COSEWIC
Assessment and Status Report

on the

Dwarf Sandwort
Minuartia pusilla

in Canada

ENDANGERED
2004

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 2004. COSEWIC assessment and status report on the dwarf sandwort *Minuartia pusilla* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 17 pp (www.sararegistry.gc.ca/status/status_e.cfm).

Penny, J.L. and B. Costanzo. 2004. COSEWIC status report on the dwarf sandwort *Minuartia pusilla* in Canada, *in* COSEWIC assessment and status report on the dwarf sandwort *Minuartia pusilla* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-17 pp.

Production note: COSEWIC acknowledges Jenifer.L. Penny and Brenda Costanzo for writing the status report on the Dwarf Sandwort *Minuartia pusilla* in Canada. COSEWIC also gratefully acknowledges the financial support of the BC Conservation Data Centre for the preparation of this report. The report was edited by Erich Haber, COSEWIC Co-chair (Vascular Plants) Plants and Lichens Species Specialist Subcommittee.

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 la minuartie naine (*Minuartia pusilla*) au Canada.

Cover illustration:
Dwarf sandwort — line drawing in Hitchcock et al. 1964 and Douglas et al. 1998. This illustration has been reproduced with permission from the University of Washington Press.

Catalogue No. CW 69-14/395-2004E-PDF
ISBN 0-662-37363-4
HTML: CW69-14/395-2004E-HTML
0-662-37364-2


Recycled paper

COSEWIC
Assessment Summary

Assessment Summary – May 2004

Common name
Dwarf sandwort

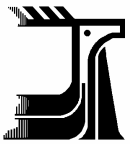
Scientific name
Minuartia pusilla

Status
Endangered

Reason for designation
An annual ephemeral herb present at a single very small vernal seepage site along a rocky maritime headland in southern Vancouver Island highly disjunct from the nearest populations in southern Washington State. The maximum population size documented totals 20 plants with numbers likely fluctuating depending on precipitation patterns. Risks to the plants arise from the susceptibility of the single small population to stochastic events and on-going disturbance of the habitat by gulls, trampling by boaters and potentially from encroaching invasive plants.

Occurrence
British Columbia

Status history
Designated Endangered in May 2004. Assessment based on a new status report.



COSEWIC
Executive Summary

Dwarf Sandwort
Minuartia pusillia

Species information

Dwarf sandwort (*Minuartia pusilla*) is a member of the Pink or Caryophyllaceae family. It is an annual herb with a weak taproot. The plant is 2-5 cm tall with solitary or few erect stems that are simple to branched and smooth, white-waxy in appearance. The basal and lower stem leaves are opposite and linear, and the upper stem leaves are few, similar, not much reduced and without stipules. The flowers are arranged in an open, leafy-bracted cluster that is often 4/5 the total height of the plant. The petals are sometimes lacking. The fruits are egg-shaped capsules that are 3-valved.

Distribution

Dwarf sandwort is found in western North America from British Columbia south to Idaho, Arizona and northwestern California. It is only known from one location in Canada in southwestern British Columbia at Rocky Point on southern Vancouver Island. The nearest known occurrence south of Rocky Point is in Klickitat County in the very southern portion of Washington State.

Habitat

Dwarf sandwort is found in a climatic and floristic anomaly in coastal British Columbia, the Coastal Douglas-fir Zone. Within this zone, it occurs in a small vernal seep on the flat top of a coastal headland with about four inches of moraine. The southeast sloping (0-24%) depression is wet in the spring and mesic to dry later in the season. The soil types are rapidly draining sandy moders (a type of sandy humus) with no soil moisture late in the season and poor nutrient content.

Biology

Dwarf sandwort likely germinates in December or January in British Columbia and reaches reproductive age within one year. It potentially over-winters in the seedling stage, and therefore behaves as a winter annual with flowers developing in May or June. It is a strict ephemeral that is greatly reliant on precipitation before and during the

growing season for its germination and longevity. Dwarf sandwort has tiny flowers, and lacks nectar glands and occasionally petals. Furthermore, the anthers open prior to floral expansion, thus suggesting that it is exclusively self-pollinated.

Population Sizes and Trends

There is only one known location for dwarf sandwort in British Columbia. When it was first observed in 1977, there were approximately 20 plants over about 10 m² and when it was last observed in 2002, there were 9 plants over the same area. Annual ephemerals often experience year to year changes in population size dependant on changing climatic conditions, so the decline may not represent a significant trend. Numerous surveys have been made in the region to locate new populations with no success.

Limiting Factors and Threats

Dwarf sandwort, diminutive in stature, is likely quite sensitive to physical disturbance. It is also likely susceptible to any physical or chemical changes to the vernal seep it inhabits. Actual threats include digging by gulls and possibly trampling by trespassing boaters. In the winter of 2002 to 2003, soils were churned up by gulls in the immediate vicinity of the site. Introduced annuals could become a problem in the future. Mosses could also pre-empt dwarf sandwort at the site. Numbers of dwarf sandwort likely fluctuate from year-to-year, but if in any given year, critical moisture is not available for germination and seedling development, it is possible that the species could disappear altogether. Likewise, if the habitat is too wet, conditions could become unsuitable.

