COSEWIC
Status Appraisal Summary

on the

Nugget Moss
Microbryum vlassovii

in Canada

ENDANGERED
2016

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status appraisal summaries are working documents used in assigning the status of wildlife species suspected of being at risk in Canada. This document may be cited as follows:

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Production note:
COSEWIC would like to acknowledge Marc Jones for writing the status appraisal summary on the Nugget Moss (*Microbryum vlassovii)* in Canada, prepared under contract with Environment and Climate Change Canada. This status appraisal summary was overseen and edited by Dr. René Belland, Co-chair of the COSEWIC Mosses and Lichens Specialist Subcommittee.

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COSEWIC
Assessment Summary

Assessment Summary – November 2016

Common name
Nugget Moss

Scientific name
Microbryum vlassovii

Status
Endangered

Reason for designation
In Canada, this globally rare moss is known from only three localized sites in semi-arid areas of south-central British Columbia. One of the sites is extirpated and another has not been seen since 1980. The moss grows on fine soils on the steep portions of silt banks in early stages of plant community development in semi-arid grassland ecosystems. The extremely small populations render this moss vulnerable to disturbance. Threats include road development and maintenance, recreational activities, and competition from vascular plants.

Occurrence
British Columbia

Status history
Designated Endangered in November 2006 and in November 2016.

COSEWIC
Status Appraisal Summary

Microbryum vlassovii

Nugget Moss

Phasque de Vlassov

Range of occurrence in Canada (province/territory/ocean): British Columbia

Status History:

Designated Endangered in November 2006 and in November 2016.

Wildlife species: Nugget Moss

Change in eligibility, taxonomy or designatable units: yes ☐ no ☒

Explanation:

No additional data since last assessment.

Range:

Change in Extent of Occurrence (EOO): yes ☒ no ☐ unk ☐

Change in Index of Area of Occupancy (IAO) : yes ☒ no ☐ unk ☐

Change in number of known or inferred current locations[1]: yes ☒ no ☐ unk ☐

Significant new survey information yes ☒ no ☐

Explanation:

In 2013, T. McIntosh identified a few specimens of Nugget Moss in a sample of dryland mosses collected in 1980. The sample was collected on a south-facing silt bank in a wet area near the Porthill border crossing in the Kootenay River Valley (BC Conservation Data Centre 2014). This occurrence has been identified as Rykerts Lake in the BC CDC species occurrence database (Figure 1). T. McIntosh revisited this occurrence in June 2016 and thinks Nugget Moss has likely been extirpated from this occurrence (see next section for details). No targeted surveys of Nugget Moss beyond the three known occurrences have been conducted, with the exception of the 2011 Kamloops area survey, where T. McIntosh and others searched for Nugget Moss on several silt banks west of the known Kamloops location. Although not targeted surveys, T. McIntosh has extensively surveyed lacustrine silt banks in the southern interior of British Columbia for many years. To date, he has found Nugget Moss only at three locations. The loss of the Rykerts Lake site results in a decrease in EOO, IAO and known current locations but it is unknown when this loss occurred.

[1] Use the IUCN definition of "location"

Population Information:

Change in number of mature individuals:	yes ☐ no ☐ unk☒
Change in population trend:	yes ☐ no ☐ unk☒
Change in severity of population fragmentation:	yes ☐ no ☒ unk☐
Change in trend in area and/or quality of habitat:	yes ☐ no ☒ unk ☐
Significant new survey information	yes ☐ no ☒

Explanation:

