

Management Plan for the Western Waterfan (*Peltigera gowardii*) in Canada

Western Waterfan



2021



Government
of Canada

Gouvernement
du Canada

Canada

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

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

MANAGEMENT PLAN FOR THE WESTERN WATERFAN (*Peltigera gowardii*) 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 Northwest Waterfan (Peltigera gowardii) 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 Western Waterfan² in Canada consists of two parts:

Part 1 – Federal Addition to the *Management Plan for Northwest Waterfan (Peltigera gowardii) in British Columbia*, prepared by Environment and Climate Change Canada.

Part 2 – *Management Plan for Northwest Waterfan (Peltigera gowardii) in British Columbia*, prepared by the British Columbia Ministry of Environment.

² This species is listed under SARA as the Western Waterfan (*Peltigera gowardii*) but is referred to as Northwest Waterfan (*Peltigera gowardii*) provincially. Both names refer to the same species.

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Part 2 – *Management Plan for the Northwest Waterfan (Peltigera gowardii) in British Columbia*, prepared by the British Columbia Ministry of Environment

Part 1 – Federal Addition to the *Management Plan for Northwest Waterfan (Peltigera gowardii) 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 Species at Risk Public Registry.

The Minister of Environment and Climate Change is the competent minister under SARA for the Western Waterfan 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 Northwest Waterfan (Part 2) as science advice to the jurisdictions responsible for managing the species in B.C. 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, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Western Waterfan 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 Northwest Waterfan (Peltigera gowardii) in British Columbia* (Part 2 of this document, referred to henceforth as “the provincial management plan”) and/or to provide updated or additional information. This species is listed under SARA as the Western Waterfan (*Peltigera gowardii*) and is referred to as the Northwest Waterfan (*Peltigera gowardii*) 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 Western Waterfan in Canada in Section 2 of the provincial management plan.

The legal designation of Western Waterfan on SARA Schedule 1 is Special Concern (2018).

2. Population and Distribution

Since publication of the provincial management plan, a new population of Western Waterfan has been confirmed from Ganokwa Creek, Babine Mountains Provincial Park, B.C (discovered in 2014). The updated summary table (Table 1 below) has been revised to include this new population (#6) and replaces Table 1 in Section 3.2 in the provincial management plan.

Table 1. Summary and description of Western Waterfan populations in B.C.

Population# / Status ^a	Population name	Dates observed	Number of colonies ^b	Land tenure
1A	Trophy Mountain Drinking water creek, Clearwater	2011	100 colonies	Non-federal
1B	Trophy Mountain, stream two, Clearwater	2011	4 colonies	Non-federal
1C (Extirpated)	Fight Lake, Clearwater	first observation in 1985; none found in 2008	None observed	Non-federal
2A	Hudson Bay Mtn., stream one, Smithers	2011	>200 colonies	Non-federal

Population# / Status ^a	Population name	Dates observed	Number of colonies ^b	Land tenure
2B	Hudson Bay Mtn., stream two, Smithers	2011	>100 colonies	Non-federal
2C	Hudson Bay Mtn., stream three, Smithers	2011	>100 colonies	Non-federal
3	John Brown Creek, Smithers	2011	>200 colonies	Non-federal
4	Trapline Mtn., Copper River Valley, Terrace	2011	3 colonies	Non-federal
5A	Brew Lake, Whistler	2011	<20 colonies	Non-federal
5B (Presumed extirpated)	Black Tusk area, Garibaldi Provincial Park, Whistler	First observation in 1961; none found in 2011	None observed	Non-federal
6 ^c	Ganokwa Creek, Babine Mountains Provincial Park	2014	Not recorded	Non-federal

^a No mapped element occurrences exist for this species with the BC Conservation Data Centre, consequently we are using only COSEWIC information.

^b Colonies are used to define a single establishment event, as distinguishing and counting individual thalli are difficult and can vary greatly during the course of a single season.

^c New occurrence not included in provincial management plan.

