

COSEWIC
Assessment and Status Report

on the

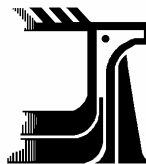
Dwarf Woolly-heads
Psilocarphus brevissimus

in Canada



ENDANGERED
2003

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



COSEPAC
COMITÉ SUR LA SITUATION DES
ESPÈCES EN PÉRIL
AU CANADA

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

Please note: Persons wishing to cite data in the report should refer to the report (and cite the author(s)); persons wishing to cite the COSEWIC status will refer to the assessment (and cite COSEWIC). A production note will be provided if additional information on the status report history is required

COSEWIC 2003. COSEWIC assessment and status report on the dwarf woolly-heads *Psilocarphus brevissimus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 19 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Douglas, G.W., J.L. Penny and K. Barton. 2003. COSEWIC status report on the dwarf woolly-heads *Psilocarphus brevissimus* in Canada in COSEWIC assessment and status report on the dwarf woolly-heads *Psilocarphus brevissimus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1- 19 pp.

Production note: COSEWIC acknowledges George W. Douglas, Jenifer L. Penny and Ksenia Barton for writing the status report on the Dwarf Woolly heads *Psilocarphus brevissimus*, in Canada. COSEWIC also gratefully acknowledges the financial support of the British Columbia Conservation Data Centre for the preparation of this report. The report was edited by Erich Haber, COSEWIC Plants and Lichens Specialist Subcommittee Co-chair.

For additional copies contact:

COSEWIC Secretariat
c/o Canadian Wildlife Service
Environment Canada
Ottawa, ON
K1A 0H3

Tel.: (819) 997-4991 / (819) 953-3215
Fax: (819) 994-3684
E-mail: COSEWIC/COSEPAC@ec.gc.ca
<http://www.cosewic.gc.ca>

Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur le psilocarpe nain (*Psilocarphus brevissimus*) au Canada.

Cover illustration:
Dwarf Woolly-heads — line drawing by Elizabeth J. Steven in Douglas et al. 1998, 2002b.

©Her Majesty the Queen in Right of Canada 2004
Catalogue No. CW69-14/367-2004E-PDF
ISBN 0-662-37043-0
HTML: CW69-14/367-2004E-PDF
0-662-37044-9



Recycled paper



COSEWIC Assessment Summary

Assessment Summary – November 2003

Common name

Dwarf woolly-heads

Scientific name

Psilocarphus brevissimus

Status

Endangered

Reason for designation

An annual herb present at only three sites at the northern edge of its range within very small vernal pool habitats of restricted occurrence. It is subject to extreme population fluctuations as a result of seasonal variance in precipitation. The species occurs on private lands potentially subject to human disturbances from ATV recreational use, roadside weed control and other forms of land use followed on Agricultural Land Reserve properties.

Occurrence

British Columbia

Status history

Designated Endangered in November 2003. Assessment based on a new status report.



COSEWIC Executive Summary

Dwarf Woolly-heads *Psilocarphus brevissimus*

Species Information

Psilocarphus brevissimus is a prostrate, matted annual herb with a short taproot. The plants are from 8 to 20 cm long. The few leaves are restricted to the stems and are opposite, lance-linear to lance-oblong or lance-triangular, 4-15 mm long and white woolly-hairy. The flower heads are disciform, usually solitary in the leaf axils or at the tips of the branches and lack involucre. The receptacular bracts are 2.4-4 mm long, hooded and balloon-like. The achenes are more or less cylindrical, glabrous, nerve-less and tipped with a small, 1-2 mm long, offset style. There is no pappus.

Distribution

Psilocarphus brevissimus ranges from southcentral British Columbia, south in the western United States to Montana, Utah and Baja California, Mexico. It is also disjunct in Chile and Argentina. In Canada, the taxon is known only from the Similkameen River valley south of Princeton along a 2.6 km stretch of Highway 3 in southcentral British Columbia.

Habitat

Psilocarphus brevissimus occurs in dried-out (wet in spring), compacted, calcareous clay soils in vernal pools in large forest openings dominated by *Plagiobothrys scouleri* (Scouler's popcornflower) and *Polygonum polygaloides* ssp. *confertiflorum* (Close-flowered knotweed). Associates in these sites include *Danthonia unispicata* (One-spike oatgrass), *Myosurus minimus* (tiny mousetail), and *Alopecurus carolinianus* (Carolina meadow-foxtail). *Psilocarphus brevissimus* also occurs at the edge of ephemeral ponds on the same type of substratum.

Biology

Little information is available on the biology of *Psilocarphus brevissimus* in British Columbia. Only basic facts about its life cycle and reproduction have been compiled. In British Columbia, flowering occurs in June. *Psilocarphus brevissimus* is an annual herb that likely reproduces primarily by self-pollination. Animals may be the primary vectors

of seed dispersal. Birds may disperse seeds over small and large geographic areas. Finally, cottontail rabbits (*Sylvilagus* spp.) are potential vectors of dispersal of seeds. Nuttall's cottontail rabbit (*S. nuttallii*) occurs in grasslands in British Columbia.

Population sizes and trends

There are three recently surveyed populations of *Psilocarphus brevissimus* covering about 0.9 ha in the Similkameen River valley, south of Princeton, British Columbia. They occur over approximately a 2.6 km stretch of highway. There were high numbers of plants in 2002 (approximately 900,000), a large increase from 2000, but numbers have been reduced significantly again in 2003 due to the dry conditions.

Limiting factors and threats

The greatest threat to the populations of *P. brevissimus* is its vulnerability to extirpation from BC and Canada. The populations occur on two private properties in the Agricultural Land Reserve. Some of the activities that are permitted in the land reserve may not be consistent with the persistence of this species. Any developments that even slightly change the hydrology of the site could be devastating to this taxon. Off-road recreational vehicle use could alter habitat conditions radically enough to make it inhospitable for this species and suitable for weedy species. Weed control measures are also a potential threat.

Special significance of the species

The vernal pools in the Princeton area in British Columbia are a restricted habitat type in the region containing an assemblage of rare plants that occur nowhere else in the province and thus warrant the status of a unique area of high conservation value. These populations are also unique because they are peripheral, or at the northern extent of their geographic range. These isolated peripheral populations are often genetically and morphologically divergent from central populations and may have an evolutionary and ecological significance out of proportion to the percentage of the species they represent.

