

COSEWIC
Assessment and Status Report

on the

White Meconella
Meconella oregana

in Canada



ENDANGERED
2005

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



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DES ESPÈCES EN PÉRIL
AU CANADA

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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>

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COSEWIC Assessment Summary

Assessment Summary – May 2005

Common name

White Meconella

Scientific name

Meconella oregana

Status

Endangered

Reason for designation

A globally threatened annual plant with a highly restricted Canadian range and area of occupancy present at only five locations within the naturally rare Garry Oak Ecosystem. Its populations, totalling fewer than 3,500 mature plants, fluctuate greatly with varying precipitation patterns and are at imminent risk of major losses from development within the highly urbanized range of the species. Its habitat has also been impacted by the spread of many exotic weedy plants.

Occurrence

British Columbia

Status history

Designated Endangered in May 2005. Assessment based on a new status report.



COSEWIC
Executive Summary

White Meconella
Meconella oregana

Species information

Meconella oregana (white meconella) is a member of the poppy family (Papaveraceae) and the only species of the genus *Meconella* in Canada. It is a small annual herb, 2-16 cm tall with a slender taproot. Plants have either a single erect stem or stems that are sparingly branched near the base. The tiny, spoon-shaped leaves that form a rosette at the base of the plant are only 3-18 mm long, including their short stalks. The small stem leaves are opposite, lance-shaped to linear and lack stalks. Flowers are borne singly on long stalks at the end of the stems or from the upper leaf axils. Within the centre of the flower, consisting of six, white, egg-shaped petals and three sepals, are 4-6 stamens and a single pistil. The fruit is a linear capsule containing many tiny seeds less than 1 mm long. In the southwestern U.S. two other, slightly larger species occur (*M. californica* and *M. denticulata*) which were once described as subspecies of *Meconella oregana*.

Distribution

The global range of *Meconella oregana* extends from California to southern British Columbia. Within Canada it has been documented in low-elevation coastal areas from Victoria to Nanaimo, in the Gulf Islands, and in Port Alberni.

Habitat

In British Columbia, the plants grow on south-facing hillsides free of woody vegetation due to shallow and droughty soils that, however, are frequently subject to early-season seepage. Associated species are other small vascular plants and bryophytes.

Biology

The flowering period of *Meconella oregana* is between early March and mid-April and the plants set seed and dry off in early to later April, depending on weather conditions. Insect pollination has not been reported on and it is likely that wind pollination occurs. Germination under horticultural conditions has been reported both in fall and early spring. Herbivory of the plants has not been observed.

Population sizes and trends

The total population size of *Meconella oregana* in Canada was 3355 plants in 2004. The area of occupancy is only between 50 and 100 m². Regular observations of population sizes and trends of *Meconella* over the years are not available for either the U.S. or Canada. In British Columbia 15 distinct populations are on record of which only five could still be confirmed as extant in the spring of 2004. Some of the records date back more than 100 years and seven of them have not been confirmed for 50 years. Population data for 2005 obtained subsequent to completion of the report and prior to designation have been added. These indicate that three of the four extant populations have suffered considerable declines since 2004.

Limiting factors and threats

The two major threats are habitat loss and habitat degradation. Habitat loss occurs primarily through residential development of the attractive open hillsides the species occupies. The two largest populations (75% of the Canadian total) are imminently threatened with such development. Habitat degradation occurs through recreational and other traffic, domestic grazing, disruption of seepage patterns, fire suppression and through the increasing colonization by non-native plant species. An intrinsic limitation for the species may be its poor dispersal ability.

Special significance of the species

It is the only species of the genus *Meconella* in Canada. No medicinal, ceremonial, or other human use is known for *Meconella oregana*.

Existing protection or other status designations

Based on 2004 counts, nearly 85% of *Meconella* plants were on private land, 11% were in a Regional Park, and just over 4% were on unprotected federal land. *Meconella oregana* has no legal protection in Canada. It is a red-listed species in British Columbia with a rank of N1S1 (critically imperiled at the national and provincial level). It is ranked S1 (critically imperiled) in California and Oregon and S2 (vulnerable to extirpation) in Washington.



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 agencies (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 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 (NOVEMBER 2004)

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 it 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 wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its 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.



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

COSEWIC Status Report

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SPECIES INFORMATION

Name and classification

Meconella oregana Nutt. is a member of the *Papaveraceae* and is one of only three species in this genus. In Canada it is the only *Meconella* species and has no recognized subspecies or varieties.

Varieties and subspecies of *Meconella oregana* described in the past have been subsequently renamed (Kartesz pers. comm. 2004). *Meconella californica* Torr. & Frém. was formerly known as *Meconella oregana* subsp. *californica* (Torr.) E. Murray, *Meconella oregana* var. *californica* (Torr. & Fremont) Jeps., *Meconella oregana* var. *californica* Jepson, *Meconella oregana* var. *octandra* (Greene) Jeps. and *Meconella oregana* var. *octandra* Jeps. *Meconella denticulata* Greene was formerly known as *Meconella oregana* var. *denticulata* (Greene) Jeps. and *Meconella denticulata* Jeps. (ITIS 2002; Kartesz pers. comm. 2004).

Former generic synonyms for this species included *Platystigma oreganum* Brew. & Wats. (1876) and *Platystemon oreganus* Curran (1887) (Hitchcock and Cronquist 1964). The current taxonomic status of this species is accepted (ITIS 2004). Genetic analysis of the family supports the current classification (Hoot *et al.* 1997).

English names for *Meconella oregana* include Oregon meconella, white fairypoppy, white meconella and Oregon poppy (Douglas *et al.* 1999; Rush *et al.* 1999; California Native Plant Society 2003; NatureServe 2003; Sacramento Fish and Wildlife Office 2003; ITIS 2004; Washington Natural Heritage Program 2004).

In California where this species' range overlaps with *Meconella californica* and *Meconella denticulata*, there has been confusion over the identification of specimens in Contra Costa and Santa Clara counties. As a result, *Meconella oregana* was not included in the new Jepson Manual, but has since been recognized to occur in California (Flora of North America Editorial Committee 1993; California Native Plant Society 2003; Clark pers. comm. 2004).¹

¹In California *Meconella oregana* specimens may be confused with depauperate *Meconella californica* except that *M. californica* generally has larger petals (8-10 mm rather than 2.5-4 mm), has a larger number of stamens (6-16 rather than 4-6), and the stamens are in two series rather than one (Munz and Keck 1959; Ernst 1967; Flora of North America Editorial Committee [eds.] 1993+). Long cylindrical anthers distinguish *Meconella denticulata* from *Meconella oregana*, which has globular anthers (Hannan, pers. comm. 2004). *Meconella oregana* can be distinguished from *Platystigma linearis* Benth. by the presence of both basal and stem leaves and white rather than yellow flowers (Munz and Keck 1959; Rush *et al.* 1999; Washington Natural Heritage Program 1992; Washington Natural Heritage Program 2004). *Meconella oregana* may also be confused with annual mustards, although the plants are very distinctive when in flower (Washington Natural Heritage Program 1992).