3. 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

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/

environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the management plan itself, but are also summarized below in this statement.

The provincial management plan for Western Waterfan contains a short section describing the effects of management activities on other species (i.e., Section 8). The competent minister adopts this section of the provincial management plan as the statement on effects of management activities on the environment and other species. The distribution of Western Waterfan overlaps with that of several other federally-listed species at risk. Conservation planning activities for Western Waterfan 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 Western Waterfan (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 Northwest Waterfan (Peltigera gowardii) in British Columbia*, prepared by the British Columbia Ministry of Environment

Management Plan for Northwest Waterfan (*Peltigera gowardii*) in British Columbia



Prepared by B.C. Ministry of Environment



November 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, or species where management is required to meet population targets for ecosystem management, human uses, or ecological services.

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 or is being managed for use, ecosystem goals, or ecological services. 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 Northwest Waterfan (*Peltigera gowardii*)
in British Columbia
Prepared by the B.C. Ministry of Environment**

November 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

This management plan has been prepared by the 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 northwest waterfan 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 northwest waterfan.

ACKNOWLEDGEMENTS

This management plan was completed by Brenda Costanzo (B.C. Ministry of Environment [MOE]). Brenda Costanzo, Marta Donovan, Peter Fielder, Dave Fraser, Jenifer Penny, and Leah Westereng (MOE) provided input on the threat assessment section. Additional assistance was received from Byron Woods (Ministry of Forests, Lands and Natural Resource Operations) and Trevor Goward (Enlivened Consulting Ltd). Additional reviews by Kella Sadler [Environment Canada –Pacific Yukon Region – Canadian Wildlife Service (EC-PYR-CWS)] and Matt Huntley (EC-PYR-CWS) and Paul Johanson [Environment Canada –Canadian Wildlife Service – National Capital Region (EC-CWS-NCR)]. Funding for technical review was provided by the Land Based Investment Strategy.

EXECUTIVE SUMMARY

Northwest waterfan (*Peltigera gowardii*) is a leafy lichen that inhabits permanent, primarily spring-fed streams in open subalpine or alpine meadows.

Northwest waterfan was designated as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but is not yet listed on Schedule 1 of the *Species at Risk Act* (SARA).¹ Northwest waterfan is endemic to western North America, with only five known populations in Canada, all in British Columbia. In British Columbia, the northwest waterfan is ranked S1S2 (critically imperiled to imperiled) by the Conservation Data Centre and is on the provincial Red list. The B.C. Conservation Framework has not ranked the northwest waterfan.

The greatest current threat to this species is from recreational activity.

The goal for this species is to maintain all known populations and any future populations of northwest waterfan that may be found in British Columbia.

The following are the management objectives will guide work in the near-term for northwest waterfan:

1. to protect² known populations of northwest waterfan throughout the B.C. range.
2. to target inventory of suitable habitat for additional populations of northwest waterfan.
3. to monitor trends in population size and distribution at all known populations.

¹ The COSEWIC assessment will be reviewed by the Governor in Council who may, on the recommendation of the Minister, amend the List to include this species on Schedule 1 of SARA.

² 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

<p>Assessment Summary: November 2013 Common Name: Western Waterfan Scientific Name: <i>Peltigera gowardii</i> Status: Special Concern Reason for Designation: This lichen is endemic to western North America. There are only five known occurrences in Canada, all in British Columbia, and; two former occurrences appear to be extirpated. This lichen is unique in growing at or below water level in clear, permanent, unshaded alpine or subalpine streams. Habitat loss is likely to result from temperature increases caused by climate change. Because of that change, larger plant species currently below the subalpine zone will be able to grow at higher elevations. Subalpine meadows are therefore predicted to become increasingly colonized by shading vegetation. Also, increasing drought will transform permanent watercourses into ephemeral streams. Occurrence: British Columbia Status History: Designated Special Concern in November 2013</p>

* Committee on the Status of Endangered Wildlife in Canada. Common and scientific names reported in this management plan follow the naming conventions of the British Columbia Conservation Data Centre (BC CDC). In this case the species' common name reported by BC CDC is different than the name reported by COSEWIC.