Existing protection or other status designations

Provincially, *P. brevissimus* has been ranked as S1 by the Conservation Data Centre and appears on the British Columbia Ministry of Sustainable Resource Management red list. This is the most critical rank that can be applied to species at the provincial level. However, there is currently no specific endangered species legislation in place for the protection of vascular plants in British Columbia that have been given this critical rank. The populations of *P. brevissimus* in British Columbia, however, may be afforded some protection against certain types of property development because they occur on two private properties that fall within the Agricultural Land Reserve. Some intensive uses are not prohibited and, as a result, populations of rare plants on these private lands are not secure.



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. 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 and include 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 organizations (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership, chaired by the Canadian Museum of Nature), three nonjurisdictional members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The committee meets to consider status reports on candidate species.

DEFINITIONS (After May 2003)

Species	Any indigenous species, subspecies, variety, or geographically or genetically distinct population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* 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.



Environment
Canada

Canadian Wildlife
Service

Environnement
Canada

Service canadien
de la faune

Canada

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

COSEWIC Status Report

on the

Dwarf Woolly-heads *Psilocarphus brevissimus*

in Canada

George W. Douglas¹
Jenifer L. Penny²
Ksenia Barton³

2003

¹6230 North Road
Duncan, BC
V9L 6K9

²P.O. Box 9993
STN PROV GOVT
Victoria, BC
B8W 9R7

³204-4272 Albert Street
Burnaby, BC
V5C 2E8

TABLE OF CONTENTS

SPECIES INFORMATION.....	3
Name and classification.....	3
Description.....	3
DISTRIBUTION.....	4
Global range.....	4
Canadian range.....	5
HABITAT.....	8
Habitat requirements.....	8
Trends.....	8
Protection/ownership.....	8
BIOLOGY.....	9
General.....	9
Reproduction.....	9
Movements/dispersal.....	9
POPULATION SIZES AND TRENDS.....	10
LIMITING FACTORS AND THREATS.....	10
SPECIAL SIGNIFICANCE OF THE SPECIES.....	12
EXISTING PROTECTION OR OTHER STATUS.....	12
International status.....	12
National and provincial status.....	12
SUMMARY OF STATUS REPORT.....	13
TECHNICAL SUMMARY.....	14
ACKNOWLEDGEMENTS.....	16
LITERATURE CITED.....	16
BIOGRAPHICAL SUMMARY OF THE REPORT WRITERS.....	18
AUTHORITIES CONSULTED.....	18
COLLECTIONS EXAMINED.....	18
FIELDWORK.....	19

List of figures

Figure 1. Illustration of <i>Psilocarphus brevissimus</i>	4
Figure 2. Distribution of <i>Psilocarphus brevissimus</i> var. <i>brevissimus</i> in North America.....	6
Figure 3. Distribution of <i>Psilocarphus brevissimus</i> in British Columbia.....	7

List of tables

Table 1. Summary of Localities and Associated Species of <i>Psilocarphus brevissimus</i>	9
Table 2. Locations and Population Sizes for <i>Psilocarphus brevissimus</i> south of Princeton.....	10

SPECIES INFORMATION

Name and classification

Scientific name: *Psilocarphus brevissimus* var. *brevissimus* Nutt.¹
Synonyms: *Psilocarphus oreganus* Nutt. var. *brevissimus* [Nutt.] Jeps.;
Bezanilla chilensis Remy in Gay; *Psilocarphus chilensis* Remy;
Psilocarphus globiferous Nutt.
Common name: Dwarf woolly-heads
Family: Asteraceae (Compositae); Sunflower family
Major plant group: Dicot flowering plant

Description

Dwarf Woolly-heads, *Psilocarphus brevissimus* var. *brevissimus* Nutt., is a member of a genus of five species that occur in the Americas (Cronquist 1950). It is one of three species occurring in British Columbia and Canada (Douglas 1998; Douglas *et al.* 2002a). Two varieties of *P. brevissimus*, var. *brevissimus* and var. *multiflorus* Cronq., are recognized. The var. *multiflorus* only occurs in California (Morefield 1993). *Psilocarphus brevissimus* var. *brevissimus* Nutt. was first recorded in Canada by Douglas *et al.* (1998a). Since the species is represented in Canada only by the typical variant, the name *P. brevissimus*, without the infraspecific designation, is used throughout this report.

Psilocarphus brevissimus is a prostrate, matted annual herb with a short taproot (Figure 1; Douglas 2002a). The plants are from 8 to 20 cm long. The few leaves are restricted to the stems and are opposite, lance-linear to lance-oblong or lance-triangular, 4-15 mm long and white woolly-hairy. The flower heads are disciform, usually solitary in the leaf axils or at the tips of the branches and lack involucre. The receptacular bracts are 2.4-4 mm long, hooded and balloon-like. The achenes are more or less cylindrical, glabrous, nerve-less and tipped with a small, 1-2 mm long, offset style. There is no pappus.

In British Columbia, herbarium specimens of *P. brevissimus* may be distinguished from *P. elatior* by their prostrate and matted habit and much narrower leaves. It is separated from *P. tenellus* var. *tenellus* by its longer (2.5-4 mm versus 1.3-2.5 mm long) receptacular bracts and its much narrower leaves. However, in British Columbia, the species distributions do not overlap.

¹ Taxonomy and nomenclature follows Douglas *et al.* (1998b, 1998c, 1999, 2001).