Morphological description

Meconella oregana is a small annual herb from a slender taproot. The stems are erect to ascending and are either solitary or sparingly branched from near the base. When in bloom the plants range from 2 to 16 cm tall and are smooth and blue-green in colour (Flora of North America Editorial Committee [eds.] 1993+; Douglas *et al.* 1999). British Columbian specimens range from 1 to 8 cm (writer's observations).

The species has spoon-shaped, entire leaves that form a basal rosette. The basal leaves are 3-18 mm long including the 1-10 mm petiole. The 5-9 mm stem leaves are opposite, lanceolate to linear in shape and unstaked (Douglas *et al.* 1999; Rush *et al.* 1999; Washington Natural Heritage Program, 2004).

The solitary flowers are borne on hair-like axillary or terminal stalks that are often longer than the stem. Flowers usually have 6 egg-shaped white petals (1.3-4 mm long) and 3 sepals (Flora of North America Editorial Committee [eds.] 1993+; Douglas *et al.* 1999). Stamens number 4-6 and are in one series (Flora of North America Editorial Committee [eds.] 1993+). The flowers may also have irregularities including fused petals or stamens, missing petals or stamens and/or irregular symmetry (Ernst 1967).

Meconella oregana produces many seeded, green and later tan to brown linear capsules. The capsule size is 1-1.6 cm long x 0.1 cm in diameter (Gunn and Seldin 1976; Gunn 1980). The capsules do not form valves but release the seed by splitting through the placentae (Ernst 1962). The seeds are smooth and shiny and range in colour from amber to blackish. Seed size is 0.6-0.8 x 0.4-0.6 x 0.3-0.4 mm (Gunn and Seldin 1976; Gunn 1980). Figure 1 illustrates the general appearance of the species.

Genetic description

Meconella oregana is diploid and has a chromosome number of $n=8$. The chromosomes are smaller than those of other species in the subfamily Platystemonoideae (Ernst 1967).



Figure 1. A small patch of *Meconella oregana*, some fruiting. The plants are ca. 4 cm tall.

DISTRIBUTION

Global range

The global range of *Meconella oregana* is restricted to southwestern British Columbia and to Washington, Oregon and California in the United States (NatureServe 2003). The distribution of populations is highly scattered and there are large discontinuities between populations (Figure 2).

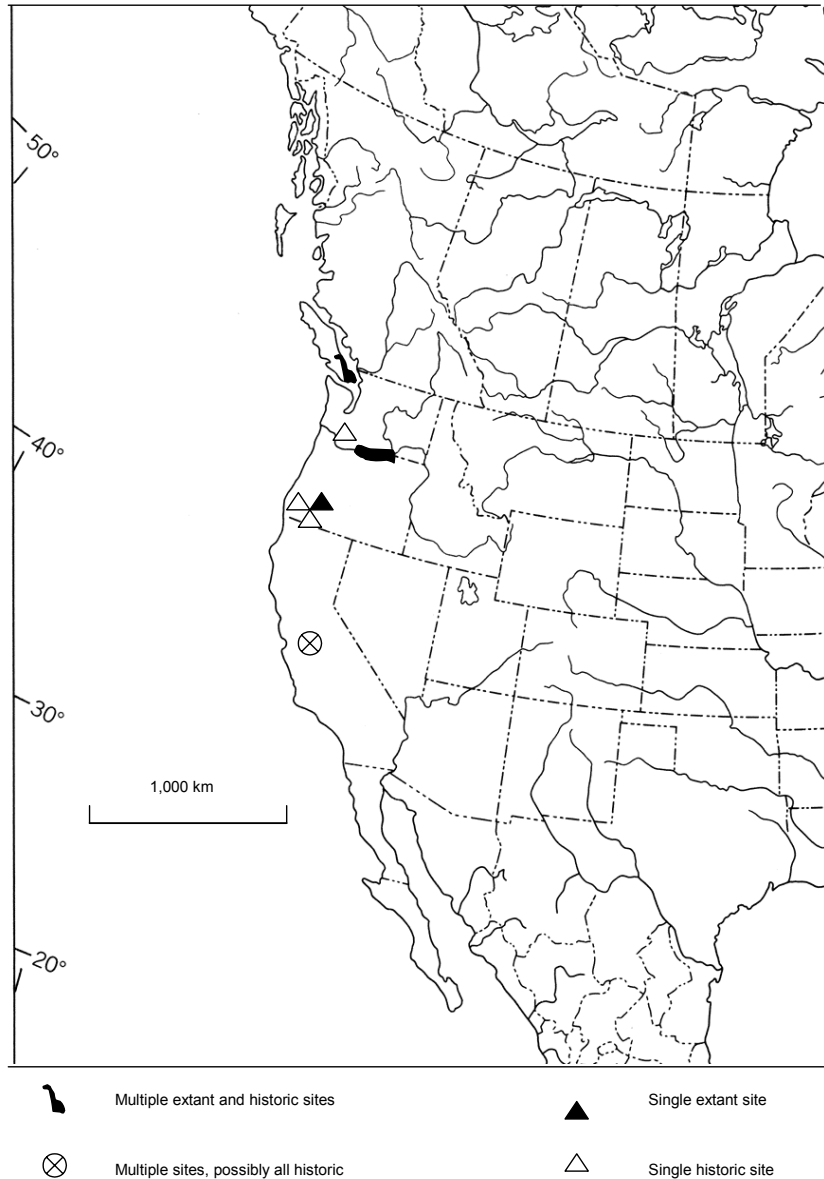


Figure 2. Global distribution of *Meconella oregana*.

The historic range is probably consistent with the current range with the populations in British Columbia representing the northern extent of the range. U.S. sources state that it is difficult to determine whether the patchy distribution is due to scattered populations or differences in collection effort because this plant is easily overlooked (Rush *et al.* 1999; East Bay Chapter, California Native Plant Society 2004; Washington Natural Heritage Program 2004).