2 SPECIES STATUS INFORMATION

Northwest waterfan^a		
Legal Designation:		
FRPA: ^b No	B.C. <i>Wildlife Act:</i> ^c No	SARA: ^d No
OGAA: ^b No		
Conservation Status^e		
B.C. List: Red	B.C. Rank: S1S2 (2010)	National Rank: N1N2 (2013) Global Rank: G3G4 (2013)
Other Subnational Ranks: ^f None		

^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; Government of Canada 2002). The COSEWIC assessment will be reviewed by the Governor in Council who may, on the recommendation of the Minister, amend the List to include this species on Schedule 1 of SARA.

^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 (2014).

3 SPECIES INFORMATION

3.1 Species Description

Northwest waterfan is a leafy lichen forming small rosettes, lobes 0.3 – 1 cm wide, which attach to rocks by holdfasts. When the lichen is wet, it is olive-black in colour and jelly-like in texture. The upper surface is smooth and the lower surface has pale veins. Fruiting bodies are reddish-

brown containing sacks, or asci, which enclose the spores (COSEWIC 2013). When dry, the lichen is crispy and gray to black.

Northwest waterfan was observed to grow from spore stage to reproductive age within one year on Trophy Mountain (population 1) (T. Goward, pers. comm. 2014). Therefore, in this report, the generation time used is one year which differs from the generation time used in the COSEWIC (2013) status report.

3.2 Populations and Distribution

Northwest waterfan is endemic to western North America from southeast Alaska to northern Washington (Figure 1). In Canada, there are five extant populations,³ consisting of eight sites, all in British Columbia (i.e., near Clearwater, Smithers, Terrace, and Whistler). Two populations at Fight Lake (population 1) and Black Tusk (population 5) area in Garibaldi Provincial Park, were not relocated in 2011 and are considered extirpated (COSEWIC 2013) (refer to Table 1 and Figure 2).



Figure 1. Northwest waterfan distribution in North America (adapted from COSEWIC 2013).

³ In this report a population was defined following element occurrence specifications by NatureServe (2014), which defines a population as being separated by a least one kilometre from one another population.

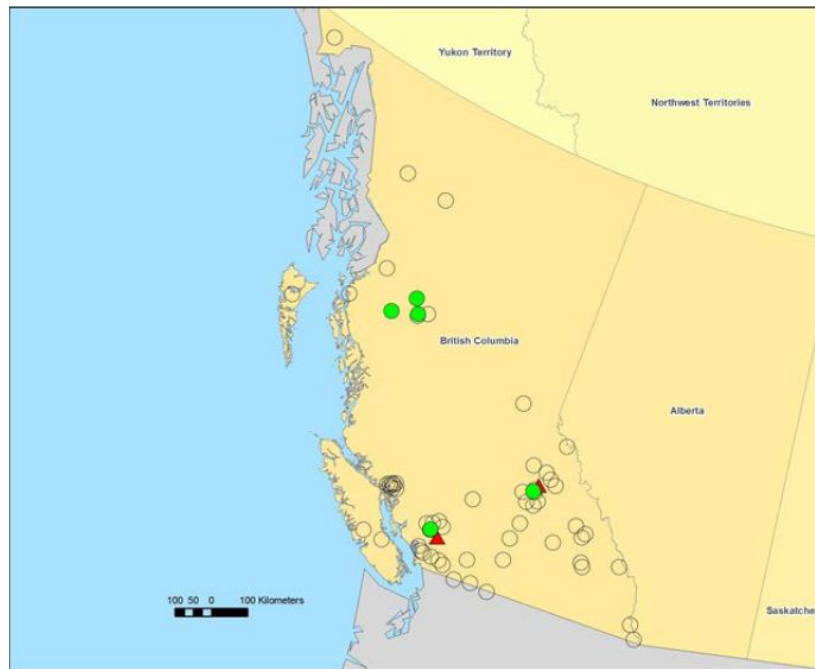


Figure 2. Northwest waterfan distribution in British Columbia. Green circles are extant populations; non-filled circles are areas searched with no occurrences found; red triangles are historical records not relocated in 2011 and considered extirpated (COSEWIC 2013).

