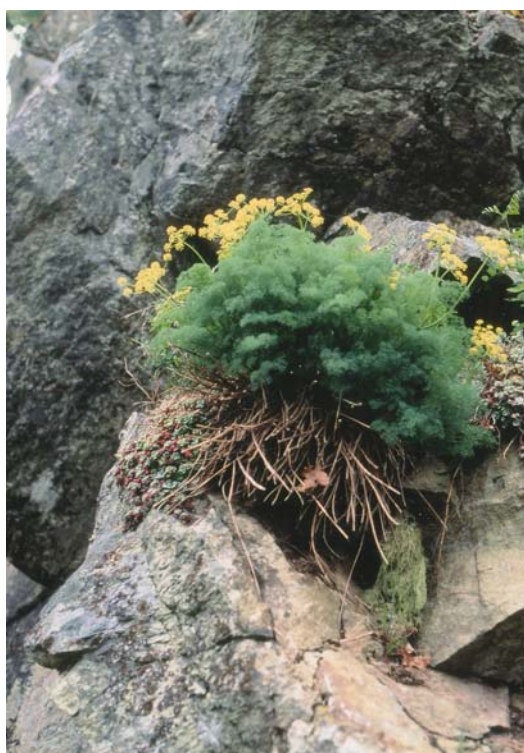


**COSEWIC**  
**Assessment and Status Report**

on the

**Gray's Desert-parsley**  
*Lomatium grayi*

in Canada



**THREATENED**  
**2008**

**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:

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Gray's Desert-parsley — Photo: Karen Golinski, April 1999, Mt. Maxwell, Saltspring Island.

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## COSEWIC Assessment Summary

### Assessment Summary – November 2008

**Common name**

Gray's Desert-parsley

**Scientific name**

*Lomatium grayi*

**Status**

Threatened

**Reason for designation**

A highly restricted perennial herb with a small population found on only two sites on the Gulf Islands of British Columbia. The presence of invasive species such as Scotch Broom reduces the quality of the fragile habitat and grazing deer and sheep likely restrict the species' ability to expand beyond its limited area of occupancy.

**Occurrence**

British Columbia

**Status history**

Designated Threatened in November 2008. Assessment based on a new status report.



**COSEWIC**  
**Executive Summary**

**Gray's Desert-parsley**  
*Lomatium grayi*

**Species information**

Gray's Desert-parsley *Lomatium grayi* is one of many species in the genus *Lomatium* of the parsley family (Apiaceae). It is a large herbaceous perennial with a strong taproot, finely divided bluish green foliage, and parsley-type, yellow-flowered flat-topped flower clusters carried on 40 to 60 cm bare stems.

**Distribution**

The species has its main distribution in the Intermountain Basins from Washington south to New Mexico. The small Canadian distribution in the southern Gulf Islands of British Columbia represents a remarkable coastal outlier west of the Cascades. The Extent of Occurrence in British Columbia is only 50 km<sup>2</sup>, including ocean areas between the two locations. The actual extent of suitable habitat on Saltspring Island is five to six square kilometres at most, while the extent on Galiano Island is < 1 km<sup>2</sup>. The actual area of habitat occupied on Saltspring Island is estimated at 8.5 hectares and on Galiano Island at 6 hectares. The two locations represent an Area of Occupancy, following COSEWIC criteria using a 2x2 km grid, of 8 km<sup>2</sup> and only 2 km<sup>2</sup> when using the preferred 1x1 km grid for a species with such a restricted habitat.

**Habitat**

Across its range, *Lomatium grayi* is a plant of dry, stony sites and often of shallow soils. The two occurrences in the Gulf Islands are both on very steep or vertical, southwest-facing rock walls where the plants grow on narrow ledges, in cracks of the rock, and in small pockets of soil. Most of this habitat is open, but there are also portions where *Lomatium* is found under stunted trees or shrubs. Similar habitats are available elsewhere in the Gulf Islands and on southern Vancouver Island but no other occurrences are known in spite of this additional available habitat.