Canadian range

The Canadian range is small and wholly contained within the distributional limits of Garry oak (*Quercus garryana*). Twenty-four records held by the BC Conservation Data Centre (Penny, pers. comm. 2004) amount to 15 discreet locations between Victoria and Port Alberni, Vancouver Island (Figure 3). Nine of these 15 locations did not yield an extant population during fieldwork in the spring of 2004 (writer's observations). Three of the nine locations are described with very low precisions, but are now deemed to be lost to residential development. One additional location has lost its population due to industrial development and one location known from a 1910 collection has not been visited (privately owned island).

The extent of occurrence in Canada is estimated at under 2,500 km². The area of occupancy is extremely small as the majority of examined subpopulations each cover only between 0.25 and 12.00 m². The total area of occupancy in Canada is estimated at between 50 and 100 m² (0.005 to 0.01 ha), based on fieldwork by the writer in 2004.

As it is difficult to determine absence of *Meconella oregana* with certainty, it will be equally difficult to compare the historic and present range of the species. According to recent surveys the extreme points of the Canadian range are still occupied, with the exception of some of the southeastern, now urban stations. However, populations in several of the intermediate points of occurrence could not be confirmed, indicating the beginning fragmentation of the range.

HABITAT

Habitat requirements

Meconella oregana requires the specialized habitat of open rocky or grassy sites that have early spring seepage but dry out in the summer (Douglas *et al.* 1999; NatureServe 2003). It is generally found at low elevations, below 300 m in the north and slightly higher in the south, on gradual to steep slopes (Flora of North America Editorial Committee [eds.] 1993+; Douglas *et al.* 1999; California Native Plant Society 2003; Washington Natural Heritage Program 2004).

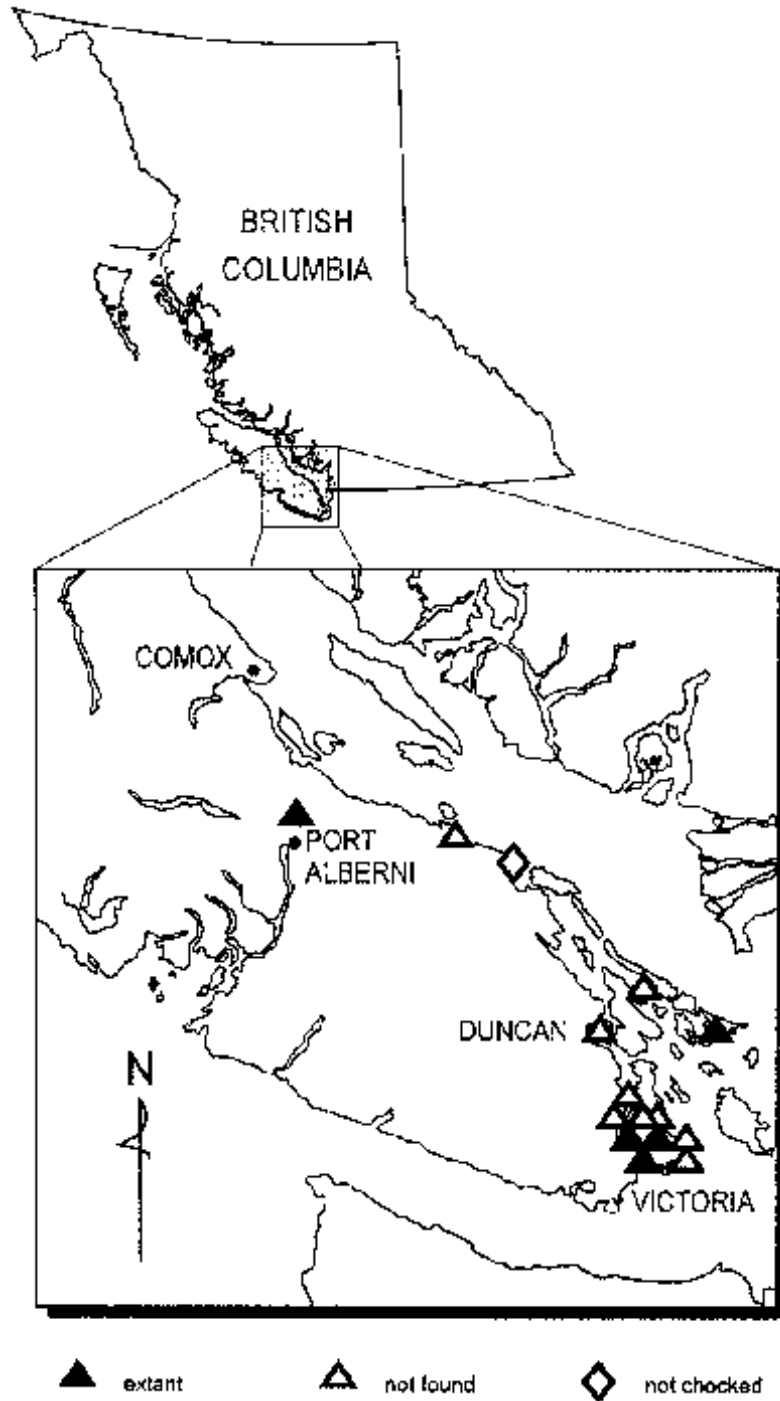


Figure 3. Distribution of *Meconella oregana* in British Columbia.

In the southern United States the species is commonly found in association with bryophytes and lichens along with species of *Dodecatheon*, *Plectritis*, Ranunculaceae and Saxifagaceae (Ernst 1967). In Washington, *Meconella oregana* grows in mixed forest/grassland sites with Douglas fir, ponderosa pine, Garry oak and with shootingstar (*Dodecatheon poeticum*), woodland star (*Lithophragma bulbiferum*) and Douglas' blue-eyed-grass (*Sisyrinchium douglasii*); see Rush *et al.* 1999; NatureServe 2003; Washington Natural Heritage Program 2004. The Flora of North America describes the habitat as part sun, and mentions "sandy bluffs" (Flora of North America Editorial Committee [eds.] 1993+). However, Dr. Gary Hannan (pers. comm. 2004) states that seepage slopes are a more typical habitat.