Only one occurrence has been relocated since the initial surveys in 1980. The Penticton subpopulation has been resurveyed in 2004, 2005, 2006, 2011, 2013, and 2016 (COSEWIC 2006; British Columbia Bryophyte Recovery Team 2009; Environment Canada 2012; T. McIntosh, pers. comm. 2016). The Penticton subpopulation has been found at multiple microsites, usually in small (<1 cm^2) colonies. Given the uncertainty over the number of mature individuals occurring in each patch over time, it is difficult to estimate population size at this location (Table 1). A portion of the Penticton site was surveyed in 2013 (very briefly) and 2016 by T. McIntosh and Environment Canada and Climate Change personnel. Nugget Moss was not found on either occasion (T. McIntosh, pers. comm. 2016). Considering that Nugget Moss has been persistent at this location since it was found in 1980 (documented in multiple surveys – 2004, 2005, 2006, and 2011), and portions of habitat there remain suitable, it is likely that it is still extant at that location (and/or that viable spores persist in the soil bank, within the general vicinity of past observations) (K. Sadler, pers. comm. 2016). The Kamloops subpopulation was not relocated in 2004 and 2011 surveys conducted by T. McIntosh (T. McIntosh, pers. comm. 2016). T. McIntosh resurveyed the Rykerts Lake subpopulation in 2016. The small lacustrine banks that he surveyed in 1980 have largely been hydroseeded and he found very few surviving mosses. He thinks it likely that Nugget Moss has been extirpated at this location (T. McIntosh, pers. comm. 2016).

Table 1. Population size of Nugget Moss in Canada, by subpopulation.

Subpopulation	Year surveyed	Estimated population size
Kamloops	1980	unknown[1]
	2004	not found
	2011	not found
Penticton	1980	unknown[1]
	2004	2 colonies[2] with at least 8 plants
	2005, 2006	8 colonies plus a few individuals at 3 microsites
	2011	1 colony with at least 10 plants
	2013	not found[3]
	2016	not found
Rykerts Lake	1980	unknown[1]
	2016	not found, possibly extirpated

[1] Samples from 1980 were not collections of Nugget Moss *per se*, but were "grab bags" of selected habitat. Nugget Moss was later identified in the samples (in the case of the Rykerts Lake location not until 2013) and no information was collected on population size.

[2] Colony refers to a group of plants that cannot be determined to be genetically unique as a result of spores arising from different parents germinating in close proximity to one another. Each colony is usually treated as one individual.

[3] This survey was cursory in nature; the negative result should not be considered indicative of the subpopulation status.

Threats:

Change in nature and/or severity of threats: yes ☒ no ☐ unk ☐

Explanation:

The activities/processes identified in the recovery strategies, road/utility construction and maintenance, recreational activities, invasive vascular plants, and unusual storm events, all remain potential threats to Nugget Moss (British Columbia Bryophyte Recovery Team 2009; Environment Canada 2012). In addition, since 2013 three additional threats to the Penticton subpopulation have been identified: new residential development, driving/parking cars on road shoulders, and soil removal (Table 2, K. Sadler, pers. comm. 2016).

The most substantial threat to Nugget Moss at both the Penticton and Kamloops occurrences is activities associated with road and utility maintenance and construction (Table 2). Both the Kamloops and Penticton sites are adjacent to roadways. New road construction and maintenance of the existing roads, such as clearing ditches or replacing utilities, could destroy Nugget Moss habitat if not carefully implemented. Environment and Climate Change Canada personnel have revisited the Penticton location in 2013, 2014, 2015, and 2016 to evaluate threats at the site. They noted cars being parked on the shoulder of the road, which could directly destroy Nugget Moss habitat. They also noted a small area where soil had been removed near a previous Nugget Moss observation.

The threat of alien invasive vascular plants appears to be more pronounced at the Penticton location. Annual vascular species, such as Prickly Russian Thistle (*Salsola tragus*) and Yellow Sweet-clover (*Melilotus officinalis*), were dominant in 2014 in some areas of Nugget Moss habitat (T. McIntosh, pers. comm. 2016). These species could alter Nugget Moss habitat through shading and could also potentially bury Nugget Moss through litter accumulation.

Recreational activities, such as hiking, dog walking, and mountain biking, could also destroy Nugget Moss habitat, especially along the lower slopes of silt banks. Some of the silt banks identified as potential critical habitat at the Kamloops location have been designated as a city nature park (Figure 2, Environment Canada 2012). This could lead to greater recreational use of these areas, although existing designated trails avoid Nugget Moss habitat (Stanley 2009).

In 2013 a residential development was proposed that could have potentially affected a portion of the Penticton subpopulation. Final subdivision plans are not yet publicly available, but it is possible that the final layout will avoid critical habitat (L. Reiss, pers. comm. 2016).