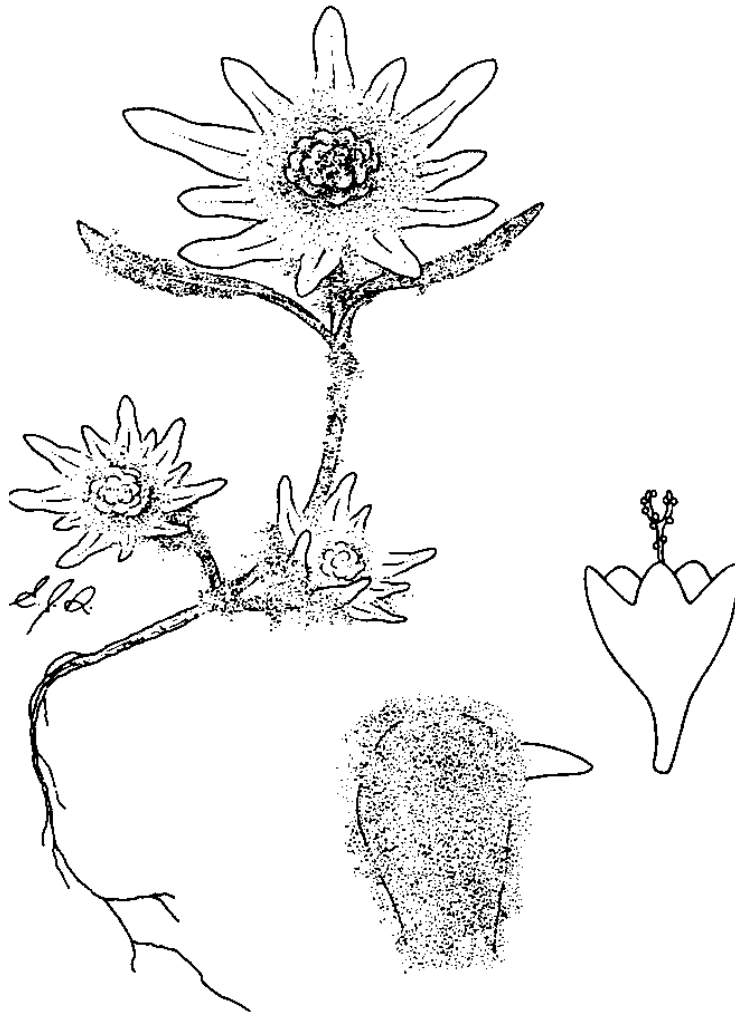


Figure 1. Illustration of *Psilocarphus brevissimus* (Line drawing by Elizabeth J. Steven in Douglas *et al.* 1998, 2002b).

DISTRIBUTION

Global range

Psilocarphus brevissimus ranges from southcentral British Columbia, south in the western United States to Montana, Utah and Baja California, Mexico (Morefield 1993; Cronquist 1994; Figure 2). There are also disjunct populations in Chile and Argentina (Cronquist 1950, 1955, 1994). The nearest known location to the BC populations is in Washington state in Lincoln county, a couple of hundred kilometres to the south. The vernal pools in BC are restricted in size (about .06 hectares), whereas those in the United States are much larger. Dispersal vectors are unknown, but may be either waterfowl or cottontail rabbits. If dispersal vectors are waterfowl, which commonly use

the vernal pools south of the border, they may be unlikely to make stops in the BC vernal pools since they are much less extensive. If dispersal vectors are cottontail rabbits, it is unlikely they will range over such distances, therefore rescue effect from immigration from the US is highly unlikely.

Canadian range

In Canada, the taxon is known only from the Similkameen valley south of Princeton along 2.6 km of Highway 3 in southcentral British Columbia (Figure 3; Douglas 1998; Douglas *et al.* 1998a, 2002a, b).

This species was discovered in British Columbia in 1996. It grows in a natural habitat type (vernal pools) in an undeveloped area with a variety of other native species, so it is unlikely that it was introduced to this site. Furthermore, the region has been generally under-collected so it was likely over-looked. Only one of the other 10 rare plant species that occur in the Princeton area was collected (on one other occasion) prior to 1996. The Princeton area may have been passed by many collectors who were en route from the coast to collecting destinations in the biologically rich Okanagan Valley further east. Another argument that favors this species as a native element is the existence of numerous taxa whose distribution follows a similar pattern in the Pacific Northwest with the northern limit of the species range in British Columbia. The shrub steppe and open forests of southern British Columbia are part of a much larger ecological unit that extends south to Washington, Oregon and other intermountain states.

Finally, in the Species at Risk Act (Section 2.2), it states that for the purposes of a wildlife species in subsection 1, a "species, subspecies or biologically distinct population is, in the absence of evidence to the contrary, presumed to have been present in Canada for at least 50 years" (Government of Canada 2003). Therefore, since there is no support for the argument that it is a non-native species, it should be assumed native.

Frank Lomer was the first collector to intensively investigate this area. He has searched for new sites for this species ever since he found it in 1996 (Lomer, pers. com., 2003). He regularly collects throughout the interior of British Columbia in unique or interesting habitats with hopes of new discoveries and keeps an eye out for several rare species including *Psilocarphus brevissimus*. He has found no other locations during this time. In both 2002 and 2003, he was contracted to undertake specific searches for new sites for the rare species known in the Princeton area. He surveyed the east side of the Similkameen River opposite the known sites without success. Calcareous wetlands and swamps were found to be relatively common in the area but not the special conditions of vernal pools.