Much of the above-mentioned habitats and even the species combinations coincide remarkably with those of the majority of the British Columbian populations. The sites surveyed in the spring of 2004 were generally in the close vicinity of seepage areas. However, the plants also occupied nearby well-drained micro-habitats. It is likely that the seepage areas themselves serve as habitat where this small annual can survive in exceptionally dry years. All visited subpopulations were on steep south to southwest-facing slopes, their specific micro-habitats on these slopes being often on more gentle benches. The shallow soils, averaging only 6 cm thick and directly underlain by bedrock, were rich in organic matter, but never entirely free of a sandy to pebbly mineral component. All occupied microsites had plant communities that formed a very short turf with some of the cover consisting of bryophytes and were largely free of dense and taller growing vascular plants. The other common features of the sites were a very high diversity of native species and the presence of other rare vascular plants, mosses and liverworts. Two provincially red-listed vascular plants also found in *Meconella* habitats are *Idahoia scapigera* and *Plagiobothrys tenellus*. Frequently associated species were documented in a vegetation table; this supplementary information is available upon request. The 10 most frequently encountered associated vascular plants were *Collinsia parviflora*, *Aira praecox*, *Aphanes occidentalis*, *Saxifraga integrifolia*, *Triteleia hyacinthina*, *Bromus hordeaceus*, *Selaginella wallacei*, *Silene gallica*, *Brodiaea coronaria*, and *Montia fontana*. The two most frequent bryophytes were *Rhacomitrium canescens* and *Mnium miniatum*.

Trends

In Canada *Meconella oregana* occupies only a small fraction of what appears to be identical and potentially suitable habitat. However, the trend for all this habitat, occupied and unoccupied, is to become increasingly overrun by non-native species. In a few instances the invasive Scotch broom (*Cytisus scoparius*) was found in the vicinity of *Meconella*. At the actual *Meconella* growing sites, however, the soils are too shallow for broom to survive; the greater threat here are introduced annuals such as *Aira*, *Vulpia* and *Bromus* species, *Cynosurus echinatus*, *Erodium cicutarium*, *Silene gallica*, *Geranium molle* and many others which collectively degrade the micro-habitat for *Meconella*. Several sites for which old *Meconella* records exist, but which are close to densely populated areas, now have highly altered plant communities consisting of mostly non-native species, apparently incapable of supporting *Meconella* (writer's

observation, 2004, based on comparison between occupied sites as shown in Table 2 and unoccupied sites). This degradation of habitats by non-native species may be considered to be equally or more important than outright habitat loss for the species.

Of five sites for which old records exist, but where the species was not found in the 2004 surveys, three have retained what may be considered “good habitat” and two marginal or poor habitat. The potential for the species reappearing in these good habitats should be kept in mind for future surveys.

Habitat protection/ownership

In British Columbia old *Meconella* records exist for six areas that enjoy protection of some sort (Table 1) including a provincial park, an ecological reserve, regional and municipal parks. The report writer's recent fieldwork included all these areas, but confirmed only one single extant population for these locations. Another extant population is partly on federal (NRC's Hertzberg Institute for Astrophysics) and partly on private property. Four extant populations, including the two largest, are on private land. In terms of numbers of individuals counted in 2004, only 368 were on the protected land (Regional District Park) and 151 on federal land, while 2806 were on privately owned land.

BIOLOGY

Life cycle and reproduction

Meconella oregana blooms in March to early April throughout its range and the blooming period is highly weather dependent (Rush *et al.* 1999; California Native Plant Society 2003; NatureServe 2003; Washington Natural Heritage Program 2004, writer's observations 2004). Known populations can be very difficult to find in some years and very abundant in other years (Janszen pers. comm. 2004) in part because this annual species is very difficult to locate when not in bloom.

Table 1. Occurrence records, confirmed records, and land status.

Location on record	Collector(s) and Year	Herbarium Records	Notes	Field-checked in 2004 (or why not checked)	Population in 2004	Land and Protection Status	Size of population (or subpopulation)
Mt. Douglas (=Cedar Hill)	Macoun, 1875, 1876, 1884, 1887; C.F. Newcombe, 1916; Redfern, 1925; Hardy, 1945, 1952	CMN (1975, 1976, 1887) all on same herbarium sheet; RBCM (1916, 1925, 1945, 1952)	1916: "small colony"	x	not found	Regional Park	
"Victoria" ¹	Dawson, 1876; Macoun, 1908	CMN (1876, 1908)		(exact location unknown) ¹	not found	mostly private	
Departure Bay, Jesse Island	Spreadborough, 1910	CMN (1910)		(privately owned island)	not examined	private	
"Tod Inlet, Victoria"	Hardy, 1927	RBCM (1927)		(exact location unknown)	not found	various	
Little Saanich Mtn., Saanich	C.F. Newcombe, 1917, 1928, 1931; Hardy, 1931; Ceska, 1977, 1980; Roemer, 2001, 2003	RBCM (1917, 1928, 1931a, 1931b, 1977)	1917: "single plant" 2003: "one of two subpopulations, approx. 20 individuals on 2 sqm"	x	extant	Federal portion	150
						Private portion	302
"Elk Lake"	Henson, 1933	UBC (1933)		(exact location unknown)	not found	various	
Mt. Finlayson, Victoria	Carter, 1918; Hardy, 1925, 1936	RBCM (1918, 1925); UBC (1936)		x	not found	Provincial Park	
Thetis Lake Park, Victoria	Clark, 1958; Melburn, 1958, 1961	UVIC (1958a); RBCM (1958b)		x	extant	Regional Park	368
Saturna Island	Janszen, 1974, 1987	RBCM (1974)	1987?: "lots of plants; only found in one small area"	x	extant	private	52
Nanoose Hill	Ceska, 1976, 1993; Douglas, 1976; Schofield, 1976	RBCM (1976a, 1976b); UBC (1976)	1976: "two small populations (~10 plants?)"	x	not found	Federal property	
Jocelyn Hill, Highlands District	Ceska, 1977, 1986; Roemer, 1997	RBCM (1977, 1997)		x	not found	Provincial Park	
Galiano Island, Sutil Mtn.	Janszen, 1980	RBCM (1980)		x	not found	Galiano Conservancy and private	
Mt. Tzuhalem Ecological Reserve	William Newcombe, 1928; Ceska, 1980	(Observations?)		x	not found	Provincial Ecological Reserve	
NE of Port Alberni	VanDieren, 1993a; Ceska, 1993b	RBCM (1993a)	1993b: "several thousand plants"	x	extant	private	1274
Skirt Mountain South	Ceska & Roemer, 2000, 2003		2003: "300+30 reproductive individuals"	x	extant	private	1209
Total: 15 Locations				11/15	5 extant popns.		confirmed number 3355

2806 unprotected on private land; 151 unprotected on federal land; 368 protected in Regional Park

¹For place names in "quotes", the exact locations are unknown because the locality descriptions are too inclusive and may overlap with other, more accurately pinpointed locations. In the intervening 70 or more years since these records were made the locations also have been subject to urban or at least residential development.

Table 2. Search effort for *Meconella oregana* in 2004.