Special Significance of the Species

As dwarf sandwort is at the northern range limit of the species in North America, there are potentially genetic differences in this population from other populations south across the Canadian-U.S. border. Genetically distinct peripheral populations may be important for the long term survival of the species as a whole.

Existing Protection or Other Status Designations

Globally, dwarf sandwort is common to very common and demonstrably secure and essentially ineradicable under present conditions. Provincially, however, the British Columbia Conservation Data Centre in the Ministry of Sustainable Resource Management has ranked this species as “S1” (critically imperiled) and placed it on the “Red list. “

Recent studies on rare plants on the Department of National Defense properties where dwarf sandwort occurs will be considered in a natural resource management plan.

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 2004)

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 that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
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 | Environnement Canada
Canadian Wildlife Service | 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 Sandwort

Minuartia pusilla

in Canada

J.L. Penny[1]
B. Costanzo[2]

2004

[1]P.O. Box 9993
STN Prov Govt
Victoria, BC
V8W 9R7
[2]P.O. Box 9338
STN Prov Govt
Victoria, BC
V8W 9M1

TABLE OF CONTENTS

List of figures

SPECIES INFORMATION

Name and classification

Scientific name: *Minuartia pusilla* (S. Wats.) Mattf.[1]
Synonyms: *Arenaria pusilla* S. Wats.
Common name: Dwarf sandwort; annual sandwort; dwarf stitchwort
Family: Caryophyllaceae; Pink Family
Major plant group: Angiospermae (flowering plants)

Minuartia is named after Juan Minuart from Barcelona (1693-1768) and *Arenaria* is from the Latin word *arena* for sand (Coombes 1985).

Arenaria pusilla was placed in the genus *Minuartia* based on the capsule opening by as many valves as there are styles. In *Arenaria,* the capsule dehisces by twice as many valves as styles (McNeill 1980). McNeill and Bassett (1974) place the genus *Minuartia* in the exstipulate subfamily Alsinoideae following Pax and Hoffmann (1934).

Based on phenetic analysis and seed morphology, Meinke and Zika (1992) have placed *Minuartia pusilla* in an alliance with *M. cismontana* (cismontane sandwort) and *M. californica* (California sandwort). The latter two species are endemic to Oregon and California.

Description

Minuartia pusilla is an annual herb from a weak taproot (Figure 1; Douglas *et al*. 1998b). The plant has a glaucous tinge (Ceska and Ceska 1980). The stems are erect, solitary or more often, few, simple to branched, glabrous and more or less glaucous, 2-5 cm tall. The basal and lower stem leaves are opposite, linear, 2-4 mm long, less than 0.5 mm wide, glabrous, obtuse, and 1-nerved. The upper stem leaves are few, similar, not much reduced and the stipules are lacking. The inflorescence usually consists of several flowers in an open, leafy-bracted cluster that is often 4/5 the total height of the plant. The petals are elliptic and 1-2 mm long, but sometimes lacking. The sepals are lanceolate, long-pointed or abruptly sharp-pointed, 2-3 mm long, and 3-nerved. The capsules are egg-shaped, 1-2 mm long, and 3-valved. The seeds are brown, about 0.3 mm long, and minutely pimply.

Minuartia pusilla resembles shining starwort (*Stellaria nitens*), but has entire petals rather than cleft ones found in *S.nitens* (Ceska and Ceska 1980). It is also similar in appearance to western pearlwort (*Sagina decumbens* ssp. *occidentalis*), which has rounded sepals, and slender sandwort (*Minuartia tenella*), which has glandular-hairy sepals and stems. *Minuartia pusilla*, in contrast, has pointed sepals and smooth stems. Both species occur in the same type of habitat as *M. pusilla*.

[1]Nomenclature in this document follows Douglas *et al*. (1998a, b, 1999, 2000 and 2001).

Figure 1. Illustration of *Minuartia pusilla* (entire plant on right; line drawing in Hitchcock et al. 1964 and Douglas et al. 1998).[2]

DISTRIBUTION

Global range

Minuartia pusilla is found in western North America from British Columbia south to Idaho, Arizona and northwestern California (Figure 2; Douglas *et al*. 1998b).

Canadian range

Minuartia pusilla is only known from a single locality in Canada on southern Vancouver Island, British Columbia (Ceska and Ceska 1980; Douglas *et al*. 1998b, 2002a, b) (Figure 3). It was discovered only relatively recently in 1977, but since it grows in a natural seepage in an undeveloped area with other native species, it is quite unlikely that it was introduced to this site. It was certainly overlooked previous to 1977 due to its occurrence on inaccessible lands restricted from public use (Department of National Defense property (DND)). Also, it may have been overlooked historically, prior to the establishment of the site as a DND property, due its diminutive stature and its

[2]This illustration has been reproduced with permission from University of Washington Press.