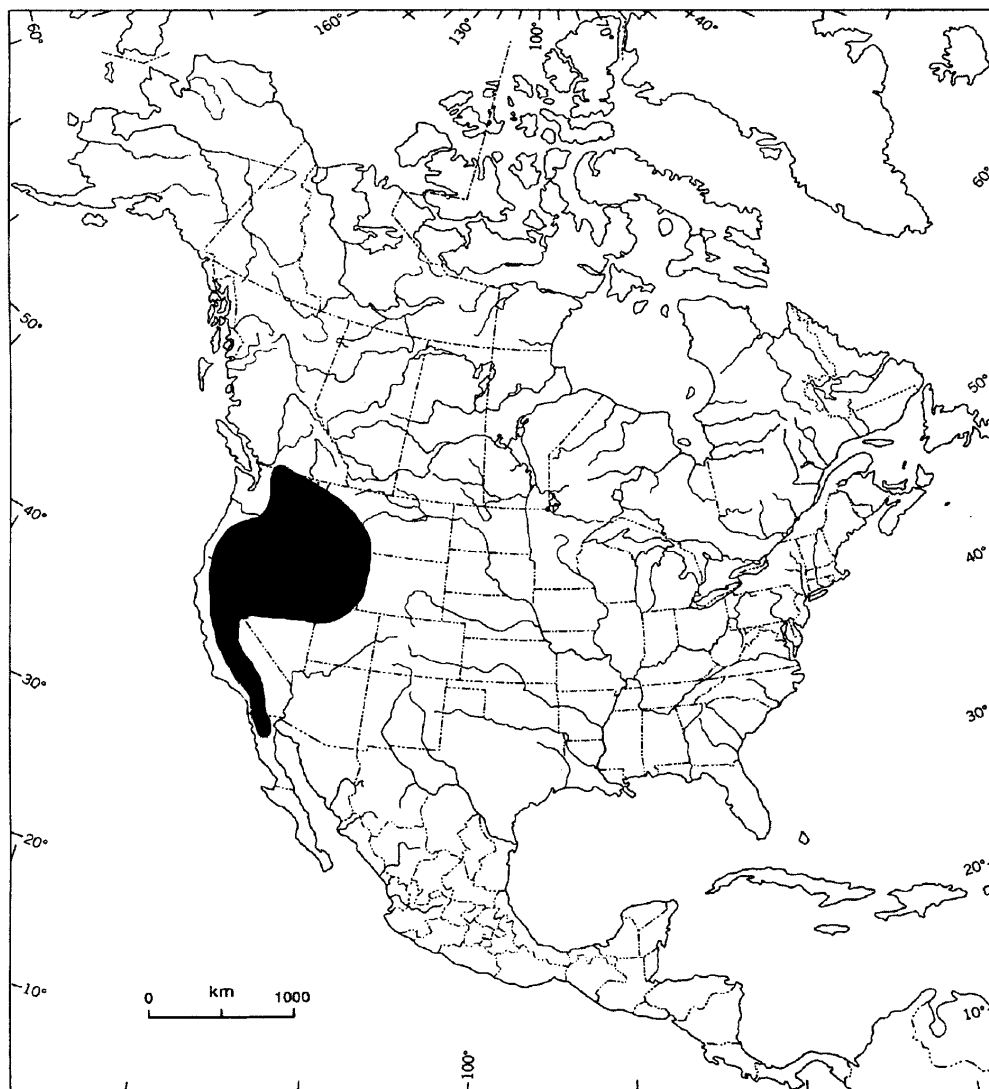


Figure 2. Distribution of *Psilocarphus brevissimus* var. *brevissimus* in North America. The var. *multiflorus* occurs only in California.

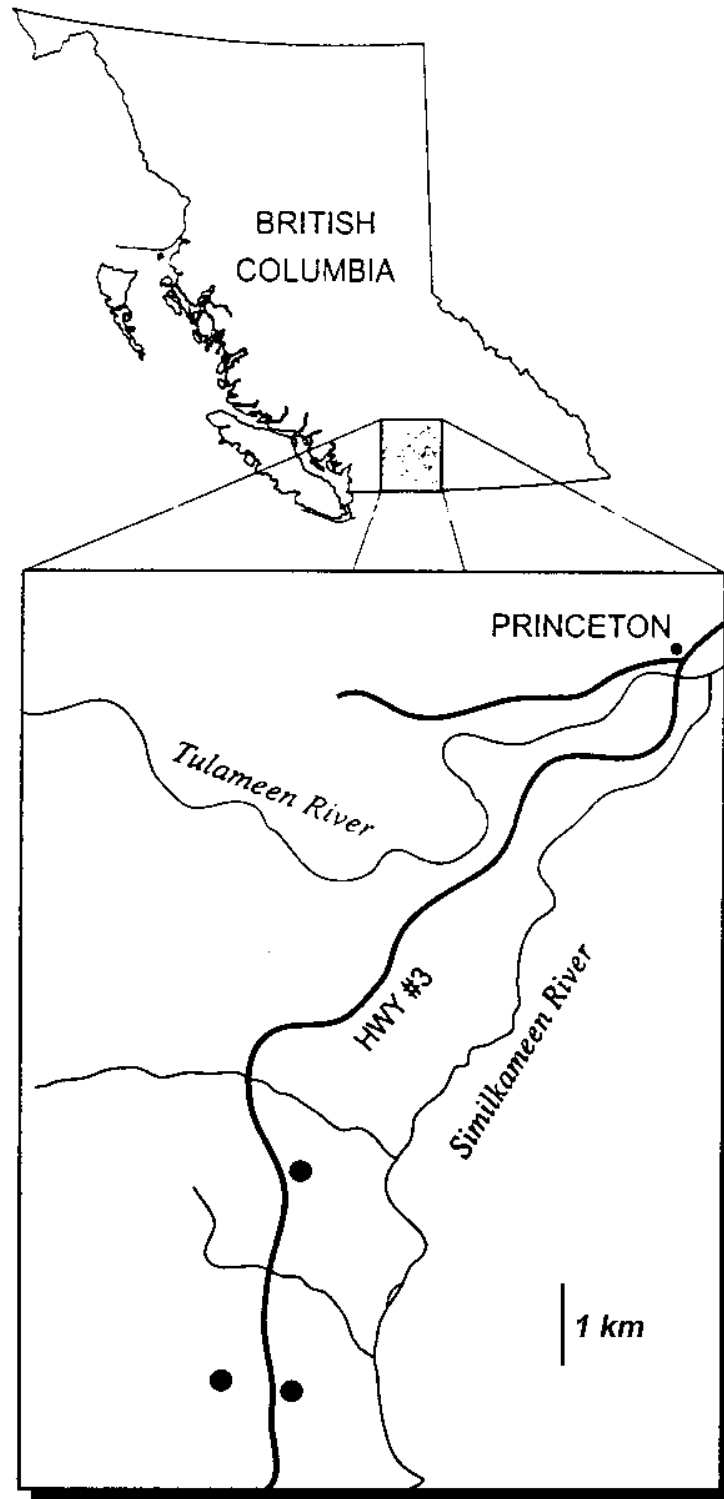


Figure 3. Distribution of *Psilocarphus brevissimus* in British Columbia.

HABITAT

Habitat requirements

Psilocarphus brevissimus occurs in the southern interior of British Columbia along the Similkameen River valley in the lower montane zone in the Interior Douglas-fir biogeoclimatic zone (Hope *et al.* 1991). Climatic conditions in this region are continental, characterized by hot, dry summers, a fairly long growing season and cool winters. A rainshadow effect prevails in this area due to the presence of the Coast-Cascade Mountains to the west.