	Localities (all surveys by writer, except where otherwise indicated in date column)	Survey dates mm/dd (all 2004)	Number of <i>Meconella</i> plants (highest total if visited repeatedly)
	Mt. Douglas, Saanich Municipality	03/28, 04/07	
	Little Saanich Mtn., Saanich Municipality	03/11, 03/13, 03/19, 03/26, 03/29, 04/06, 04/09	422
	Mt. Finlayson, Langford Municipality	04/18	
	Thetis Lake Park, View Royal Municipality	03/23, 03/30, 04/01	368
Known localities where species was found in the past	Saturna Island	03/22 04/05 (H.Janszen)	52
	Nanoose Hill	03/16	
	Jocelyn Hill, Highlands District	03/27, 04/19	
	Sutil Mtn., Galiano Island	03/24	
	Mt.Tzuhalem Ecological Reserve, Duncan NE of Port Alberni	04/02 (A. & O.Ceska) 04/02	1274
Unknown or lost localities where species was found in the past; too poorly defined	Skirt Mountain South, Langford Municipality	03/12, 03/13	1209
	“Victoria”: Exact locality unknown; overlaps with several of the surveyed localities		
	“Tod Inlet”: “Victoria”: Exact locality unknown; promising natural habitats are developed		
Known locality, not visited	“Elk Lake”: Exact locality unknown; overlaps with two of the surveyed localities		
	Departure Bay, Jesse Island: (privately owned island)		
Additional localities with promising habitats	Bear Hill, Saanich Municipality	03/(18?)	
	Skirt Mountain West, Langford Municipality	03/17, 03/21	
	Mill Hill, Langford Municipality	03/20, 04/12, + many later visits	
	Mathews Point, Galiano Island	03/24	
	Stewart Mtn., Highlands District	03/23	
	Lone Tree Hill, Highlands District	03/27	
	total		3355

Very little information is known about the reproductive biology of *Meconella oregana*. *Platystemon californicus*, a closely related annual species from California is highly self-incompatible and has a high pollen:ovule ratio (Hannan, 1981). Although solitary bees pollinate *P. californicus* (Andrenidae and Halictidae), the plants are also wind pollinated (Hannan, 1981). Although *Meconella oregana* has a low number of stamens and fairly small stigmas, the high density of the plants may allow effective wind pollination (Hannan, pers. comm. 2004) especially since few pollinators are active in the early spring when it blooms. Although *Meconella oregana* is probably partially self-compatible, the stigmas expand above the anthers a day or two after anthesis to increase the potential for outcrossing (Ernst 1967). The petals close at night, which excludes the possibility of night pollinators (Ernst 1967).

In greenhouse experiments at Stanford University, Ernst (1967) found *Meconella* species difficult to grow: seedlings were susceptible to damping off and often required more than one year to germinate. Adding gravel to the top of pots helped aerate the base of the plants and prevented seeds from washing away (Ernst 1967). In Victoria *Meconella oregana* has in two instances been observed to germinate in the fall (Pinder-Moss, pers. comm. 2004, Hans Roemer's observations 2004/2005); however, at Stanford, it was observed to germinate in the spring. In natural habitats germination was found to begin after a wet/warm spell in late January (Hans Roemer's observation 2005).

Meconella oregana is an annual and the plant dies after producing seed. The seed may have a limited life expectancy because old seed does not germinate readily (Pinder-Moss, pers. comm. 2004).

Herbivory

Herbivores affecting *Meconella oregana* are not listed in any published literature and no signs of herbivory were observed in the field in 2004. The specific function of protopine and the additional alkaloid found in the closely related *Meconella californica* is not known. However, in other species, alkaloids are known to deter pathogens including bacteria, fungi, insects, nematodes and protozoa (Salmore and Hunter 2001). Alkaloids may also deter other herbivores.

Physiology

There is no literature on the physiological requirements and tolerances of *Meconella oregana*. The closely related *Meconella californica* has been found to contain the alkaloid protopine in addition to a second minor alkaloid that could not be re-extracted in sufficient quantity for identification (Stermitz and Coomes 1969). In conditions of water stress, the closely related species, *Platystemon californicus*, was found to have decreased water potential, lower stomatal conductance and decreased photosynthesis. *Platystemon californicus* is not particularly sensitive to increased ozone levels (Bytnerowicz *et al.* 1988).

Dispersal

Meconella oregana produces many-seeded capsules that dehisce apically by three valvelike carpels. The carpels separate at maturity and occasionally twist (Gunn and Seldin 1976; Gunn 1980) releasing the seed. Although seed of other genera in the Papaveraceae have arils that attract ants as seed dispersers, *Meconella oregana* seed does not have arils (Ernst 1962; Gunn and Seldin 1976; Gunn 1980). Because of the small size of this plant, the small seeds (compare morphological description) and the lack of arils, dispersal distance from the parent plant is probably very limited. This is borne out by the very small areas occupied by the Canadian subpopulations. The average patch size of all 17 subpopulations found in 2004 was 3.4 m². However, it ranged as low as 0.03 m² (Figure 4). The fact that several subpopulations were found straddling deer trails suggests that longer-distance dispersal may occur with clumps of moist soil on the hooves of these animals (Hans Roemer's observations 2004).



Figure 4. Fifty *Meconella* plants at the Port Alberni site marked for counting. Note shallow soil and bike tracks.

Interspecific interactions

Fire may have played a role in maintaining habitat for *Meconella oregana*. Regular fires would have decreased competition by reducing shrub invasion and decreasing the growth of grasses and forbs (Rush et al. 1999; Washington Natural Heritage Program 2004). Populations of *Meconella oregana* are probably negatively impacted by competition from exotic annual grasses (Ertter pers. comm. 2004; Washington Natural Heritage Program 2004), which are very effective at capturing spring moisture. In the Canadian habitats, 25 non-native plants were among the associates of *Meconella*, seven of them exotic annual and biennial grass species.

Adaptability

As would be expected for an annual, the size of *Meconella oregana* plants and flowers changes in response to variations in seasonal rainfall and temperature (Ernst 1967). In 2004 the writer observed flowering specimens between 1 and 8 cm tall which ranged from single-stemmed to branched with up to five stems. Open flowers ranged from 2 to 6 mm in diameter. The largest plants occurred in less exposed and more sheltered, or in partly shaded microhabitats. *Meconella* plants were also observed to have their flowering period shorter and earlier in dry habitats and longer and later in seepage areas.

POPULATION SIZES AND TRENDS

Search effort

Meconella oregana is easily overlooked and the plants are difficult to locate, except when they are in flower. The plants flower for a very short time each year and the bloom time changes considerably from year to year (e.g. from mid-March to mid-April) depending on local weather conditions (Rush *et al.* 1999; East Bay Chapter, California Native Plant Society 2004; Washington Natural Heritage Program 2004). In 2004 the report writer found flowering *Meconella oregana* from March 11 to April 10.