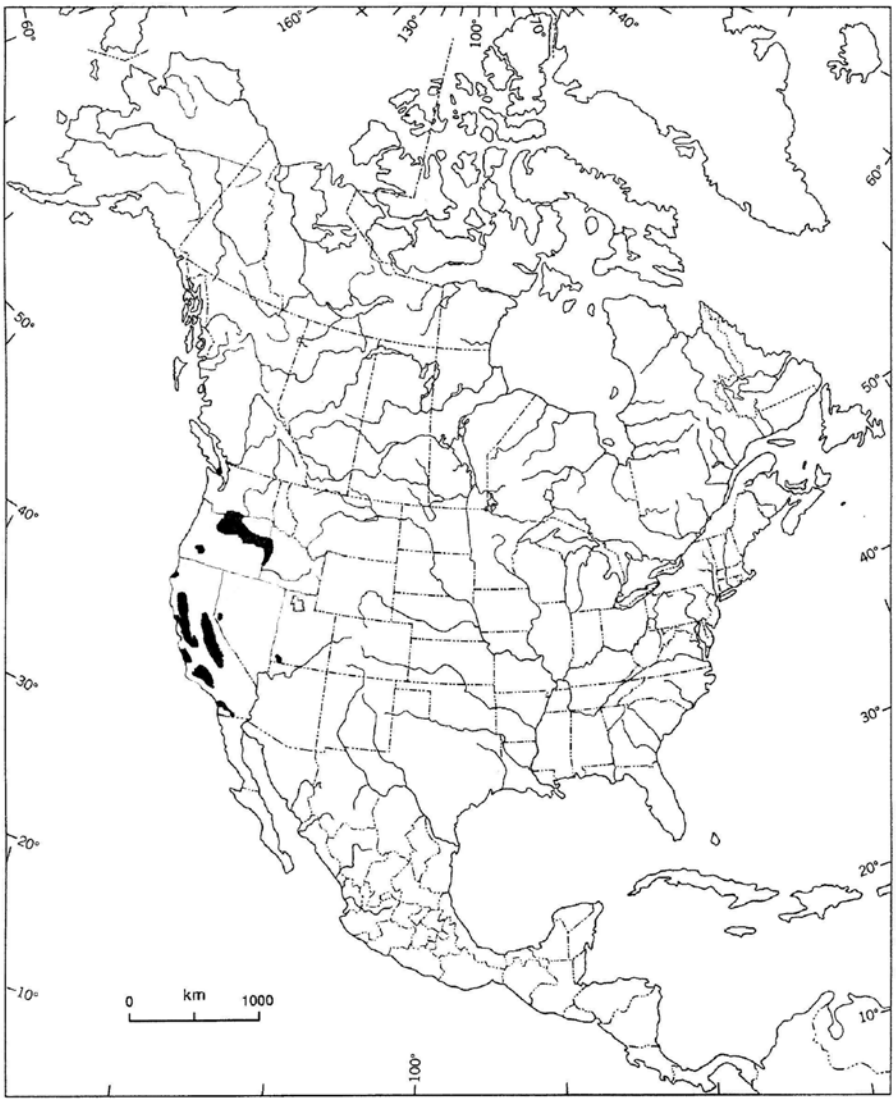


Figure 2. Distribution of *Minuartia pusilla* in North America.

superficial similarity to the widespread *M. tenella*, which occurs in similar habitats. Since its discovery, botanists have scoured the region around Victoria for it with great care and found no further records.

Since 1997 over 150 person search hours by qualified individuals have been conducted at the most likely sites including Trial, Discovery, Griffing Calmer, Saturna Islands, Alpha Islet and Harling and Sax Points and Uplands Park. No additional individuals or populations have been found. In February 2004, specimens of *Minuartia tenella* at the BC Provincial Museum were checked to see if any overlooked specimens of *M. pusilla* had been collected, but misidentified. No additional specimens of *M. pusilla* were found (Jennifer Penny, pers. comm. to David Fraser, February 9, 2004).