Within this zone, the sites occur in a matrix of level to gently sloping *Artemisia tridentata* (big sagebrush) shrub/grassland with scattered *Pinus ponderosa* (Ponderosa pine) and *Pseudotsuga menziesii* (Douglas-fir). The area is at the western edge of the distribution of open shrub/grassland at that elevation. Specifically, *P. brevissimus* occurs in calcareous clay soils in vernal pools in large forest openings dominated by *Plagiobothrys scouleri* (Scouler's popcornflower) and *Polygonum polygaloides* ssp. *confertiflorum* (Close-flowered knotweed). Associates in these sites include *Danthonia unispicata* (One-spike oatgrass), *Myosurus minimus* (tiny mouse-tail), *Alopecurus carolinianus* (Carolina meadow-foxtail), *Gnaphalium palustre* (lowland cudweed), and *Deschampsia danthonioides* (annual hairgrass; Table 1). *Psilocarphus brevissimus* also occurs at the edge of ephemeral ponds in the same type of substratum. The vernal pools and ephemeral pond edges are wet in spring and dried out and compacted in the summer.

Psilocarphus brevissimus is considered to be a vernal pool specialist (Schlising and Sanders 1982; Keeley and Zedler 1998; Bauder 2000). The species is able to outcompete grassland species due to its tolerance of inundation, and aquatic/wetland species due to its tolerance of soil desiccation and heat during summer drought (Bauder 2000). Keeley and Zedler (1998) define vernal pools as "precipitation-filled seasonal wetlands inundated during periods when temperature is sufficient for plant growth, followed by a brief waterlogged-terrestrial stage and culminating in extreme desiccating soil conditions of extended duration".

Trends

Past range use appears to have been moderate. Heavy range use could disturb the hydrological conditions that are particularly important in maintaining the sites in an optimal state. There is, however, no evidence to suggest that range use is going to change.

Protection/ownership

The populations of *P. brevissimus* in British Columbia occur on private property in the Agricultural Land Reserve.

Table 1. Summary of Localities and Associated Species of *Psilocarphus brevissimus*.

Population	Associated vascular plant species (including community dominants and co-dominants)
#1 Princeton, SE of Tracey Lake	<i>Gnaphalium palustre</i>
#2 Princeton, ESE of Tracey Lake	<i>Plagiobothrys scouleri</i> , <i>Myosurus minimus</i> , <i>Polygonum aviculare</i> , & <i>Alopecurus carolinianus</i>
#3 Princeton, SE of Stevenson Lake	<i>Plagiobothrys scouleri</i> , <i>Myosurus minimus</i> , <i>Polygonum polygaloides</i> ssp. <i>confertiflorum</i> , <i>Alopecurus carolinianus</i> , <i>Deschampsia danthonioides</i> , & <i>Danthonia unispicata</i>

BIOLOGY

General

Little information is available on the biology of *Psilocarphus brevissimus* in British Columbia including aspects of its physiology and interspecific interactions. Only basic facts about its life cycle and reproduction are known.

Keeley and Zedler (1998) recognize four stages in the annual vernal pool cycle: (1) a wetting phase; (2) an aquatic or inundation phase; (3) a waterlogged-terrestrial phase; and (4) the drought phase. In vernal pool species, germination is typically initiated during the wetting or inundation phases. Flowering is usually initiated during the transition to the waterlogged-terrestrial phase. In the Princeton area of southern British Columbia, this phase occurs during June and fruiting follows during the dessication period.

Reproduction

Psilocarphus brevissimus is an annual herb that likely reproduces primarily by self-pollination. The assumption of a selfing breeding system is based on the taxon's lack of pollinator attracting structures and the proximity of the stigmas to the central pollen-producing flowers. In addition, the abundance of woolly hairs and the lack of achene pappus appear to limit pollen dispersal by wind. Another possibility is that plants set seed without pollination, through asexual reproduction (Cronquist 1950).

Movements/dispersal

Animals may be the primary vectors of seed dispersal for *Psilocarphus brevissimus*. Birds may disperse seeds over small and large geographic areas. The use of vernal pools by various migrating avian species, particularly waterfowl and shorebirds, is well documented in other regions (Silveira 1998). Finally, cottontail rabbits (*Sylvilagus* spp.) are potential agents of dispersal of *P. brevissimus* seeds. A study in

California found that seeds were commonly found in cottontail pellets. The excreted seeds germinated easily, suggesting that the lagomorphs may be important agents of seed dispersal between vernal pools on a small scale (Zedler and Black 1992). British Columbia sites for *P. brevissimus* may provide habitat for Nuttall's cottontail (*Sylvilagus nuttallii*), a species that frequents grasslands.

POPULATION SIZES AND TRENDS

There are three recently surveyed populations of *Psilocarphus brevissimus* covering about .96 ha in the Similkameen River valley, south of Princeton, British Columbia (Table 1). These populations occur along an approximately 2.6 km stretch of Highway 3 (Figure 3). In 2002, they numbered from 450 to approximately 900,000 plants, an increase from 2000. Long-term trends for these populations are unknown but can be expected to vary markedly in the short term due to differences in yearly seed germination and seedling success. The population numbers at the Stevenson Lake site increased drastically from 2000 to 2002 (Lomer, pers. com., 2002). Then they drastically dropped in 2003 from approximately 900,000 to 300 plants (Lomer, pers. com., 2003).

Population sizes of this annual herb are strongly tied to annual precipitation patterns (Bauder 2000). This is typical of vernal pool plants (Griggs and Jain 1983). The drastic decrease in population size at Stevenson Lake is likely attributed to the 2003 drought conditions in BC.

Table 2. Locations and Population Sizes for *Psilocarphus brevissimus* south of Princeton

Collection site	Last observation	Collector	Number of plants/area (m ²)
#1 Princeton, SE of Tracey Lake	1996	Lomer	30/unknown
#2 Princeton, ESE of Tracey Lake	2002	Douglas & Penny	450/392
#3 Princeton, SE of Stevenson Lake	2003	Lomer	330-340/570

LIMITING FACTORS AND THREATS

In general, only 2% of BC grassland areas had protected status in 1992 (The Land Conservancy of BC 2002); however, grassland and open forest habitats are threatened by a number of factors. Development pressure from the expanding population, habitat fragmentation, degradation due to weed invasion, and off-road vehicle activity have been identified as threats (BC WLAP 2002).

