, this could lead to increased mortality and a reduced population size of cryptic paw lichen, and small populations of cryptic paw lichen could be extirpated.

IUCN #7 Natural system modifications (7.2 Dams and water management use)

The building of dams may directly affect old-growth forests. If part of the population was destroyed, it would lead to increased lichen mortality and a reduced population size through the loss of host tree species. Small populations of cryptic paw lichen could be extirpated through the loss of host trees from dam building.

IUCN #11 Climate change & severe weather (11.2 Droughts; 11.3 Temperature extremes)

Climate change and severe weather may directly affect old-growth forests. Habitat alterations through droughts and high or unusually variable temperature may alter the heat and moisture conditions in the forest that favour cryptic paw. Droughts and temperature extremes may occur in successive summers when they normally would not have and thereby change the growing conditions for plants. Any alteration in the composition of the forest (i.e., a change in the host tree species) will affect the distribution of cryptic paw lichen).

5 MANAGEMENT GOAL AND OBJECTIVES

5.1 Management Goal

The management goal is to maintain all known extant populations of cryptic paw in British Columbia.

5.2 Rationale for the Management Goal

No quantitative management goal is possible for cryptic paw as basic population demographics and trends are unknown for all populations. However, to prevent cryptic paw 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 establish habitat protection[4] for known extant populations of cryptic paw.
2. To inventory suitable habitat for additional populations of cryptic paw.
3. To mitigate threats associated with this species.

[4] 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.

4. To clarify the population demographics and establish monitoring protocols for extant populations of cryptic paw in British Columbia.

6 APPROACHES TO MEET OBJECTIVES

6.1 Actions Already Completed or Underway

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

Compile Status Report and Send to COSEWIC (complete)
- COSEWIC report completed (COSEWIC 1995). Updated in 2006.

Planning (complete)
- BC Management Plan completed (this document, 2011).

Habitat Protection and Private Land Stewardship (in progress)
- Three populations in Wells Gray Provincial Park are protected through provisions of the *Forest and Range Practices Act*, the *BC Park Act*, and the *Protected Areas of British Columbia Act*. Another population (#41 in Table 1) is offered some protection as part of the Forest Development Plan for the McCully Creek drainage.

6.2 Recommended Management Actions

Table 3. Recommended management actions for cryptic paw.

Priority	Obj. no.	Threat[a] or concern addressed	Conservation Framework action group	Management action	Timeline (start date)
Urgent	1, 3	3.2, 5.3, 7.2 (loss of old-growth forests)	Habitat Protection; Private Land Stewardship	Contact land managers on Crown land and engage their cooperation to establish habitat protection on these sites using tenure appropriate tools for the species	2011
E*ssential*	1, 3	3.2, 5.3, 7.2		Develop and provide best management practices or site-specific management plans	2013
Beneficial	1, 3	3.2, 5.3, 7.2		Land managers and any private landowners within the species' potential range (old-growth forests) are contacted and provided with education and outreach material	2014
Beneficial	4	Knowledge gaps	Monitor Trends	Develop and implement standardized habitat survey and monitoring protocol	2011
Beneficial	4	Knowledge gaps		Initiate the monitoring of the extant populations every five years	2012
Beneficial	4	Knowledge gaps		Report monitoring results every five years, and assess trends in populations, area of occupancy and habitat condition, and vigour and health of population	2016 and ongoing
Beneficial	4	Knowledge gaps		Inventory to confirm distribution at extant, accessible locations	2016
Beneficial	3	Mitigate threats	Planning	Research on threats and mitigation	2016
Beneficial	2	Knowledge gaps	Compile Status Report	Inventory to find new populations (e.g., following wind events visit potential sites) and complete a small % of inventory in the litter-fall in accessible locations.	2011

[a] Threat numbers according to the IUCN-CMP classification (see Table 1 for details).

6.3 Narrative to Support Management Actions Table

Recommended actions have been categorized by the action groups of the Conservation Framework.

6.3.1 Habitat protection; private land stewardship

The development of best management practices, or specific site management plans for this species will assist in mitigating threats on Crown and provincial park lands. If cryptic paw is found on private lands, stewardship activities with land owners need to be initiated to protect the species habitat. No species-specific actions are currently underway to protect cryptic paw in British Columbia. The Objectives for Biodiversity in the *Forest and Range Practices Act* (Province of British Columbia 2002), may aid in the conservation of rare lichens on unprotected Crown lands. Forestry companies are required to map these stands of old forest and identify them when preparing forest stewardship plans.

6.3.2 Monitor trends

Population size of extant populations needs to be monitored to establish baseline information to monitor trends. As well, the vigour and overall health of the extant population, along with their associated habitat, are unknown, and these should be investigated as well.

6.3.3 Compile status report (update)

Twenty-four new locations of cryptic paw have been documented in British Columbia since 1994. However, given the low search effort throughout most of the Canadian portion of the range of this species, it is highly probable that more populations exist. More populations will likely be found in old-growth forests of British Columbia with increased lichen surveys (COSEWIC 2006). This information can be used to update the status report for cryptic paw; if sufficient new locations were found, it could result in the de-listing of this species.

7 MEASURING PROGRESS

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution goal and recovery objectives. Performance measures are listed below for each objective.

Objective 1: Land owners and land managers of 60% of the sites are contacted and have applied the appropriate tools for habitat protection by 2016. At least 40% of land owners or land managers within the species' potential range that are contacted and provided with education and outreach material for cryptic paw by 2016.

Objective 2: Suitable habitat has been surveyed for new populations, and the status of existing and new locations has been confirmed by 2016.

Objective 3: Impact of the threats to the populations at a minimum of 60% of the sites (Crown land, provincial parks) has been investigated by 2014 and threats have been reduced (population numbers remaining stable or increasing in size at these sites) by 2016.

Objective 4: Research projects on population demographics have been initiated along with the establishment of monitoring protocols by 2016.

8 EFFECTS ON OTHER SPECIES

Habitat protection for this species will also protect other flora and fauna that reside in the same old-growth habitat with cryptic paw including the numerous vascular and non-vascular plants, and wildlife that reside in the two biogeoclimatic zones (BEC zones) where cryptic paw lichen is found.

9 RECOMMENDED APPROACH FOR IMPLEMENTATION

Land managers and the public should be made aware of cryptic paw and become engaged in its conservation. This can partially be accomplished by directed land owner contact programs (Table 3) in conjunction with habitat protection and private land stewardship.

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