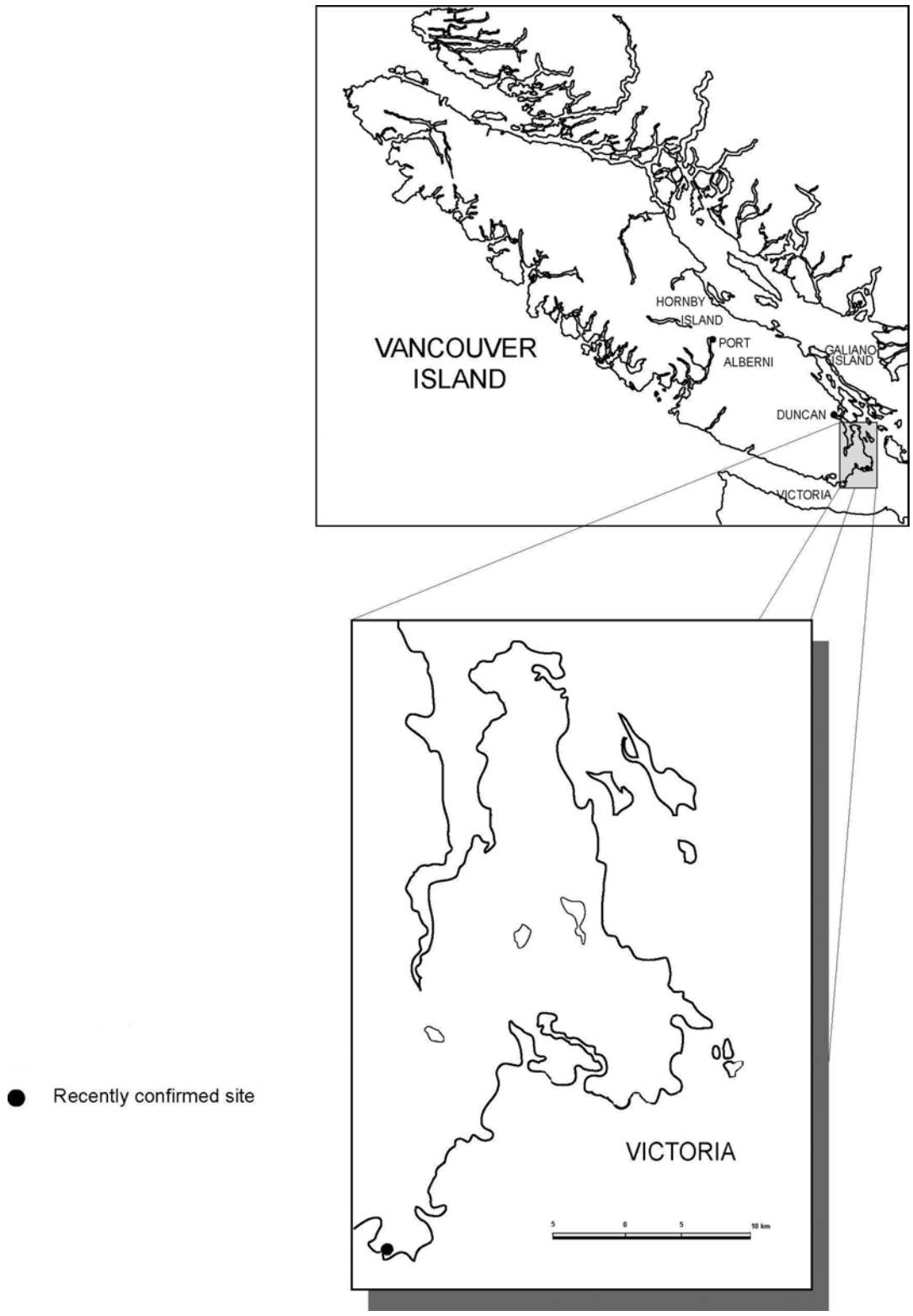


Figure 3. Location of *Minuartia pusilla* in British Columbia.

This species appears to be similar in distribution to a large suite of species that are found in California and Oregon, but are completely or largely absent from Washington State. This group include species such as *Allium amplectens, Crassula erecta* (= *C. connata*), *Clarkia viminea, Dryopteris arguta, Isoetes nuttallii, Juncus kelloggii, Minuartia pusilla, Microseris bigelovii, Montia howellii, Myrica californica, Ranunculus californicus, Trifolium depauperatum, Triphysaria versicolor, Vulpia pacifica, Woodwardia fimbriata*, etc. (Ceska and Ceska 1997). Distribution of this species is similar to Small-flowered tonella (*Tonella tenella*), COSEWIC endangered (2003), as it also is found at only one site in the Georgia Depression.

HABITAT

Habitat requirements

Minuartia pusilla in British Columbia is found in a climatic and floristic anomaly in coastal British Columbia, the Coastal Douglas-fir Zone. This zone includes a small portion of southeastern Vancouver Island, several islands in the Gulf of Georgia, and a narrow strip of the adjacent mainland (Nuszdorfer *et al*. 1991). As it is situated at a relatively southern latitude for Canada, on its west coast, and in a rainshadow belt created by the Olympic and Vancouver Island Mountains, the result is a Mediterranean climate with warm, dry summers and mild, wet winters.

Within this region, *Minuartia pusilla* occurs on the flat top of a coastal headland in a shallow soil depression with about four inches of moraine (Ceska and Ceska 1980). The southeast sloping (0-24%) depression is wet in the spring and mesic to dry later in the season. The soils are a rapidly draining sandy moder with poor nutrient content and no soil moisture late in the season. The root-restricting layer is 1-20 cm and the coarse fragment content about 35-70% (M. Fairbarns, pers. comm.).