Of the 15 known distinct locations in Canada all but four were re-surveyed (Tables 1 and 2). All these locations are from several to many kilometres distant from each other and represent 15 populations. Within populations, the largest distance between two sub-populations was 200 metres. Three of the four locations/populations that were not visited (all based on records between 50 and over 100 years old) are known with too low precision to locate and are also now in residential areas. The remaining location not re-surveyed (a record dated 1910) is on a privately owned island. Of the 11 surveyed locations with existing records, five yielded extant populations. These included the largest known and the most southerly and northerly populations. Three populations were composed of two to nine separate subpopulations. In addition to the populations with existing records six other locations with promising habitats were searched for new populations, none of them successfully (Table 2). Further, the report writer has been familiar with *Meconella oregana* for the past 30 years and has located only one new population during this time, despite frequent visits to potential locations and habitats. Similar statements could also be made for other local field botanists. It is therefore likely that the majority of *Meconella* occurrences in Canada are known.

Meconella searches by the report writer and associates were based on habitat recognition, as only very small segments of the landscape contain potential habitats (see "Habitat requirements"). Potential habitats were identified by a combination of physical terrain attributes (south-facing slopes, neighborhood of seepages), physiognomy (very short turf), and, later, species combination gleaned from the extant occurrences.

Over 200 of what were considered "prime microhabitats" were surveyed to detect a total of 17 subpopulations representing the 5 extant populations.

Abundance

Very little quantitative information is associated with the old Canadian records (BC Conservation Data Centre records 2004). The number for the largest population is given with "several thousand" for the year 1993. The report writer's counts for 2004 are provided in Tables 1 and 2. These counts are considered accurate within +/-15% where the numbers are above, and more accurate where the numbers are below one thousand. Under the assumption that all Canadian populations were found, a total of only 3355 *Meconella* plants would result for the year 2004. All these plants are flowering individuals as no non-flowering plants appeared to occur at all, no matter how small the observed

plants were. This does not mean, however, that all these plants reach viable seed-bearing status, something highly dependent on weather development after anthesis.

Fluctuations and trends

As mentioned, quantitative data for past records are too sparse to assess fluctuations properly. The largest Canadian population for which “several thousand” were reported in 1993 had 1274 plants (+/-) in 2004. The second-largest population which the writer observed for the last four years was estimated at 60, 100, 330 and 1209 individuals in these consecutive years. This would suggest that 2004 was a “good” year for *Meconella*. Both the 1274 and the 1209 plant populations are in habitats with distinct seepage influence and it seems possible that for plants in drier habitats the year may have been less favorable. Clearly, the populations can fluctuate considerably within a period of several years.

Table 1 shows 15 Canadian *Meconella* occurrences recorded over the last 129 years. Eleven of these sites were examined in the 2004 surveys by the writer, but only five could be confirmed as extant. While no absolute certainty exists that all populations were found, this still raises strong concerns about an overall downward trend for the species in Canada.

Note: In April 2005, prior to designation in May 2005, additional population data were collected by H. Roemer and M. Fairbarns. Data for 2005 indicate that there had been a decline at three of the four extant populations: Port Alberni (from 1274 to >500), Skirt Mountain (1209 to 86) and Little Saanich Mountain (from 422 to 197). No 2005 data were available for the Saturna Island population (E. Haber, Co-chair, Subcommittee for Plants and Lichens, May 1, 2005)

Rescue effect

Meconella oregana has a spotty distribution from southwestern British Columbia and across the border through Washington, Oregon and California. In the United States, the population sizes for records of *Meconella oregana* are not given for each location. In Washington, the population size is “thousands” at one location and ranges from about 75 to 15 individuals at other locations where population size is noted (Washington Natural Heritage Program 1992; Caplow pers. comm. 2004). In Oregon, population sizes range from few plants (4-6), to about 25 plants to 50-100 plants where population size is noted (Oregon State University database 2004). No population sizes are recorded for California (California Natural Diversity Database 2004).

Meconella oregana is rare (variously listed as S1 or S2) in Washington and very rare (S1) further south (Oregon and California). On this basis, rescue effect from the south therefore appears to be an uncertain scenario, should the Canadian populations be extirpated. In fact, the United States populations are equally likely to need “rescue” by Canadian populations.

In Washington state the nearest *Meconella* population on Whidbey Island is about 50 km distant from Canadian populations and it is unknown if genetic information is exchanged over such distances in *M. oregana*. Similar and larger distances exist between extant Canadian occurrences.

LIMITING FACTORS AND THREATS

In the Canadian populations the two main threats to the long-term survival of *Meconella* populations are loss of habitat and habitat degradation.

Loss of habitat to development is a major factor in the decline of *Meconella*. Eleven out of the 15 locations listed in Table 1 are in the Capital Regional District (CRD). The human population of the CRD has been growing rapidly and is forecast to increase by nearly 75,000 by the year 2020 (CRD Regional Growth Strategy 2003). As much of the easily developed land has been used up, present and future residential growth is now beginning to occupy the remaining rocky hillsides outside of parks, the general environment within which *Meconella oregana* microhabitats are embedded. Only one of the five extant *Meconella* occurrences is inside a park.

Unfortunately, the above-described trend of urban growth is impacting the two largest Canadian *Meconella* occurrences and has placed these under imminent threat of development. Both of these occurrences are on private land: The largest population (Port Alberni) was recently acquired by a new owner and is now under application for residential subdivision. The second-largest population (Skirt Mountain), part of a large golf course and residential development, is on the verge of being accessed by a new road. Subdivision application for the latter area is expected “within a year” (D. Fraser 2005, pers. comm., after enquiries with municipal planning department). Threats on these sites include complete obliteration by construction of roads and residences, landscaping, soil disturbance and hydrological changes, to name a few. Part of another population (Little Saanich Mountain) is also on private property. These three private sites together hold nearly 85% of the total Canadian *Meconella* population. All these sites have in common that they are highly desirable real estate on south-facing hillsides with mountain and sea views.

Meconella oregana is a species strongly associated with the Garry oak ecosystem. Lea (2002) mapped the decrease in Garry oak areas on the Saanich Peninsula for the period from 1800 to 1997. The Saanich Peninsula includes nine of the original 15 and three of the five extant *Meconella* sites (Table 1). Lea found that only 512 ha of Garry oak communities remained in 1997, less than 5% of the extent in the year 1800. A corresponding decline, possibly slightly less due to the more rocky terrain, will have occurred in *Meconella* habitat.