The most imminent threat to the populations of *Psilocarphus brevissimus* is their vulnerability to extirpation due to their small occupied area (.96 ha). Such populations

are extremely vulnerable to demographic or environmental variation (Primack 1998). Since suitable habitats for this species are also extremely restricted, the opportunities for colonization and expansion are also limited.

Another threat that may have an impact is recreational off-road vehicle use. The authors observed evidence of ATV and dirt bike use in the immediate area of the sites in 2002. However, the precise area of at least one of the populations is well-fenced at this time and not yet disturbed. When moist, this habitat would be highly susceptible to this kind of recreation and, at the same time, be at its most desirable to off-road users. Overuse of the habitat in this way could disturb the sites enough to radically alter the substrate, and promote the establishment of non-native species.

The private property where the *P. brevissimus* populations occur is in the Agricultural Land Reserve (ALR), where primary land use is agriculture. On this land, development pressures may not appear to be an issue at this time. There have been no applications to have the private properties taken out of the ALR for development (Wallace, pers. com., 2003), but the land owners may decide to apply in the future. Housing sales have trended upwards in the last 12-18 months in the Princeton area in tandem with markets in the Okanagan Valley (Fabri, pers. com., 2003).

The ALR status may prevent subdivision development, but does allow other activities that could also potentially threaten the populations. For instance, some types of fill/soil removal are allowable without application to the Agricultural Land Commission (Provincial Agricultural Land Commission 2003). Any developments that even slightly change the hydrological conditions could be devastating to this taxon. In recent years many tracts of ALR land in southern British Columbia have been converted to housing developments, shopping malls and golf courses, either by decisions of the Agricultural Land Commission or very rarely by an 'order in council' by the sitting provincial legislature.

In addition, in the future, agriculture tourism may be permitted since it is a developing business in the area (Town of Princeton 2003). According to the University of California Small Farm Centre, agriculture tourism operations provide a bridge between urban and rural dwellers (University of California Small Farm Centre 2003). Potential enterprises include festivals, agriculture food and craft shows, guest lodging, off-road motorcycling, ATV recreation, mountain biking, rodeos, tours, and horseback riding. These enterprises could include some intensive land use in the future. Motorcycling, ATV use and horseback riding could all potentially have serious impacts on rare plants if in they occur in area occupied by plants.

Another potential threat is weed control activities. Under the Weed Control Act, an occupier must control noxious weeds growing or located on land and premises, thus marginally specific chemical weed control substances that kill broad-leaved plant species would likely kill *P. brevissimus*. The close proximity of the populations to the highway and power line rights of way also presents a problem in terms of weed control.

SPECIAL SIGNIFICANCE OF THE SPECIES

The vernal pools in the Princeton area in British Columbia are a restricted habitat type in the region containing an assemblage of rare plants that occur nowhere else in the province and thus warrant the status of a unique area of conservation value. *Psilocarphus brevissimus* occurs in vernal pools, habitats that have increasingly been recognized as being ecologically and floristically unique. Studies have documented assemblages of species that are able to tolerate the extreme flooding and drying events of the annual vernal pool cycle (Schlising and Sanders 1982; Keeley and Zedler 1998; Bauder 2000). Vernal pools often support species that have become rare due to loss of the habitat. The moisture regimes of vernal pools usually prevent the invasion of most non-native species.

These populations are also unique because they are peripheral, or at the northern extent of their geographic range. They may not be globally endangered, but represent isolated peripheral populations that may be genetically and morphologically divergent from central populations and may have an evolutionary and ecological significance out of proportion to the percentage of the species they represent (Mayr 1982; Lesica and Allendorf 1995). The selfing breeding system of *Psilocarphus brevissimus* may further contribute to genetic differentiation among the populations. The protection of genetically distinct peripheral populations may be important for the long-term survival of the species as a whole (Lesica and Allendorf 1995).

EXISTING PROTECTION OR OTHER STATUS

International status

Globally, *P. brevissimus* has a rank of G4T? indicating that in most of its range the species is "apparently secure, because uncommon but not rare, and usually widespread with possible cause for long-term concern" (NatureServe 2001). The status of the variety is unknown.

National and provincial status

Since the species is restricted to British Columbia, it has a national rank in Canada of N1. Provincially, *P. brevissimus* has been ranked as S1 by the Conservation Data Centre and appears on the British Columbia Ministry of Sustainable Resource Management red list (Douglas *et al.* 2002b). This is the most critical rank that can be applied to species at the provincial level and indicates that the species is "critically imperiled because of extreme rarity (typically five or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation or extinction".

There is currently no specific endangered species legislation in place for the protection of vascular plants in British Columbia that have been given this critical rank.

The populations of *P. brevissimus* in British Columbia, however, may be afforded some protection against certain types of property development because they occur on a private property that falls within the Agricultural Land Reserve. In these lands, agriculture is recognized as the primary land use, but some activities, which are allowable, could be inconsistent with the habitat requirements of *P. brevissimus*. As a result, without active stewardship, populations of rare plants on these private lands are not secure.

SUMMARY OF STATUS REPORT

Only three extant populations, over a 2.6 km stretch of Highway 3 south of Princeton, are known in British Columbia. Suitable habitats for *P. brevissimus* are extremely restricted in Canada only occurring in the Princeton area, thus opportunities for colonization are extremely limited. The population is vulnerable to extirpation due to its small occupied area and the possibility of demographic and environmental variation and loss of genetic variability. Recreational off-road vehicle use, evidence of which has been observed in the immediate area, may threaten the integrity of its habitat. Furthermore, activities permitted in the Agricultural Land Reserve (ALR) where the populations occur may be inconsistent with its habitat requirements. The Princeton area has seen an increase in housing starts that warns of possible future development that could eventually involve removal of private properties from the ALR. Finally, the populations of *P. brevissimus* in British Columbia are at the northern extent of their range and may represent populations that are genetically distinct and important for the long-term survival and evolution of the species.