At the Rykerts Lake occurrence, erosion control concerns have led to the area being hydroseeded. Very few mosses appear to have survived this treatment, and it may have led to the extirpation of Nugget Moss at this subpopulation.

Table 2. Threats to Nugget Moss in Canada.

	Threat level		
Threat	**Kamloops**	**Penticton**	**Rykerts Lake**
Road/utility construction and maintenance	high	high	unknown
Recreational activities	low	moderate	unknown
Alien invasive plants	unknown	moderate	unknown
Unusual storm events	unknown	high	unknown
Residential development	unknown	unknown	unknown

Driving/parking vehicles on road shoulders	unknown	high	unknown
Soil removal	unknown	moderate	unknown
Erosion control/hydroseeding	n/a	n/a	high

Protection:
Change in effective protection: yes ☒ no ☐ unk ☐

Explanation:

A portion of the polygon identified as potentially containing critical habitat for the Kamloops subpopulation (Figure 2, Environment Canada 2012) has been designated as a city nature park. Although the exact boundaries of the park are unclear and the park does not have an existing management plan (Stanley 2009), this designation is likely to prevent urban development that could otherwise destroy Nugget Moss habitat within its boundaries. The impact of other threats, such as recreational activities, is unknown within the park (Figure 2). Figure 3 shows designated critical habitat for the Penticton subpopulation.

Rescue Effect:
Change in evidence of rescue effect: yes ☐ no ☒

Explanation:

The likelihood of a rescue effect remains unlikely. The nearest documented Nugget Moss population outside Canada is in California (Zander 2007).

Quantitative Analysis:
Change in estimated probability of extirpation: yes ☐ no ☐ unk ☒

Details:

No quantitative analysis has been done for Nugget Moss.

Summary and Additional Considerations: [e.g., recovery efforts]
A federal recovery strategy has been published for Nugget Moss (Environment Canada 2012). This report incorporated the provincial recovery strategy (British Columbia Bryophyte Recovery Team 2009), identified critical habitat for the Penticton subpopulation, and (in the Schedule of Studies section) delineated an area potentially containing critical habitat for the Kamloops subpopulation.

Acknowledgements and authorities contacted:

Brenda Costanzo, Chair, British Columbia Bryophyte Recovery Team, BC Ministry of Environment, Victoria, BC.

Marta Donovan, Botanist, BC Conservation Data Center, Victoria, BC.

Judith Harpel, Curator of Bryophytes, University of British Columbia Herbarium, Vancouver, BC.

Terry McIntosh, Consultant, British Columbia Bryophyte Recovery Team, Vancouver, BC.

Lucy Reiss, Senior Terrestrial Habitat Planner, Environment and Climate Change Canada-Canadian Wildlife Service, Kelowna, BC.

Kella Sadler, Senior Species at Risk Biologist, Environment and Climate Change Canada-Canadian Wildlife Service, Delta, BC.

Information sources:

BC Conservation Data Centre. 2014. Occurrence report summary, shape ID: 81984, Nugget Moss. BC Ministry of Environment, Victoria, BC. Web site: http://delivery.maps.gov.bc.ca/ess/sv/cdc [accessed April 12, 2016.

BC Conservation Data Centre. 2016. Species summary: *Microbryum vlassovii*. BC Ministry of Environment. Web site: http://a100.gov.bc.ca/pub/eswp/ [accessed April 12, 2016].

British Columbia Bryophyte Recovery Team. 2009. Recovery strategy for the nugget moss (*Microbryum vlassovii*) in British Columbia. Prepared for the BC Ministry of Environment, Victoria, BC.

COSEWIC. 2006. COSEWIC assessment and status report on the nugget moss *Microbryum vlassovii* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa.

Environment Canada. 2012. Recovery strategy for the Nugget Moss (*Microbryum vlassovii*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa, Canada.

McIntosh, T.T. 1989. Bryophyte Records from the Semiarid Steppe of Northwestern North America, including Four Species New to North America. The Bryologist 92:356–362.