Table 1. Summary and description of northwest waterfan populations in B.C.

COSEWIC Population# / Status^a	Population name	Dates observed	Number of colonies^b	Land tenure
1A	Trophy Mountain Drinking water creek, Clearwater	2011	100 colonies	Provincial Park
1B	Trophy Mountain, stream two, Clearwater	2011	4 colonies	Provincial Park
1C (Extirpated)	Fight Lake, Clearwater	first observation in 1985; none found in 2008	None observed	Provincial Park
2A	Hudson Bay Mtn., stream one, Smithers	2011	>200 colonies	Crown? (Ski-Smithers lease?)
2B	Hudson Bay Mtn., stream two, Smithers	2011	>100 colonies	Crown
2C	Hudson Bay Mtn., stream three, Smithers	2011	>100 colonies	Crown
3	John Brown Creek, Smithers	2011	>200 colonies	Crown

COSEWIC Population# / Status^a	Population name	Dates observed	Number of colonies^b	Land tenure
4	Trapline Mtn., Copper River Valley, Terrace	2011	3 colonies	Crown
5A	Brew Lake, Whistler	2011	<20 colonies	Crown
5B (Presumed extirpated)	Black Tusk area, Garibaldi Provincial Park, Whistler	First observation in 1961; none found in 2011	None observed	Provincial Park

^a No mapped element occurrences exist for this species with the BC Conservation Data Centre, consequently we are using only COSEWIC population numbers.

^b Colonies are used to define a single establishment event, as distinguishing and enumerating individual thalli are difficult and can vary greatly during the course of a single season (T. Goward, pers. comm., 2015).

3.3 Habitat and Biological Needs of Northwest Waterfan

Northwest waterfan is found in several biogeoclimatic zones as described by Meidinger and Pojar (1991): the Coastal Western Hemlock (CWH), Mountain Hemlock (MH) and Engelmann Spruce Subalpine Fir (ESSF) zones of the coastal mountains; and the Interior Douglas Fir (IDF) zone in the Columbia Mountains.

Northwest waterfan occurs on a wide variety of rock types (e.g. from granites to basalts) (T. Goward, pers. comm., 2015) in streams one metre or less wide. Typically these streams are associated with older forests in open subalpine or alpine meadows, above 1200 metres in elevation. The streams associated with northwest waterfan occurrences are described as being permanent, primarily spring-fed, with relatively stable flows and minimal scouring or siltation, low in nitrates, and of neutral pH. Stream water temperature averages from 5 to 8°C (COSEWIC 2013).

3.4 Limiting Factors

Northwest waterfan has relatively narrow habitat requirements. Stream water temperature must be low (average from 5 to 8°C), contain low nitrates, have a neutral pH, and have little siltation for the species to persist (COSEWIC 2013). Lichens exist as a symbiotic relationship between a fungal and an algal component – a cyanobacterium in the case of northwest waterfan. Fungal spores are discharged into the air and, for successful lichen re-establishment, must successfully germinate and find neighboring compatible cyanobacteria in order to grow and develop (COSEWIC 2013).

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.⁴ Threats do not include limiting factors, which are presented in Section 3.4.⁵

⁴ 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-term and/or short-term trend factors (Master *et al.* 2012).

⁵ 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 northwest waterfan were assessed for the entire province (Table 2).

Table 2. Threat classification table for northwest waterfan.