TECHNICAL SUMMARY

Psilocarphus brevissimus

Dwarf Woolly-heads

psilocarphe nain

Range of Occurrence in Canada: British Columbia

Extent and Area Information	
<ul style="list-style-type: none"> Extent of occurrence (EO)(km²) Based on area encompassed within a polygon of the three sites. 	<3 km ²
<ul style="list-style-type: none"> Specify trend in EO 	Unknown, probably stable
<ul style="list-style-type: none"> Are there extreme fluctuations in EO? 	Unlikely as there is very little suitable habitat in which to spread
<ul style="list-style-type: none"> Area of occupancy (AO) (km²) Based on an approximation of area occupied. 	<<1 km ² (<1ha)
<ul style="list-style-type: none"> Specify trend in AO 	Unknown, probably stable
<ul style="list-style-type: none"> Are there extreme fluctuations in AO? 	Unlikely as there is very little suitable habitat in which to spread
<ul style="list-style-type: none"> Number of known or inferred current locations 	3
<ul style="list-style-type: none"> Specify trend in # 	Unknown, probably stable
<ul style="list-style-type: none"> Are there extreme fluctuations in number of locations? 	Unlikely as there is very little suitable habitat in which to spread
<ul style="list-style-type: none"> Specify trend in area, extent or quality of habitat 	Unknown, probably stable
Population Information	
<ul style="list-style-type: none"> Generation time (average age of parents in the population) 	1 year
<ul style="list-style-type: none"> Number of mature individuals 	ca. 1000 -1,000,000
<ul style="list-style-type: none"> Total population trend: 	Natural fluctuation occurs but no trend data as such
<ul style="list-style-type: none"> % decline over the last/next 10 years or 3 generations. 	N/A
<ul style="list-style-type: none"> Are there extreme fluctuations in number of mature individuals? 	Yes, due to annual fluctuations in climatic conditions and site hydrological regime
<ul style="list-style-type: none"> Is the total population severely fragmented? 	Yes
<ul style="list-style-type: none"> Specify trend in number of populations 	Unknown, probably stable
<ul style="list-style-type: none"> Are there extreme fluctuations in number of populations? 	Unlikely, but some annual fluctuations could occur due to climatic conditions and site hydrological regime
List populations with number of mature individuals in each: 1-~30, 2-~450, 3-~330-340	
Threats (actual or imminent threats to populations or habitats)	
<ul style="list-style-type: none"> - Activities such as filling allowable in ALR lands - Off-road vehicle use and consequent weed establishment - Weed control activities 	
Rescue Effect (immigration from an outside source)	
<ul style="list-style-type: none"> Status of outside population(s) USA: Unknown 	
<ul style="list-style-type: none"> Is immigration known or possible? 	Unknown
<ul style="list-style-type: none"> Would immigrants be adapted to survive in Canada? 	Unknown
<ul style="list-style-type: none"> Is there sufficient habitat for immigrants in Canada? 	Unlikely
<ul style="list-style-type: none"> Is rescue from outside populations likely? 	Unlikely
Quantitative Analysis	
N/A	
Current Status	
COSEWIC: Endangered	

Status and Reasons for Designation

Status: Endangered	Alpha-numeric code: B1ac(iv)+2ac (iv)
Reasons for Designation: An annual herb present at only three sites at the northern edge of its range within very small vernal pool habitats of restricted occurrence. It is subject to extreme population fluctuations as a result of seasonal variance in precipitation. The species occurs on private lands potentially subject to human disturbances from ATV recreational use, roadside weed control and other forms of land use allowed on Agricultural Land Reserve properties.	

ACKNOWLEDGEMENTS

We thank Frank Lomer for his assistance in re-locating the populations of *Psilocarphus brevissimus* in 2002 and 2003.

Funding for the preparation of this status report was provided by the British Columbia Conservation Data Centre.

LITERATURE CITED

- Bauder, E.T. 2000. Inundation effects on small-scale plant distributions in San Diego, California vernal pools. *Aquatic Ecology* 34:43-61.
- British Columbia Ministry of Water, Land and Air Protection (BC WLAP). 2002. South Okanagan Lower Similkameen Habitat Atlas for Wildlife at Risk. BC Ministry of Water, Land and Air Protection, Penticton, BC. http://wlapwww.gov.bc.ca/sir/fwh/wld/atlas/introduction/intro_index.html [Jun. 3, 2002].
- Cronquist, A. 1950. A review of the genus *Psilocarphus*. *Research Studies of the State College of Washington* 18: 71-89.
- Cronquist, A. 1955. *Vascular plants of the Pacific Northwest. Part 5: Compositae.* University of Washington Press, Seattle, WA. 343 pp.
- Cronquist, A. 1994. *Intermountain flora-vascular plants of the Intermountain West, USA, Volume five: Asterales.* New York Botanical Garden, New York, NY. 496 pp.
- Douglas, G.W. 1998. Asteraceae. Pp. 96-392 in G.W. Douglas, G.B. Straley, and D. Meidinger (eds.). *Illustrated flora of British Columbia Volume 1. Gymnosperms and Dicotyledons (Aceraceae through Asteraceae).* British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests, Victoria, BC. 436 pp.
- Douglas, G.W., F. Lomer, and Hans L. Roemer. 1998a. New or rediscovered native vascular plant species in British Columbia. *Canadian Field-Naturalist* 112: 276-279.
- Douglas, G.W., D. Meidinger and J.L. Penny. 2002a. *Rare Native Vascular Plants of British Columbia. Second edition.* Province of British Columbia. Victoria, BC. 359 pp.
- Douglas, G.W., D. Meidinger and J. Pojar. 1999. *Illustrated flora of British Columbia. Volume 4. Dicotyledons (Orobanchaceae through Rubiaceae).* British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests, Victoria, BC. 427 pp.
- Douglas, G.W., D. Meidinger and J. Pojar 2001. *Illustrated flora of British Columbia. Volume 7. Monocotyledons (Orchidaceae to Zosteraceae).* British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 379 pp.
- Douglas G.W., D. Meidinger and J. Pojar. 2002b. *Illustrated flora of British Columbia. Volume 8 – General Summary, Maps and Keys.* British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 457 pp.
- Douglas, G.W., G.B. Straley and D. Meidinger. 1998b. *Illustrated flora of British Columbia. Volume 1. Gymnosperms and Dicotyledons. (Aceraceae through*