The vegetation of the coastal headlands where *M. pusilla* occurs is controlled by exposure to winds and salt spray. Shrub and tree species such as salal (*Gaultheria shallon*) and shore pine (*Pinus contorta*) are unable to grow close to shore. Low-growing herbs are able to grow under such conditions, although they are also limited by those factors. Within the vernal seep habitat, erosion plays a key role in maintaining a constant, fresh supply of mineral soil that is needed for germination by *M. pusilla*.

Associated species in the vernal seep include the following (A. Ceska and M. Fairbarns, pers. comm.): barren fescue (*Vulpia bromioides*), beach bluegrass (*Poa confinis*), blinks (*Montia fontana*), cudweed (*Gnaphalium* species), dwarf owl-clover (*Triphysaria pusilla*), early hairgrass (*Aira praecox*), erect pygmyweed (*Crassula connata* var. *connata*), few-flowered shootingstar (*Dodecatheon pulchellum*), hairy cat's-ear (*Hypochaeris radicata*), rattail fescue (*Vulpia myuros*), red thread-moss (*Bryum miniatum*), ribwort plantain (*Plantago lanceolata*), Scouler's popcorn flower (*Plagiobothrys scouleri*), slender plantain (*Plantago elongata*), small-leaved bentgrass (*Agrostis microphylla*), sticky chickweed (*Cerastium glomeratum*), and thrift (*Armeria maritima*).

In Washington, California, Oregon, and Idaho, the habitat is open, dry soil of big sagebrush (*Artemisia tridentata*) and ponderosa pine (*Pinus ponderosa*) forest (Hitchcock *et al*. 1964). *Minuartia pusilla* occurs in a variety of primarily xeric habitats, often in waste areas or otherwise sterile sites (Meinke and Zika 1992).

Trends

The Coastal Douglas-fir zone has a very limited range in the province and suitable habitats for *Minuartia pusilla* within it are also restricted and fragmented. Urbanization, agriculture and the spread of invasive species within the range of *M. pusilla* may limit its ability to expand to other potentially suitable habitats. These factors have reduced the Garry Oak woodland to less than 5% of its original extent in the Victoria area (Lea 2002). Specifically, within the known site, the habitat has remained virtually unchanged since the discovery of it in 1977 (A. Ceska pers. comm.). Drying of the seep would be disastrous for *M. pusilla*. Likewise, if conditions become too wet, the species could disappear. Changes in the conditions of the habitat could also allow introduced annual or other native species such as mosses to increase and pre-empt *M. pusilla*.

Protection/ownership

The single occurrence of *Minuartia pusilla* is found on Canadian Department of National Defense (DND), C.F.B. Esquimalt, property where public access is restricted. The area in which *M. pusilla* occurs is currently used as a buffer and training area (for small patrols carrying out map and compass work) with no foreseeable alternate use into the future (A. Robinson, pers. comm.). A natural resource management program for these DND properties is going to be implemented. The plan includes recommendations from the science advisory committee, a group that oversees research on the lands. Rare plant demographic studies and mapping are currently part of the research program. Locations of all rare plant species are going to be identified on a sensitive sites map for the properties so that they can be better protected (A. Robinson, pers. comm.).

BIOLOGY

General

There has been one study that included mention of *Minuartia pusilla* (Meinke and Zika 1992), and some work has been done on other similar species. These studies may be used to draw some conclusions about the biology of this species.

Phenology

Minuartia pusilla likely germinates in December or January in British Columbia, and reaches reproductive age within one year (A. Ceska pers. comm.). It potentially over-winters in the seedling stage and therefore behaves as a winter annual with

flowers developing in May or June (A. Ceska pers. comm.). Meinke and Zika (1992) state that *M. pusilla* is a strict ephemeral that is reliant on precipitation both before and during the growing season for germination and longevity.

Although no work has been done on *Minuartia pusilla* specifically, its lifecycle requirements appear to have similarities to other close taxa within the family. Baskin and Baskin (1987) looked at *Arenaria fontinalis,* an eastern North American endemic winter annual. They found that dormant seeds in spring required high summer temperatures to promote after-ripening. This after-ripening period released the seeds from dormancy in the fall. Baskin and Baskin (1972, 1976) and Wyatt (1984) observed that high summer temperatures promoted after-ripening of seeds in several species with similar life cycles, including *A. uniflora*, another winter annual of the eastern United States. In addition, Baskin and Baskin (1987) investigated the effect of vernalization on seeds and found that *A. fontinalis* seeds flowered without vernalization, but greenhouse experiments showed that plants kept in an unheated greenhouse during the winter were healthier and had higher survivorship than those kept in a heated greenhouse. As is the case in the majority of winter annual species (Baskin and Baskin 1974, 1987), *M. pusilla* flowering is potentially controlled by temperature and not photoperiod.

Mating systems

Meinke and Zika (1992) report that *M. pusilla* has tiny flowers that lack nectar glands and also occasionally lack petals. As well, the anthers open prior to floral expansion suggesting that *M. pusilla* is exclusively self-pollinated.