Stanley, M. 2009. Proposal for a Dallas-Barnhartvale Nature Park management plan. Report prepared for the Dallas Community Association, Kamloops, BC. Web site: http://www.parkfriends.ca/downloads/managementplanproposal.pdf [accessed April 15, 2016].

Zander, R.H. 2007. *Microbyum*. Pp. 627–631*in* Flora of North America Editorial Committee, editor. Flora of North America, Volume 27 Bryophyta, part 1. Oxford University Press, New York, NY.

TECHNICAL SUMMARY

Microbryum vlassovii

Nugget Moss

Phasque de Vlassov

Range of occurrence in Canada (province/territory/ocean): British Columbia

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines (2011) is being used)	unknown
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	The subpopulation at the Penticton site has been persistent but the number of mature individuals over time is uncertain. Population size at other locations unknown but would certainly be fewer than 250.
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	unknown
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	unknown
Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	a. yes b. yes c. no
Are there extreme fluctuations in number of mature individuals?	Unknown, but unlikely

Extent and Occupancy Information

Estimated extent of occurrence (EOO)	8 km²
Index of area of occupancy (IAO) (Always report 2x2 grid value).	8 km² (assuming the Rykert's Lake occurrence is extirpated)

Is the population "severely fragmented" i.e., is >50% of its total area of occupancy in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. no b. yes
Number of "locations"∗ (use plausible range to reflect uncertainty if appropriate)	2 (not including Rykert's Lake which is presumed extirpated)
Is there an [observed, inferred, or projected] decline in extent of occurrence?	yes, observed (Rykerts Lake: location sampled in 1980, Nugget Moss identified in sample in 2013, site visit determined Nugget Moss likely extirpated at location in 2016)
Is there an [observed, inferred, or projected] decline in index of area of occupancy?	yes, observed, based on loss of Rykerts Lake occurrence
Is there an [observed, inferred, or projected] decline in number of subpopulations?	yes, observed, based on loss of Rykerts Lake occurrence
Is there an [observed, inferred, or projected] decline in number of "locations"*?	yes, observed, based on loss of Rykerts Lake occurrence
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat?	Extent of habitat at the Penticton and Kamloops occurrences has remained relatively consistent; however, the presence of invasive vascular plants at one Penticton microsite could reduce habitat quality at this location.
Are there extreme fluctuations in number of subpopulations?	no
Are there extreme fluctuations in number of "locations"∗?	no
Are there extreme fluctuations in extent of occurrence?	no
Are there extreme fluctuations in index of area of occupancy?	no

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	**N Mature Individuals**
Penticton	1-8 colonies with a total of at least 8-10 individuals
Kamloops	unknown
Rykerts Lake	unknown
Total	1-8 colonies with a total of at least 8-10 individuals

∗ See Definitions and Abbreviations on COSEWIC website and IUCN (Feb 2014) for more information on this term.

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Quantitative analysis not completed

Threats (direct, from highest impact to least, as per the IUCN Threats Calculator)

Was a threats calculator completed for this species? no

no, identified threats are:

i. (high) Road/utility construction and maintenance
ii. (moderate) Recreational activities such as hiking, dog walking, and mountain biking
iii. (moderate) Encroachment by invasive vascular plants
iv. (high) Unusual storm events
v. (unknown) Residential development
vi. (high) Driving/parking vehicles on road shoulders
vii. (moderate) soil removal
viii. (high) erosion control/hydroseeding

What additional limiting factors are relevant? Documented Nugget Moss locations in BC have been limited to silt banks associated by glacio-lacustrine processes and are of limited extent in the province.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	Nugget Moss has been documented at two locations in California in 1993 and 1998. Size and current status of these locations is unknown.
Is immigration known or possible?	unlikely
Would immigrants be adapted to survive in Canada?	probably
Is there sufficient habitat for immigrants in Canada?	probably
Are conditions deteriorating in Canada?+	no
Are conditions for the source population deteriorating?+	unknown
Is the Canadian population considered to be a sink?+	unknown
Is rescue from outside populations likely?	no

Data Sensitive Species

Is this a data sensitive species? no

Status History

COSEWIC: Designated Endangered in November 2006 and in November 2016.