Threat ^a #	Threat description	Impact ^b	Scope ^c	Severity ^d	Timing ^e	Population(s)
6	Human intrusions & disturbance	Medium-Low	Restricted	Moderate-slight	High	
6.1	Recreational activities	Medium-Low	Restricted	Moderate-slight	High	Trophy, Hudson Bay, and Trapline Mountains

^a Threat numbers are provided for Level 1 threats (i.e., whole numbers) and Level 2 threats (i.e., numbers with decimals).

^b **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.

^c **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%).

^d **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 1 year was used resulting in severity being scored over a 3-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%).

^e **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

The overall province-wide Threat Impact for this species is Medium to Low.⁶ The greatest threat at the present time is from recreational activities (Table 2). Details are discussed below under the Threat Level 1 headings.

For the provincial threats assessment, a generation time of **one** year was used and not 10–20 years as stated in the COSEWIC status report. The lichen has been observed in some years to be absent from a particular locality at snowmelt and yet fully mature in the same locality two or three months later (T. Goward, pers. comm., 2014).

4.2.1 Threats with Impacts to the Northwest Waterfan

IUCN-CMP Threat 6. Human intrusions & disturbance

6.1 Recreational activities (impact medium to low)

Trophy Mountain (population 1), Hudson Bay Mountain (population 2), and Trapline Mountain (population 4) are all active skiing, snowmobile, ATV, and/or hiking areas; these activities are likely to increase in the future.

Silt has been observed in streams of Trophy (population 1) and Hudson Bay Mountains (population 2); such silt deposition, in combination with low snow cover or warm temperatures, could affect northwest waterfan. The status report reported soil erosion on Trophy Mountain (population 1) and Trapline Mountain (population 2) due to ATV use (COSEWIC 2013). As siltation interferes with light absorption by *Nostoc* (photosynthetic partner), activities such as horseback riding and ATV use could cause decreased growth of northwest waterfan. However, summer ATV use is usually restricted to lower to middle forested elevations and rarely extends into subalpine where northwest waterfan occurs (T. Goward, pers. comm., 2014).

Unmanaged backcountry camping or overuse of designated camping sites could cause impacts on northwest waterfan by changing water quality and quantity which would decrease the potential for the species to grow and reproduce.

Changes in streamflow and water chemistry would have the greatest impact on northwest waterfan. Most of the streams where northwest waterfan occurs do not fluctuate much throughout the year as the streams are maintained by seepage from the ground via lingering snow patches. Therefore, if the size and durability of the snow patch changed substantially over time, then flow rates could become more variable, to the detriment of northwest waterfan. However, such drastic changes in streamflow are unlikely to occur in the next three generations (T. Goward, pers. comm., 2014).

⁶ The overall threat impact was calculated following Master *et al.* (2012) using the number of Level 1 Threats assigned to this species where Timing = High or Moderate. This includes 1 Medium-Low (Table 2). The overall threat considers the cumulative impacts of multiple threats.

Most of known populations are along trails, but the effects of hiking would be negligible, unless they were to affect water chemistry (T. Goward, pers. comm., 2014).

4.2.2 Threats with Unknown Impacts or outside Assessed Timeframe

IUCN-CMP Threat 1. Residential & commercial development

1.3 Tourism & recreation areas (not scored)

The expansion of the ski village at Hudson Bay Mountain (population 2) ski hill is a potential threat. However, as the resort is located at lower elevation than the lichen occurrence, winter damage would be insignificant as the lichens are under the snowpack. There would have to be substantial changes to the streams to negatively affect the lichen (T. Goward, pers. comm., 2014).

IUCN-CMP Threat 6. Human intrusions & disturbance

6.3 Work & other activities (impact not calculated)

In 2011, filming and other work caused issues for this species at one site (Hudson Bay Mountain, population 2) when the headwaters of a stream was used as a movie set. The filming activities and film set clean-up caused some siltation in the stream (COSEWIC 2013).