Speculation on the mating system operating in the British Columbia population of *M. pusilla* could be based on studies done on other species in the family with similar life cycles. Wyatt (1984, 1986) reported that populations of *A. uniflora* have a wide range of different mating systems with large-flowered plants predominantly outcrossing in the center of the species range and highly selfing small-flowered pseudo-cleistogamous plants in the peripheral parts of the range. Fishman and Wyatt (1999) found in *A. uniflora* that selfing was common in plants of ephemeral habitats. Likewise, Lloyd (1965) found that populations that grew on shallow soils were forced to bloom earlier, thereby missing the emergence of pollinating insects. As there is a greater potential for local adaptation by self-pollinating taxa (Jain 1976), it seems that there would be great advantage for an isolated population at the furthest extent of the species range to adopt self-pollination as its mating system. Therefore, given all the above observations, it is likely that *Minuartia pusilla* is self-pollinating.

Pollinators have not been observed on *M. pusilla* in British Columbia. *Andrena* bees are important pollinators for species of *Arenaria*. The pollinators of *A. uniflora* were Dipterans (particularly syrphid flies), Hymenoptera species (particularly andrenid and halictid bees) and one species of Lepidoptera (Wyatt 1986).

Survival

Sharitz and McCormick (1973) found that the early juvenile stages were the most vulnerable period in *M. uniflora*. This was due to the washing out of seeds and seedlings due to natural precipitation, as well as a demonstrated sensitivity to moisture stress. These two factors both contributed to early mortality. Wyatt (1986) also looked at survivorship in *A. uniflora* and in dry years, survivorship decreased due to competition for available water. Wyatt (1986) also found that the species was less resistant to abiotic stress than other primary invaders (of granite outcrops). Sharitz and McCormick (1973) found that soil depth and moisture determined plant densities and the outcome of within-species competition. For *A. uniflora*, Wyatt (1984) found that deeper soils lead to the invasion of other plants that would potentially outcompete smaller species such as *Arenaria* species.

Physiology

Unknown.

Movements/dispersal

Minuartia pusilla seeds have no mechanisms for dispersal; however, Wyatt (1984) found that seashore birds walking in muddy areas may disperse seeds of *A. uniflora*. The location of the extant population of *M. pusilla* in BC is adjacent to the ocean and gulls are known to frequent the area.

Nutrition and interspecific interactions

Unknown.

Behaviour/adaptability

Minuartia pusilla is an ephemeral species and therefore, relies on seasonal precipitation for germination and longevity (Meinke and Zika 1992). It is dependent on consistent year-to-year moisture during the appropriate seasons for both germination and seedling development. We do not know how adaptable the species will be to climate change (i.e. to an increasing drying trend), but it is likely that it will not survive, due to these requirements.

It is unknown how well *M. pusilla* will tolerate environmental degradation, but since it is a diminutive annual, any small disturbance is likely to interfere with its lifecycle and thereby decrease survival rate.

POPULATION SIZES AND TRENDS

There is only one known location for *M. pusilla* in British Columbia. It was first observed in 1977. Adolf and Oluna Ceska have sought out suitable habitats for this species in the region since the discovery in 1977 (A. Ceska, pers. comm.). In 2002, they were also commissioned to do another detailed survey for it in suitable habitats, but no new sites were found. A population of approximately 20 plants over about 10 m² were enumerated in 1977 and 9 plants were observed in 2002 over the same area (A. Ceska, pers. comm.). As this population has not been monitored, we do not know the year-to-year changes in population size; however, a decrease in numbers from 1977 to 2002 indicates a 55% decline over a 25 year period. One should be cautious in interpreting the decline as annual ephemerals can experience large changes in numbers from year to year depending on climatic conditions. It appears that *M. pusilla* has remained relatively stable at a very low effective population size at the single Canadian site.

Although this species exists in Washington State, it is unlikely that any immigration would occur. The nearest known location in Washington is in Klickitat County in the very southern portion of the state over 300 km distant.

LIMITING FACTORS AND THREATS

Any random unexpected disturbances that could damage the 10 m² of habitat at the one known site for this species pose an imminent threat. *Minuartia pusilla* is likely quite sensitive to physical disturbance due to its diminutive stature and susceptible to any physical or chemical changes to the vernal seep it inhabits.

Actual threats include digging by gulls and possibly trampling by trespassing boaters. In the winter of 2002 to 2003, soils were moderately churned up by gulls in the immediate vicinity of *M. pusilla*. Light disturbance likely helps limit pre-emption by mosses and other annuals. It is not known to what degree *M. pusilla* is able to compete with other annual species such as *Vulpia* spp. Competition could become a limiting factor.

Minuartia pusilla also likely experiences demographic fluctuations as a result of natural but irregular and limited winter rains. It is possible that the species could disappear altogether if critical moisture is not available for germination and seedling development, and is therefore potentially susceptible to climate change (i.e., drying trends). Likewise, if conditions are too wet, the habitat will be unsuitable.

SPECIAL SIGNIFICANCE OF THE SPECIES

As *Minuartia pusilla* is at the northern range limit of the species in North America, there may be genetic differences between this population and the United States 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).