## **Biology**

Plants of the Gulf Islands populations leaf out in early April, flower in late April, and set seed and enter summer dormancy with yellowing foliage by mid-summer. Pollinators have not been identified, but are probably bees, based on studies in Utah. The mode of seed dispersal has not been reported, but in the Canadian cliff populations it may be by wind. Germination takes place in early spring and cultivated plants can reach flowering size in two or three years. U.S. studies indicate that *Lomatium grayi* reaches seven years of age.

## **Population sizes and trends**

With 240 and 1650 individuals respectively on Saltspring Island and Galiano Island, the Canadian populations are very small. The two populations are 17.5 km apart and occupy only 8.5 (Saltspring Island) and 6 (Galiano Island) hectares. Population trends are unknown as intensive studies did not occur before 2002. The extreme terrain makes it unlikely that human impacts have reduced populations in historical times, other than through domestic grazing animals. Slight degradation of the biotic habitat is possible through the increase of introduced species.

## **Limiting factors and threats**

The exclusive occurrence on inaccessible terrain suggests that grazing by native deer and feral sheep is a major limitation for the species to spread into other open, but readily accessible habitats. The few plants found within reach of grazing animals were all young or depauperate. Cultivated plants were consumed by mice, rats and eastern cottontail rabbits. Long-distance seed dispersal across non-habitat areas is also likely to be a limiting factor. Potential threats could be the increase of invasive plants.

## **Special significance of the species**

*Lomatium grayi* is one of the more attractive members of this genus and may well find a place in horticulture. Like several other *Lomatium* species, it was used by some Aboriginal peoples as a source of food and it may, like a closely related species, have antiviral and antibacterial properties. The Canadian occurrences are unique in being the most northerly and the only coastal populations. This disjunct occurrence could be connected with genetic differences.

## **Existing protection or other status designations**

*Lomatium grayi* receives no legal protection throughout its main distribution and is not considered to be at risk in the U.S. In British Columbia it is on the provincial Red list. But this does not convey legal protection. The Saltspring Island population (13% of the estimated total number of individuals) is protected in a Provincial Park/Ecological reserve complex. The Galiano Island population occurs on private properties.



## COSEWIC HISTORY

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

## COSEWIC MANDATE

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

## COSEWIC MEMBERSHIP

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

## DEFINITIONS (2008)

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

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

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

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



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

# **COSEWIC Status Report**

on the

## **Gray's Desert-parsley** *Lomatium grayi*

**in Canada**

2008

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## SPECIES INFORMATION

### Name and classification

- Scientific name: *Lomatium grayi* (Coul. & Rose) Coul. & Rose
- Synonyms: *Peucedanum millefolium* Wats. (1881), *Peucedanum grayi* Coul. and Rose (1888), *Cogswellia millefolia* M.E. Jones (1908), *Cogswellia grayi* Coul. and Rose (1909), *Lomatium millefolium* Macbr. (1918) and *Peucedanum grayi* var. *aberrans* M.E. Jones (1902).
- Common names: Gray's Desert-parsley, Mountain Desert-parsley, Gray's Lomatium, Narrow-leaf Lomatium, and Gray's Biscuit-root.
- Family: Apiaceae, parsley family
- Major plant group: Eudicot flowering plant

*Lomatium grayi* (Coul. & Rose) Coul. & Rose is one of more than 40 species listed for the Pacific Northwest in this genus (Hitchcock and Cronquist 1973). No subspecies have been described within *Lomatium grayi*. However, the variety *depauperatum* (M.E. Jones) Matthias is recognized in some of the U.S. states, and in this context, our plants would be considered *Lomatium grayi* var. *grayi* (Douglas, pers. comm. 2001 ex Schaefer 2002).