+ See Table 3 (Guidelines for modifying status assessment based on rescue effect) .

Additional Sources of Information:
BC Conservation Data Centre. 2016. Species summary: *Microbryum vlassovii*. BC Ministry of Environment. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed April 12, 2016).

British Columbia Bryophyte Recovery Team. 2009. Recovery strategy for the nugget moss (*Microbryum vlassovii*) in British Columbia. Prepared for the BC Ministry of Environment, Victoria, BC.

COSEWIC. 2006. COSEWIC assessment and status report on the nugget moss *Microbryum vlassovii* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa.

Environment Canada. 2012. Recovery strategy for the Nugget Moss (*Microbryum vlassovii*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa, Canada.

McIntosh, T. T. 1989. Bryophyte Records from the Semiarid Steppe of Northwestern North America, including Four Species New to North America. The Bryologist 92:356–362.

Zander, R. H. 2007. *Microbyum*. Pages 627–631 *in* Flora of North America Editorial Committee, editor. Flora of North America, Volume 27 Bryophyta, part 1. Oxford University Press, New York, NY.

Status and Reasons for Designation:

Status:	**Alpha-numeric codes:**
Endangered	D1

Reasons for designation:
In Canada, this globally rare moss is known from only three localized sites in semi-arid areas of south-central British Columbia. One of the sites is extirpated and another has not been seen since 1980. The moss grows on fine soils on the steep portions of silt banks in early stages of plant community development in semi-arid grassland ecosystems. The extremely small populations render this moss vulnerable to disturbance. Threats include road development and maintenance, recreational activities, and competition from vascular plants.

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Population trends are unknown.
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. Although the index of area of occupancy and extent of occurrence are below the threshold for Endangered and there are fewer than 5 locations, no other subcriteria are met (there are no extreme fluctuations, no severe fragmentation, and the declines in the extent of occurrence, index of area of occupancy, and the loss of the Rykerts Lake location may have occurred outside the time series of this assessment).
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. Population trends are unknown.
Criterion D (Very Small or Restricted Population): Meets Endangered, D1, since the total number of mature individuals does not exceed the 250 maximum for this criterion.
Criterion E (Quantitative Analysis): Not done.