The species has no known special interest to science or to the public. There are no known horticultural uses, although some members of the genus are favourite horticultural rock garden species (Bailey and Bailey 1976).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Globally, *Minuartia pusilla* has been given a rank of "G5" by NatureServe (2002), a ranking that indicates that, on a global scale, it is considered to be "common to very common; demonstrably secure and essentially ineradicable under present conditions". Nationally, it has been given a rank of “N1.” The British Columbia Conservation Data Centre in the Ministry of Sustainable Resource Management has ranked this species as “S1” and placed it on the “Red list “(Douglas et al. 2002a).

There is currently no specific provincial rare species legislation in place for the protection of endangered/threatened vascular plants in British Columbia. Once designated by COSEWIC, *Minuartia pusilla* could, however, be considered federally protected by the Species at Risk Act.

TECHNICAL SUMMARY

Minuartia pusilla
Dwarf sandwort minuartie naine
Range of Occurrence in Canada: British Columbia

Extent and Area Information	
Extent of occurrence (EO)(km²)	<< 1 km² (10 m^2)
• *Specify trend in EO*	Stable
• *Are there extreme fluctuations in EO?*	Unknown
Area of occupancy (AO) (km²)	<< 1 km² (10 m^2)
• *Specify trend in AO*	Stable
• *Are there extreme fluctuations in AO?*	Unknown
• *Number of known or inferred current locations*	1
• *Specify trend in #*	Stable
• *Are there extreme fluctuations in number of locations?*	No
• *Specify trend in area, extent or quality of habitat*	Decline is likely based on impacts of trampling and disturbance by gulls
Population Information	
• *Generation time (average age of parents in the population)*	1 year (< 6 months)
• *Number of mature individuals*	9 (in 2002) but variable in number and maintained at low levels
• *Total population trend:*	Unknown
• *% decline over the last/next 10 years or 3 generations.*	Numbers likely fluctuate yearly
• *Are there extreme fluctuations in number of mature individuals?*	Unknown but possible at very low levels of population size
• *Is the total population severely fragmented?*	Yes (disjunct from populations in NW USA)
• *Specify trend in number of populations*	Stable
• *Are there extreme fluctuations in number of populations?*	None (1 population)
• List populations with number of mature individuals in each: - 9 plants at the single population	
Threats (actual or imminent threats to populations or habitats)	
- imminent: invasive species competition; climate change (drying trends) - actual: trampling by boaters, wave action, and diggings by gulls	
Rescue Effect (immigration from an outside source)	
• *Status of outside population(s)?* **USA**: Stable	
• *Is immigration known or possible?*	Unlikely
• *Would immigrants be adapted to survive in Canada?*	Unknown
• *Is there sufficient habitat for immigrants in Canada?*	Probably
• *Is rescue from outside populations likely?*	No
Quantitative Analysis	Not Applicable
Other Status	

Status and Reasons for Designation

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

Reasons for Designation: An annual ephemeral herb present at a single very small vernal seepage site along a rocky maritime headland in southern Vancouver Island highly disjunct from the nearest populations in southern Washington State. The maximum population size documented totals 20 plants with numbers likely fluctuating depending on precipitation patterns. Risks to the plants arise from the susceptibility of the single small population to stochastic events and on-going disturbance of the habitat by gulls, trampling by boaters and potentially from encroaching invasive plants.

Applicability of Criteria

Criterion A (Declining Total Population):
Likely not applicable due to naturally fluctuating population size

Criterion B (Small Distribution, and Decline or Fluctuation):
N/A. Small EO and AO but decline not evident due to fluctuation in numbers of the few plants documented.

Criterion C (Small Total Population Size and Decline):
N/A. Small population that fluctuates but no decline evident.

Criterion D (Very Small Population or Restricted Distribution):
Endangered under D1 due to presence of <250 plants

Criterion E (Quantitative Analysis): N/A

ACKNOWLEDGEMENTS

We thank Adolf and Oluna Ceska for finding the location in 2002 and Adolf for reviewing the text. We also thank Matt Fairbarns for sharing his observations about the Minuartia pusilla site.

Funding for the preparation of this status report provided by the BC Conservation Data Centre.

AUTHORITIES CONTACTED

Adolf Ceska, Plant Ecologist, Ceska Geobotanical Consulting, P.O. Box 8546, Victoria, B.C., Canada V8W 3S2. Matt Fairbarns. Conservation Data Centre British Columbia Ministry of Sustainable Resource Management. PO BOX 9344 Stn Prov Govt V8W 9R7

Art Robinson, Pacific Forestry Centre and Department of National Defense. Secretariat, DND Environmental Science Advisory Committee.

LITERATURE CITED

Bailey, L.H. and E.Z. Bailey. 1976. Hortus Third. MacMillan Publishing Company, New York, NY. 1290 pp.

Baskin, J.M. and C.C. Baskin. 1972. Physiological ecology of germination of *Viola rafinesquii*. Amer. J. Bot. 59: 981-988.