- Asteraceae). British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests. Victoria, BC. 436 pp.
- Douglas, G.W., G.B. Straley, D. Meidinger and J. Pojar. 1998c. Illustrated flora of British Columbia. Volume 2. Dicotyledons. (Balsaminaceae through Cuscutaceae). British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests. Victoria, BC. 401 pp.
- Fabri, P. Pers. Comm. 2003. Market analyst. Canada Mortgage and Housing Corporation, Suite 103, 1708 Dolphin Avenue, Kelowna, BC V1Y 9S4.
- Government of Canada. 2003. The Species at Risk Act Public Registry. The Act. http://www.sararegistry.gc.ca/the_act/default_e.cfm.
- Griggs, F.T. and S.K. Jain. 1983. Conservation of vernal pool plants in California, II. Population biology of a rare and unique grass genus *Orcuttia*. *Biological Conservation* 27: 171-193.
- Hope, G.D., W.R. Mitchell, D.A. Lloyd, W.R. Erickson, W.L. Harper and B.M. Wikeem. 1991. Interior Douglas-fir zone. Pages 153-166 *in* D. Meidinger and J. Pojar (eds.). *Ecosystems of British Columbia*. British Columbia Ministry of Forests Special Report Series No. 6, Victoria, British Columbia. 330 pages. <http://www.for.gov.bc.ca/hfd/pubs/Docs/Srs/SRseries.htm> (Feb 22, 2001).
- Keeley, J.E. and P.H. Zedler. 1998. Characterization and global distribution of vernal pools *in* C.W. Witham, E.T. Bauder, D. Belk, W.R. Ferren Jr., and R. Ornduff (eds.). *Ecology, Conservation, and Management of Vernal Pool Ecosystems: Proceedings from a 1996 Conference*. California Native Plant Society, Sacramento, CA. www.cnps.org/vernalpools/ [Mar. 26, 2002].
- Lesica, P. and F.W. Allendorf. 1995. When are peripheral populations valuable for conservation? *Conservation Biology* 9: 753-760.
- Mayr, E. 1982. Adaptation and selection. *Biologisches Zentralblatt* 101:161-174.
- Morefield, J.D. 1993. *Psilocarphus*. Page 329 *in* *The Jepson manual: Higher plants of California*. Edited by J. C. Hickman. University of California Press. Berkeley, CA. 1400 pp.
- NatureServe. 2001. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.6. Arlington, VA: NatureServe. Available: <http://www.natureserve.org/explorer>.
- Primack, R.B. 1998. *Essentials of Conservation Biology*. Sinauer Associates Inc., Sunderland, Massachusetts.
- Provincial Agricultural Land Commission. 2003. Agricultural Land Reserve – Frequently Asked Questions. Provincial Agricultural Land Commission. 133-4940 Canada Way, Burnaby, B.C. Canada, V5G 4K6. http://www.alc.gov.bc.ca/faq/faq_alr.htm.
- Schlising, R.A. and E.L. Sanders. 1982. Quantitative analysis of vegetation at the Richvale vernal pools, California. *American Journal of Botany* 69:734-742.
- Silveira, J.G. 1998. Avian uses of vernal pools and implications for conservation practice. *in* C.W. Witham, E.T. Bauder, D. Belk, W.R. Ferren Jr., and R. Ornduff (eds). *Ecology, Conservation, and Management of Vernal Pool Ecosystems. Proceedings from a 1996 Conference*. California Native Plant Society, Sacramento, CA. <http://www.cnps.org/vernalpools/pollak.pdf> [May 8, 2002].
- Town of Princeton. 2003. Agriculture – Princeton British Columbia Naturally. <http://town.princeton.bc.ca/newpages/business/agriculture.html>.

- The Land Conservancy of BC. 2002. Interior Grasslands and Forests. Victoria, BC.
<http://www.conservancy.bc.ca/interior/pages/index3.2.html> [Jun. 3, 2002].
- University of California Small Farm Centre. 2003. Agricultural Tourism.
<http://www.sfc.ucdavis.edu/agritourism/agritour.html>.
- Zedler, P.H. and C. Black. 1992. Seed dispersal by a generalized herbivore: rabbits as dispersal vectors in a semiarid California vernal pool landscape. *American Midland Naturalist* 128:1-10.

BIOGRAPHICAL SUMMARY OF THE REPORT WRITERS

George W. Douglas has an M.Sci. (Forestry) from the University of Washington and a Ph.D. (Botany) from the University of Alberta, Edmonton. George has worked with rare plants for over 20 years. He was senior author of *The Rare Plants of the Yukon* (1981), co-authored *The Rare Plants of British Columbia* (1985) and was senior author of the *Rare Native Plants of British Columbia* (1998, 2002). He is also the senior editor for the *Illustrated Flora of British Columbia* (1998-2002). George served as the program botanist for the British Columbia Conservation Data Centre from 1991 to 2003 and is currently running an ecological consulting company. George has written or co-written or is in the process of writing 33 COSEWIC status reports during this period.

Jenifer L. Penny has a B.Sc. in Biology from the University of Victoria. She has been employed by the British Columbia Conservation Data Centre as a botanist since 1995. Jenifer has done extensive fieldwork in botany and is senior author for three COSEWIC status reports. She is also senior author for the family Primulaceae in the *Illustrated Flora of British Columbia* (1999) and co-author of the *Rare Native Vascular Plants of British Columbia*, second edition (2002).

Ksenia Barton has an M.Sc. (Biology) from McGill University. Ksenia specializes in plant ecology and has conducted research and resource inventory projects throughout British Columbia for the past seven years. She has written four species accounts for rare plants as part of the British Columbia Identified Wildlife Strategy. She has recently completed extensive surveys for rare plants throughout the Black Hills (in South Dakota and Wyoming) for the US Forest Service.

AUTHORITIES CONSULTED

Lomer, F. June 2002. 711 Colborne St., New Westminster, British Columbia V3L 5V6.

COLLECTIONS EXAMINED

Herbarium specimens housed at the Royal British Columbia Museum in Victoria (V) were viewed and verified.

FIELDWORK

During 2002 and 2003, fieldwork was conducted within southcentral British Columbia for a number of rare species. Time did not allow for the re-location and documentation of one of the three *Psilocarphus brevissimus* sites for this species that was less accessible (Penny, pers. comm. Feb. 2003).