IUCN-CMP Threat 8. Invasive & other problematic species & genes

8.2 Problematic native species (impact unknown)

COSEWIC (2013) stated that *Didymosphenia gemminata* (“rock snot”), recently documented in fish streams in B.C., could spread to rock surfaces currently colonized by northwest waterfan, thereby potentially excluding it by covering northwest waterfan or inhibiting attachment to rock surface. This, however, would probably require a change in water chemistry, and seems unlikely at the present time (T. Goward, pers. comm., 2014).

IUCN-CMP Threat 9. Pollution

9.5 Air-borne pollutants (impact unknown)

Lichens are sensitive to air pollution, ozone, and acid rain (APIS 2014); two populations could be subject to pollution (Brew Lake and Black Tusk near Whistler - population 5) from Whistler, Squamish, and/or Vancouver, but levels are well below standard thresholds for concern. The Black Tusk location is considered to be extirpated. An asphalt plant in Whistler may be a source of pollution for Brew Lake (population 5) occurrences (COSEWIC 2013). However, since these species are in the subalpine and aquatic, they are not likely to be affected by atmospheric pollution that originates in valley bottoms (T. Goward, pers. comm., 2014).

IUCN-CMP Threat 11. Climate change & severe weather

These threats are outside of the considered assessment timeframe because of the one-year generation time used; therefore the impacts were not calculated.

11.1 Habitat shifting & alteration (impact not calculated)

Over the long-term, climate change could lead to the reduction in the amount of available open habitat as shrubs and trees invade subalpine habitats at the inland sites due to warmer summers and rising tree lines (Gayton 2008; COSEWIC 2013).

11.2 Droughts (impact not scored)

Over the long-term, drought is a main threat in the Interior mountain ranges (7 of 8 extant locations) as mean annual temperature is predicted to rise and snowfall may decline by 30%. Subalpine streams fed by snowmelt may become ephemeral streams in dry years (COSEWIC 2013; T. Goward, pers. comm. 2014). Along the coast the summers may be drier and longer while the winters will be shorter and wetter. If this climate trajectory occurs, there could be a reduction in streamflow after two to three dry summers (Trophy Mountain – population 1, and John Brown Creek – population 3) (COSEWIC 2013). These changes could result in a northwest waterfan no longer being capable of reproduction due to the alteration of stream flow.

At the present time, there is no evidence of decreasing winter snow packs within the range of northwest waterfan. Furthermore, it seems possible that absolute winter snow depth may be less important for the ecology of this species than the amount of drifting snow during the winter months. This could be forecast to increase with increasing frequency of severe winter storms. If so, then winters would have to be significantly drier and/or summers significantly warmer to affect water flow in streams currently supporting northwest waterfan (T. Goward, pers. comm., 2014).

11.4 Storms & flooding (impact not scored)

Over the long-term, increased severity of storms during winter may bring heavy and late-lying snow at two coastal sites (Brew Lake - population 3, and Black Tusk – population 5). This did occur in 2011 with resulting decreased thalli growth (COSEWIC 2013). However, in general, at higher elevations the snow pack is not as important as wind strength and direction which influences how snow drifts form during intense winter events. Snow drifts from winter storms contribute to the maintenance of the streams in which northwest waterfan occurs. As snow melt occurs first in the streams and then on the land on the stream sides, late-lying snow should not affect the species in the long-term (T. Goward, pers. comm., 2014).

5 MANAGEMENT GOAL AND OBJECTIVES

5.1 Population and Distribution Goal

The goal for this species is to maintain all known extant populations and any future populations of northwest waterfan that may be found in British Columbia.

5.2 Rationale for the Population and Distribution 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 northwest waterfan as basic population demographics and trends are unknown for all populations. Once knowledge gaps have been fulfilled, the goal can be refined. As with many other rare plant species, we lack adequate information about the historical distribution of northwest waterfan, and do not know if it was once more widespread.