Baskin, J.M. and C.C. Baskin. 1974. Influence of low winter temperatures on flowering of winter annuals. Castanea 39:340-345.

Baskin, J.M. and C.C. Baskin. 1976. High temperature requirement for after-ripening in seeds of nine winter annuals. New Phytol. 77: 619-624.

Baskin, J.M. and C.C. Baskin. 1987. Seed germination and flowering requirements of the rare plant, *Arenaria fontinalis* (Caryophyllaceae). Castanea 52(4): 291-299.

Ceska, A. and O. Ceska. 1980. Additions to the Flora of British Columbia. Can. Field-Nat. 94:69-74.

Ceska, A. 2002. Personal Communication. Victoria, British Columbia.

Ceska, A. and O. Ceska. 1997. New species for British Columbia: Clarkia viminea (Onagraceae) No. 171, July 30, 1997.

Coombes, Allen, J. 1985. Dictionary of Plant Names. Timber Press, Portland, OR. 207 pp.

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. 358 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. 2000. Illustrated flora of British Columbia. Volume 5. Dicotyledons (Salicaceae to Zygophyllaceae) and Pteridophytes. British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests, Victoria, BC. 389 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. 1998a. 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. 1998b. Illustrated flora of British Columbia. Vol. 2. Dicotyledons (Balsaminaceae through Cuscutaceae). British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forests. Victoria, BC. 401 pp.

Fishman, L. and R. Wyatt. 1999. Pollinator-mediated competition, reproductive character displacement, and the evolution of selfing in *Arenaria uniflora* (Caryophyllaceae). Evol. 53(6):1723-1733.

Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. 1964. Vascular Plants of the Pacific Northwest. Part 2: Salicaceae to Saxifragaceae. Univ. Wash. Press, Seattle, WA. 597 pp.

Jain, S.K. 1976. The evolution of inbreeding in plants. Annual Review of Ecology and Systematics. 7: 469-495.

Lea, Ted. 2002. Historical Garry Oak Ecosystems of Greater Victoria and Saanich Peninsula. 1:20,000 Map. Terrestrial Information Branch, B.C. Ministry of Sustainable Resource Management. Victoria, B.C.

Lesica, P. and F.W. Allendorf. 1995. When are peripheral populations valuable for conservation? Conservation Biology. 9: 753-760.

Lloyd, D.G. 1965. Evolution of self-compatibility and racial differentiation in *Leavenworthia* (Cruciferae). Contributions from the Gray Herbarium of Harvard University 195: 3-134.

McNeill, J. 1980. The delimitation of *Arenaria* (Caryophyllaceae) and related genera in North America, with 11 new combinations in *Minuartia*. Rhodora 82:495-502.

McNeill, J. and I.J. Bassett. 1974. Pollen morphology and the infrageneric classification of *Minuartia* (Caryophyllaceae). Can. J. Bot. 52: 1225-1231.

Meinke, R.J. and P.F. Zika. 1992. A new annual species of *Minuartia* (Caryophyllaceae) from Oregon and California. Madroño 39 (4): 288-300.

NatureServe 2002. NatureServe Explorer: An online encyclopedia of life [web application]. 2002. Version 1.6. Arlington, VA, USA: NatureServe. Available: http://www.natureserve.org/explorer.

Nuszdorfer, F.C., K. Klinka and D.A. Demarchi. 1991. Coastal Douglas-fir zone. Pages 95-112 *in* Ecosystems of British Columbia. D. Meidinger and J. Pojar (eds.). British Columbia Ministry of Forests Special Report Series No. 6, Victoria, BC. 330 pp.

Pax, F. and Hoffman, K. 1934. Caryophyllaceae. *In*: Engler, A. & Harms, H. Die naturlichen Pflanzenflamilien, ed. 2, 16c, pp. 275-364. Leipzig.

Sharitz, R.R. and J.F. McCormick. 1973. Population dynamics of two competing annual plant species. Evol. 54(4):723-739.

Wyatt, R. 1984. The evolution of self-pollination in granite outcrop species of *Arenaria* (Caryophyllaceae). I. Morphological correlates. Evol. 38(4):804-816.

Wyatt, R. 1986. Ecology and evolution of self-pollination in *Arenaria uniflora* (Caryophyllaceae). J. Ecol. 74:403-418.

BIOGRAPHICAL SUMMARY OF REPORT WRITERS

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 conducted extensive field work in botany and has co-authored six 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* (2002).

Brenda Costanzo has an M.Sc. (Botany) from the University of Victoria. She was the Assistant Curator of the Herbarium at the University of Victoria from 1989 until 2001. Brenda has done extensive field work in botany and has recently worked on preparing fact sheets for plants at risk in Garry oak and associated ecosystems for the Garry Oak Recovery Team (GOERT). She was also the chair of the Plants at Risk Recovery Action Group under GOERT for six months. Brenda is currently the Species at Risk Recovery Coordinator for forest dependent species at the British Columbia Ministry of Water Land Air Protection.