### Morphological description

*Lomatium grayi* is a large perennial, usually with a branched caudex, growing from a deep taproot. The basal tuft of finely divided leaves stands 20 to 40 cm high and can reach 40 to 50 cm in diameter in vigorous specimens. It bears 40 to 60 cm tall flowering stems that exceed the foliage and have typical parsley-type and attractively yellow-flowered umbels (Figure 1 & Figure 2). Vigorous plants may produce up to 20 naked flowering stems (scapes). Fruits are smooth, elliptic and flattened, up to 15 mm long and have lateral wings up to 2/3 of the width of the fruit body. Non-flowering/fruitlet herbarium specimens of *Lomatium grayi* may be difficult to distinguish from similar species outside the Canadian range. However, the plants are quite distinctive in the field, with their fluffy, bluish green foliage. In the Canadian range and on the coast, the only other large member of this genus which is superficially similar when lacking flowers and young foliage is *Lomatium dissectum* var. *dissectum*. In fact, the first collection of *Lomatium grayi* was misidentified as *Lomatium dissectum* var. *multifidum*.



Figure 1. Flowering *Lomatium grayi* in a typical rock habitat. Note the previous season's dead leaf stalks, a diagnostic feature for the species. *Sedum spathulifolium*, the most frequently associated species, on the left. Photo: Karen Golinski, April 1999, Mt. Maxwell, Saltsping Island.



Figure 2. The lower part of a vertical rock wall with several clumps of *Lomatium grayi*. The lowest plants are still above the reach of deer. Garry Oak (*Quercus garryana*) woodland below. Photo: Karen Golinski, April 1999, Mt. Maxwell, Saltspring Island.

## **Genetic description**

The variety *depauperatum* is distinguished from the typical variety in western Utah and adjacent Nevada (e.g., Cronquist *et al.* 1997; Welsh *et al.* 1993). By default, the Canadian plants are thought to belong to the var. *grayi* (Douglas, pers. comm. 2001 ex Schaefer 2002). However, no taxonomic or genetic studies have been undertaken on the Canadian population. The Canadian population is about 250 km distant from the nearest presumed extant population in Chelan Co., WA, and is the only coastal population of the species. Due to this large isolation, genetic differences may exist but this has not been directly evaluated.

Based on U.S. population studies, it has been suggested that flowering and sex expression might differ genetically between populations (Thompson 1987). Soltis *et al.* (1997) also found significant intrapopulation genetic diversity in *Lomatium grayi*, although Novak and Soltis (1991) found no phylogeographical pattern to the genetic variation they studied, unlike in other species of *Lomatium*.

## **Designatable units**

A single designatable unit is recognized for this species restricted to only two locations within the Pacific Ecological Area as defined by COSEWIC.

## **DISTRIBUTION**

### **Global range**

The global range of *Lomatium grayi* is restricted to northwest North America and comprises mainly an area between the Cascade Range / Sierra Nevada and the Rocky Mountains within Washington, Idaho, Oregon, Wyoming, Nevada, Utah, Colorado and New Mexico (Figure 3). It is rare in California. Within the U.S. range the species occurs from lowlands to near alpine elevations.



Figure 3. Global distribution of *Lomatium grayi* compiled from USDA Plants Database county occurrence records.

### Canadian range

The Canadian range is small and restricted to two locations 17.5 km from each other, on Saltspring and Galiano Islands, British Columbia, between sea level and about 600 m. These locations are 37 and 55 km respectively north of Victoria, BC, and are the only *Lomatium grayi* locations on the coast and west of the Cascades (Figure 4).