This lichen is endemic to western North America. Only five populations, comprised by a total of eight subpopulations, are known in Canada all of which are in British Columbia; two former subpopulations are extirpated. This lichen is unique in growing at or below water level in clear, permanent, unshaded alpine or subalpine streams (COSEWIC 2013). Conservation of this species should focus on improving the probability that it will persist in the wild. Addressing current and upcoming threats (e.g., recreation, climate change), will help ensure that this species does not become more at risk.

To prevent northwest waterfan from becoming threatened or endangered, all known extant populations should be maintained.

5.3 Management Objectives

The following are the management objectives will guide work in the near-term for northwest waterfan:

1. to protect⁷ known populations of northwest waterfan throughout the B.C. range.
2. to target inventory of suitable habitat for additional populations of northwest waterfan.
3. to monitor trends in population size and distribution at all known populations.

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.

Compile Status Report (complete)

- COSEWIC report completed (COSEWIC 2013). Update due 2023.

⁷ 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.

Send to COSEWIC (complete)

- Northwest waterfan assessed Special Concern (COSEWIC 2013). Re-assessment due 2023.

Planning (complete)

- B.C. Management Plan completed (this document, 2015).

Habitat Protection (in progress)

- One location of this species at Trophy Mountain is within Wells Gray Provincial Park and is protected through the provisions of the B.C. *Park Act*.
- Another location is within Garibaldi Provincial Park (Black Tusk) but this occurrence is extirpated.

6.2 Recommended Management Actions

Table 3. Recommended management actions and suggested implementation schedule for northwest waterfan.

Objective	Actions to meet objectives	Threat^a or concern addressed	Priority
1	Contact land managers on Crown land and engage their cooperation to establish habitat protection on these sites using appropriate tools for the species.	6.1	Essential
	Develop and provide best management practices or site-specific management plans to applicable agencies and land managers.	6.1	Essential
	Land managers within the species’ potential range are contacted and provided with educational and outreach material particularly on the location of this species on their lands.	6.1	Essential
	Develop and implement a strategy for communicating with land users/stakeholders with respect to recovery activities as required.	6.1	Necessary
	Develop or refine site-specific management plans for parks and protected areas to reduce or remove threats to populations and habitat.	6.1	Necessary
2	Inventory to find new populations, and to confirm distribution at extant locations.	6.1	Necessary
	Identify and map suitable habitat localities for targeted inventory.	6.1	Necessary
	Prioritize areas for inventory and conduct inventory.	6.1	Necessary

Objective	Actions to meet objectives	Threat^a or concern addressed	Priority
1, 3	Develop and implement standardized habitat survey and monitoring protocol to detect threats at each known site.	6.1	Beneficial
3	Monitor status of populations and threats at extant locations every 5 years, or when land management activities change.	6.1	Beneficial
3	Report monitoring results every 5 years, and assess trends in populations, area of occupancy and habitat condition, and vigour and health of populations.	6.1	Beneficial

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

7 MEASURING PROGRESS

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

Objective 1:

- Landowners and land managers of 60% of the sites are contacted and have applied the appropriate tools for habitat protection. At least 40% of landowners or land managers within the species' potential range are contacted and provided with education and outreach material for northwest waterfan.

Objective 2:

- Suitable habitat has been surveyed for new populations, and the status of existing and new locations has been confirmed.

Objective 3:

- Population monitoring has indicated that known locations are still extant and population data have been gathered to help determine long-term trends.

8 EFFECTS ON OTHER SPECIES

Conservation planning and management for this species is not anticipated to effect other species, either positively or negatively, in the near term. Habitat protection for this species will also protect other flora and fauna that reside in the same habitat. Listed species in these areas could include the Red-listed southern Mountain Population of Caribou (*Rangifer tarandus* population 1), and Blue-listed Grizzly Bear (*Ursus arctos*) and Blue-listed wolverine (*Gulo gulo*). Conservation and management activities for northwest waterfan will be planned and

implemented with consideration for all co-occurring species at risk, such that there are no negative impacts to these species or their habitats.

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