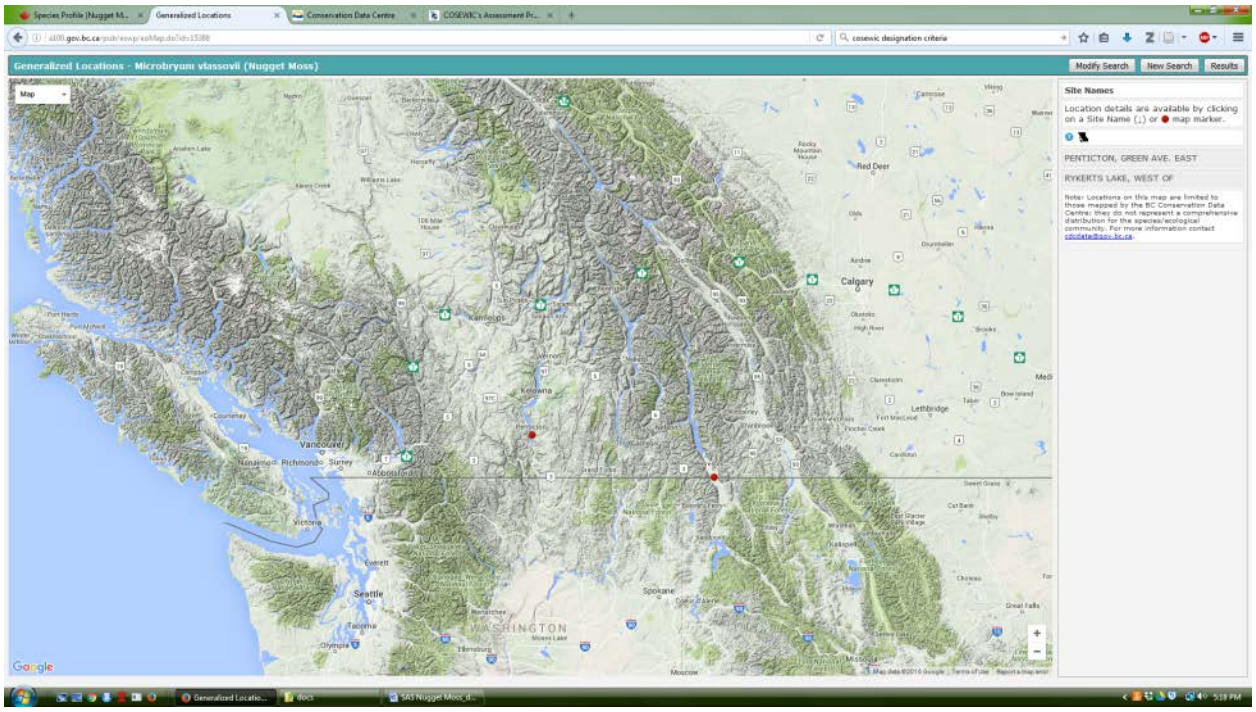

Figure 1. Map of subpopulations of Nugget Moss tracked by the BC Conservation Data Centre showing the approximate location of the Rykerts Lake collection. Note that the Kamloops location is not shown.