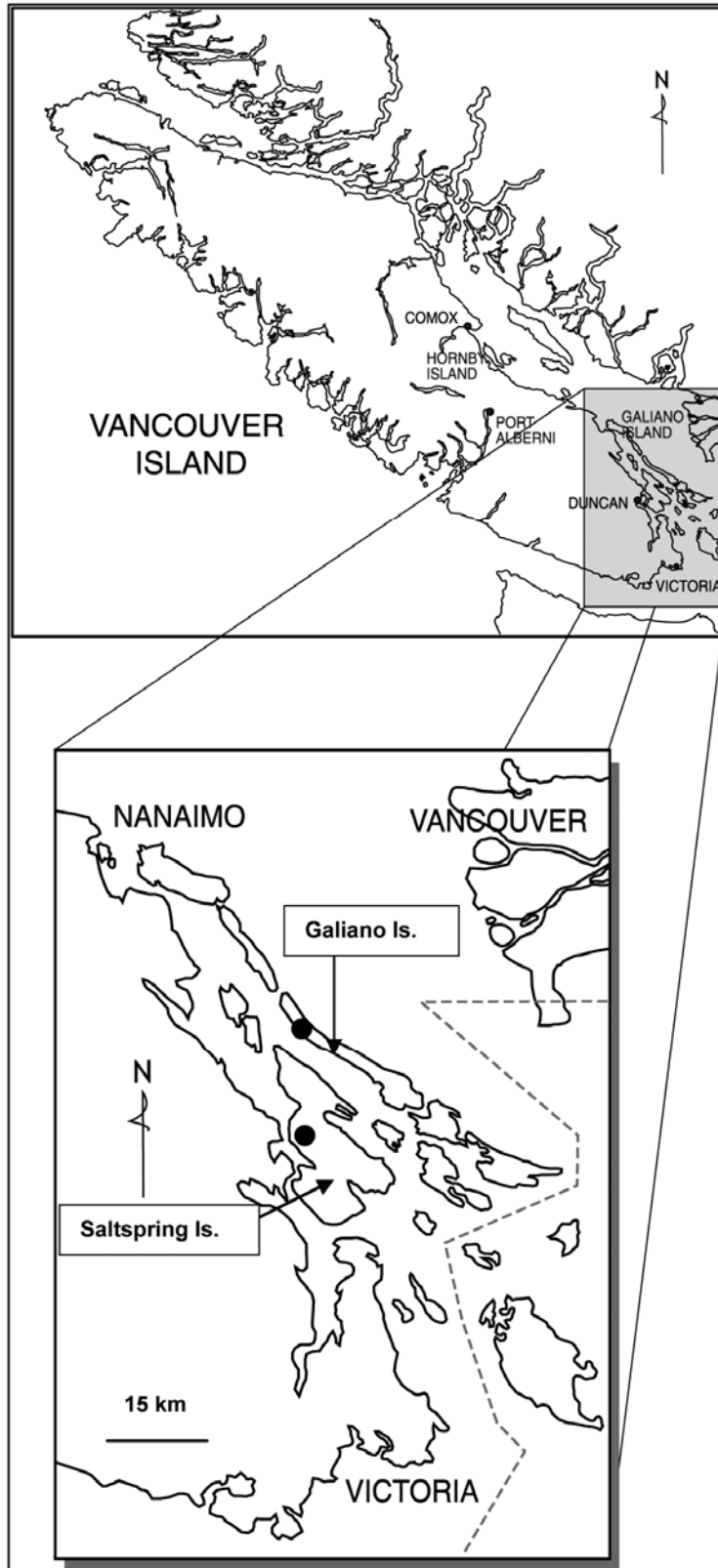


Figure 4. Distribution of *Lomatium grayii* in British Columbia and Canada.

The occurrence of *Lomatium grayi* in Canada was first recognized 20 years ago (see Table 1). The first collection was made in 1980 and was misidentified as *Lomatium dissectum*. Although it is surprising that a showy plant of this stature should have been overlooked for so long, the late recognition does not indicate a recent arrival in Canada. The reasons for not finding this species earlier are: its habitat in inaccessible places (see following sections), the small range, and the absence of focused rare plant searches until recently.