Habitat degradation can be initiated by disturbances such as domestic grazing or soil injury that favour invasion by exotic species (see “Habitat trends”). However, exotic species invasion also proceeds on its own and causes habitat change and degradation

itself. As already mentioned, invasive species, in this case mostly annual grasses and herbs, form stands that are taller than *Meconella* and compete with it for light and soil moisture.

Seventeen sub populations within the five extant *Meconella* populations were examined for associated species by tabulating all vascular plants and bryophytes growing in the same microhabitat within 10 cm from the nearest *Meconella* plants (vegetation table available upon request). Among 82 vascular plants, 25 were introduced species and the proportion of these species in the 17 subpopulations sampled ranged from 19 to 56%. Much higher percentages (up to 85%) of introduced species are found on rocky and grassy knolls within Greater Victoria (Roemer 1995) where some of the older, now lost *Meconella* sites were located.

Previous to the subdivision application tree harvesting occurred surrounding the natural opening of the Port Alberni population. This led not only to direct disturbance of the site by machinery and scattered wood debris, but also to increased access from all sides and new damage by motorcycles (Figure 4).

Fire suppression may also negatively impact *Meconella oregana* habitat. Regular fires would have maintained an open landscape and limited competition from other species (Rush *et al.* 1999; California Native Plant Society 2003; Washington Natural Heritage Program 2004). *Meconella oregana* is vulnerable to competition from exotic, weedy grasses (Rush *et al.* 1999; NatureServe 2003; Washington Natural Heritage Program 2004).

Degradation of habitat from grazing or soil compaction from recreational use will negatively affect this species (Rush *et al.* 1999; Washington Natural Heritage Program 2004). Changes to hydrology either of the site or upslope from populations will alter the habitat and will threaten this species (Rush *et al.* 1999; Washington Natural Heritage Program 2004).

As discussed under “Dispersal”, the extremely small patch size of *Meconella* subpopulations can be considered an indication that dispersal is an intrinsic limiting factor for the species.

SPECIAL SIGNIFICANCE OF THE SPECIES

This species is not known to have been used traditionally by Aboriginal people (Moerman 1998; Turner pers. comm. 2004). However, the closely related *Meconella californica* contains protopine (Stermitz and Coomes, 1969), an alkaloid common in the Papaveraceae that is known to be pharmacologically active (Kutchan and Dittrich 1995). The small size of this plant and its rarity would make the extraction of the alkaloid unfeasible.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Meconella oregana is a red-listed species in British Columbia with a rank of G2S1 (globally imperiled, provincially critically imperiled). However, this conveys no legal protection to the plants. This species has a National Heritage Rank of N2 in the United States and of N1 in Canada². In the United States, this species is ranked S1 (critically imperiled) in California and Oregon and S2 (vulnerable to extirpation) in Washington (California Native Plant Society 2003; NatureServe 2003; Rush *et al.* 1999; Washington Natural Heritage Program 2004). Despite its rankings, *Meconella oregana* has no legal protection in Washington, Oregon and California. However, it may receive protective management where it occurs in formal conservation areas.

Of the 3355 plants forming the total Canadian population of *Meconella oregana* only 11% occur on protected land, a highly visited Regional Park close to Victoria, while nearly 85% are on private land and about 4% are on unprotected federal land.

²Following 2005 rank revision in British Columbia.

TECHNICAL SUMMARY

Meconella oregana

White meconella

méconelle d'Orégon

Range of Occurrence in Canada: Southern Vancouver Island and Gulf Islands

Extent and Area Information	
• <i>Extent of occurrence (EO)(km²) in Canada</i>	<2,500 km ²
• <i>Specify trend in EO</i>	no change
• <i>Are there extreme fluctuations in EO?</i>	no
• <i>Area of occupancy (AO)</i>	50 – 100 m ²
• <i>Specify trend in AO</i>	overall decreasing
• <i>Are there extreme fluctuations in AO?</i>	no multi-year studies available
• <i>Number of known or inferred current locations</i>	five (5)
• <i>Specify trend in #</i>	no periodic monitoring available
• <i>Are there extreme fluctuations in number of locations?</i>	unlikely
• <i>Specify trend in area, extent or quality of habitat</i>	area and quality of habitat decreasing
Population Information	
• <i>Generation time (average age of parents in the population)</i>	10-12 months
• <i>Number of mature individuals (in 2004)</i>	3,300 – 3,500
• <i>Total population trend:</i>	decreasing
• <i>% decline over the last/next 10 years or 3 generations.</i>	no complete counts from earlier years
• <i>Are there extreme fluctuations in number of mature individuals? (see discussions of Abundance and Fluctuations on p. 10)</i>	likely yes, in years with exceptional weather
• <i>Is the total population severely fragmented?</i>	yes
• <i>Specify trend in number of populations: : Long-term downward trend from 15 to 5 populations; no short-term trend (last 10 yrs) available, but see under 'Fluctuations and Trends'</i>	down; but no complete counts in earlier years
• <i>Are there extreme fluctuations in number of populations?</i>	Unknown: Only one year with range-wide observations
• List populations with number of mature individuals in each: Little Saanich Mountain 422 Thetis Lake Park 368 Saturna Island 52 Port Alberni 1274 Skirt Mountain 1209	
Threats (actual or imminent threats to populations or habitats)	
1) Habitat loss imminent through residential development, 2) habitat degradation in longer term through introduced plant species, 3) habitat degradation through inappropriate recreational use	
Rescue Effect (immigration from an outside source)	
• <i>Status of outside population(s)?</i> USA: Washington S1S2; Oregon S1; California S1	
• <i>Is immigration known or possible?</i>	unlikely
• <i>Would immigrants be adapted to survive in Canada?</i>	unknown
• <i>Is there sufficient habitat for immigrants in Canada?</i>	yes, but habitat quality mostly poor/decreasing
• <i>Is rescue from outside populations likely?</i>	unlikely
Current Status	
COSEWIC: Endangered (May 2005)	