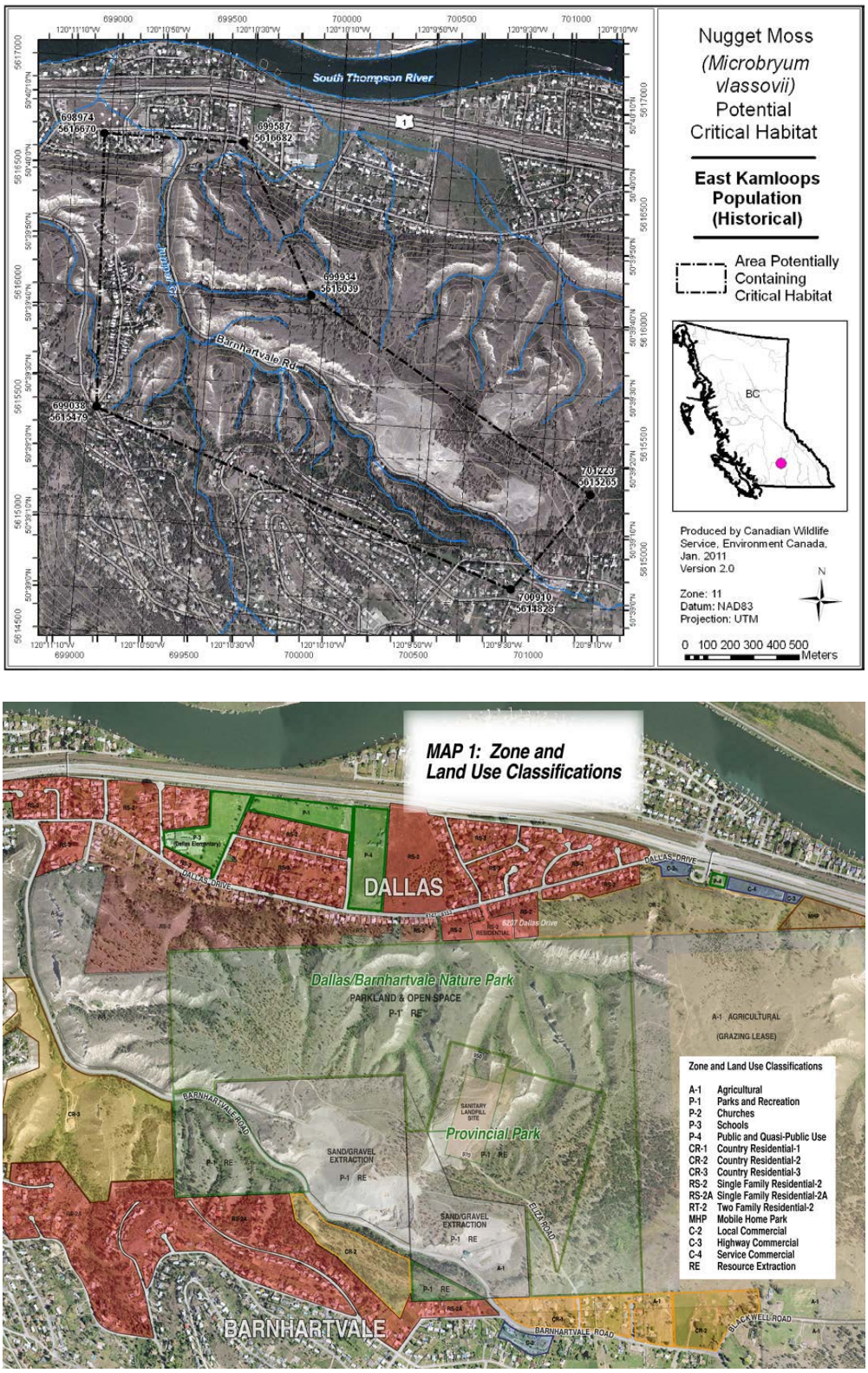

Figure 2. Map of potential critical habitat for the Kamloops subpopulation (Environment Canada 2012) and location of the Dallas-Barnhartvale Nature Park (Stanley 2009).

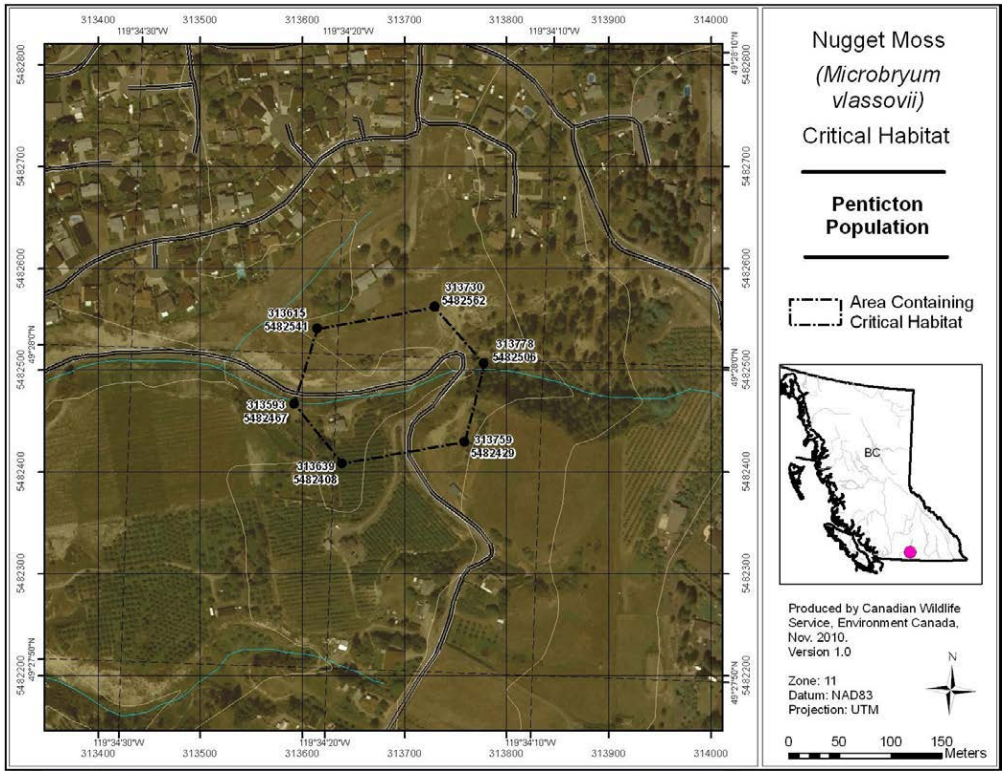

Figure 3. Map of critical habitat for the Penticton subpopulation (Environment Canada 2012).

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2016)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

Environment and Climate Change Canada
Canadian Wildlife Service
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Canada

The Canadian Wildlife Service, Environment and Climate Change Canada, provides full administrative and financial support to the COSEWIC Secretariat.