Status and Reasons for Designation	
Status: Endangered	Alpha-numeric code: A3c; B1ab (i, ii, iii, iv,v), c (iv) + 2ab; (i, ii, iii, iv, v); c(iv); C1 + 2b
Reasons for Designation: A globally threatened annual plant with a highly restricted Canadian range and area of occupancy present at only five locations within the naturally rare Garry Oak Ecosystem. Its populations, totalling fewer than 3,500 mature plants, fluctuate greatly with varying precipitation patterns and are at imminent risk of major losses from development within the highly urbanized range of the species. Its habitat has also been impacted by the spread of many exotic weedy plants.	
Applicability of Criteria	
Criterion A (Declining Total Population): Endangered A3c based on inferred loss of the two largest sites due to development within 10 years (71-75% loss).	
Criterion B (Small Distribution, and Decline or Fluctuation): Meets Endangered B1 and B2a (5 sites) b (i,ii,iii,iv,v), c (iv). The extent of occurrence and area of occupancy are below critical levels, with only 5 populations extant and continuing decline in area, extent and/or quality of habitat based on spread of alien species and inferred decline and or loss of at least the largest population to development; four consecutive year population data on one site indicates that extreme population fluctuation occurs and is likely related to climatic fluctuation (especially precipitation patterns).	
Criterion C (Small Total Population Size and Decline): Endangered C1 and C2b. Although population size in 2004 was estimated as 3300-3500 mature plants, it is clear from the monitoring of the second largest population over a four-year period that extreme fluctuations occur. On this basis, there were likely fewer than 2500 plants in the year 2000 when this site had only 60 plants. The lower estimate must be accepted when dealing with species that fluctuate greatly. A decline is inferred based on the imminent loss of the two largest populations if a housing development proceeds.	
Criterion D (Very Small Population or Restricted Distribution): Threatened D2 based on the occurrence of only 5 sites and a very small area of occupancy of perhaps <100 m ² with imminent risk of loss inferred for the two largest populations.	
Criterion E (Quantitative Analysis): Insufficient data.	

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- Dr. Peter L. Achuff. National Botanist, Ecological Integrity Branch, Parks Canada, Waterton Lakes National Park, Waterton Park AB T0K 2M0.
- Ms. Diane Amirault. Senior Species at Risk Biologist, Canadian Wildlife Service, Environment Canada, P.O. Box 6227, Sackville NB, E4L 1G6.
- Roxanne Bittman. E-mail correspondence to Matt Fairbarns. California Natural Diversity Database, Department of Fish and Game, 1807-13th Street, Suite 202, Sacramento, CA 95814.
- Florence Caplow. Botanist, Washington Natural Heritage Program, Department of Natural Resources, P.O. Box 47014, Olympia, WA 98504-7014.
- Dr. Kenton Chambers. Emeritus Professor, Department of Botany and Plant Pathology, Oregon State University, 2082 Cordley Hall, Corvallis, Oregon 97331-2902.
- Saleem Dar. Habitat Stewardship Program for Species at Risk, Canadian Wildlife Service, Environment Canada, RR1, 5421 Robertson Road, Delta BC, V4K 3N2.
- Dr. George Douglas. Douglas Ecological Consultants Ltd, 6230 North Road, Duncan, BC. V9L 6K9 (Formerly Senior Botanist, British Columbia Conservation Data Centre, Resources Inventory Branch, Ministry of Environment, Lands and Parks).
- Matt Fairbarns. Botanist, Aruncus Consulting.
- Dr. B. Theresa Fowler. Science Advisor/ Species Assessment Biologist, Species at Risk Branch, Canadian Wildlife Service, Environment Canada, Ottawa ON, K1A 0H3.
- Dave Fraser. Endangered Species Specialist, Biodiversity Branch, Terrestrial Ecosystem Science Section, Ministry of Water, Land and Air Protection, Government of British Columbia, P.O. Box 9338 - Station Prov Govt, Victoria BC, V8W 9M1.
- Dr. Lynn Gillespie. Research Scientist, Canadian Museum of Nature, P.O. Box 3443 - Station D, Ottawa ON, K1P 6P4.

Gloria Goulet. Coordinator, Aboriginal Traditional Knowledge, COSEWIC Secretariat, Canadian Wildlife Service, Environment Canada, Ottawa ON K1A 0H3.

Shirley Hamelin. Administrative Assistant, COSEWIC Secretariat, Canadian Wildlife Service, Environment Canada, Ottawa, ON K1A 0H3

Dr. Gary Hannan. Professor, Biology Department, Eastern Michigan University.

Mr. Harvey Janszen. Botanist. 251 East Point Road, Saturna Island, B.C. Canada VON 2Y0.

Mr. Russ Jolley. 7710 North Jersey. Portland, Oregon. 97203.

Jack McMillen. Washington Natural Heritage Program. Department of Natural Resources, P.O. Box 47014, Olympia, WA 98504-7014.

Jennifer Penny. British Columbia Conservation Data Centre, Wildlife Inventory Section, Resources Inventory Branch, Ministry of Environment, Lands and Parks, P.O. Box 9344, Station Provincial Government, Victoria, BC V8W 9M1.

Lorraine Standing. Recovery biologist for species at risk, Canadian Wildlife Service, Environment Canada, Place Vincent-Massey, 4th Floor, 351 St-Joseph Boul, Gatineau, QC J8Y 3Z5.

Dr. David Tibor. Rare Plant Botanist, California Native Plant Society, 2707 K Street, Suite 1, Sacramento, CA 95816.

Dr. Nancy Turner. Professor, School of Environmental Studies, P.O. Box 1700, University of Victoria, Victoria, BC,

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Hans Roemer received his MSc from the Technical University of Hannover, Germany, in 1967 and his PhD from the University of Victoria, British Columbia, in 1972. His PhD dissertation was on the forest vegetation and environments of the Saanich Peninsula, Vancouver Island, and both his professional work and private interests up to the present

revolved around plant ecology and botany. He held a post-doctoral fellowship at the University of British Columbia and worked as an environmental consultant in British Columbia and Germany to 1977. From 1978 to 2002 he held positions as plant ecologist in the Ecological Reserve and Provincial Park Programs with the Government of British Columbia. After early retirement from the public service in early 2002 he returned to consulting in conservation assessments, plant ecology and field botany.

COLLECTIONS EXAMINED

Canadian Museum of Nature (CMN), Herbarium, Ottawa, ON. P.O. Box 3443 - Station D, Ottawa ON, K1P 6P4.

Oregon State University database. Oregon Natural Heritage Information Center, 1322 SE Morrison St., Portland, OR 97214.

Royal British Columbia Museum (RBCM). Herbarium, 675 Belleville Street, V8W 9W2. Victoria, BC.

University and Jepson Herbaria, University of California, 1001 Valley Life Sciences Building, # 2465, Berkeley, CA 94720-2465.

University of British Columbia (UBC), Department of Botany, University of British Columbia, 3525-6270 University Blvd, Vancouver, BC. V6T 1Z4.

University of Victoria (UVIC), Herbarium, Victoria, BC. P.O. Box 3020, Station CSC, Victoria, BC. V8W 3N5.

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