**Table 1. Occurrence frequencies of associated plants at 16 growing sites at the Saltspring Is. population.**

No. of Occurrences at 16 sites	Species
12/16	<i>Sedum spathulifolium</i>
7/16	<i>Cerastium arvense</i> , <i>Bromus sterilis</i> *
6/16	<i>Eriophyllum lanatum</i> , <i>Quercus garryana</i>
5/16	<i>Holodiscus discolor</i> , <i>Cynosurus echinatus</i> *, <i>Selaginella wallacei</i> , <i>Elymus glaucus</i>
4/16	<i>Symphoricarpos albus</i> , <i>Mahonia aquifolium</i> , <i>Melica harfordii</i>
3/16	<i>Festuca rubra</i> , <i>Delphinium menziesii</i> , <i>Arabis</i> sp., <i>Agoseris grandiflora</i>
2/16	<i>Poa canbyi</i> , <i>Castilleja hispida</i> , <i>Camassia leichtlinii</i> , <i>Achillea millefolium</i> , <i>Stipa lemmonii</i> , <i>Rosa nutkana</i> , <i>Epilobium</i> sp., <i>Allium acuminatum</i>

There is no evidence that the historic range of *Lomatium grayi* in its main distribution is different from the current range. No scientific literature exists specifically for the Canadian occurrence, except a recent Stewardship Account (Schaefer 2002) and a field survey report for the species prepared under the auspices of the Garry Oak Ecosystems Recovery Team (Janszen and Roemer 2002). There is therefore no basis for describing differences between the historic and current distribution of *Lomatium grayi* in Canada and British Columbia. The extreme nature of the habitat makes it unlikely that human impacts have induced significant changes in the Canadian distribution.

Measuring only 50 km<sup>2</sup>, the Extent of Occurrence in British Columbia is small and severely limited by habitat. The actual extent of suitable habitat on Saltspring Island would be 5-6 square km at most, while the extent on Galiano Island would be < 1 km<sup>2</sup>. The actual area of habitat occupied on Saltspring Island is estimated at 8.5 hectares and that on Galiano Island at 6 hectares. The two locations represent an Index of Area of Occupancy, following COSEWIC criteria using a 2x2 km grid, of 8 km<sup>2</sup> and only 2 km<sup>2</sup> when using the preferred 1x1 km grid for a species with such a restricted habitat.



## HABITAT

### Habitat requirements

Within its main range in the USA, the species occurs in open areas and commonly in rocky sites and extends in elevation from the foothills and lowlands to moderate elevations in the mountains (Hitchcock *et al.* 1955-1969). In British Columbia, *Lomatium grayi* is a species of cliff faces and other extremely steep terrain. The great majority of plants occur on inaccessible ledges, under rock overhangs, in rock crevices and on small accumulations of talus surrounded by rock. This suggests that grazing and browsing by mammals and possibly invertebrates are determining factors restricting the species' occurrence (Janszen and Roemer 2002).

Soils, where they are available at all, are generally rocky, shallow and fast draining. However, in some cases the plants may benefit from early-season seepage descending along fissures in the rock walls. In both locations, the majority of *Lomatium* plants occur on southwest-facing cliffs of Cretaceous conglomerate and sandstone. Only a few plants occur on much older (Lower Devonian) metamorphic rocks. Where the nature of ledges and crevices allows, scattered stunted trees and shrubs may provide partial shade and it appears that these conditions are equally as suitable as open sites.

A large number of other vascular plants are associated with *Lomatium grayi* in the two locations and in part determine the habitat. However, no distinctive, recurrent plant communities are formed by them and the combinations may be called "opportunistic" or somewhat random. The scattered trees, mentioned above, include in order of decreasing presence, *Quercus garryana*, *Pseudotsuga menziesii*, *Arbutus menziesii* and *Acer macrophyllum*. For the Saltspring Island location, a tally of the immediate associates was kept for 16 *Lomatium* growing sites and resulted in the frequency of presences as indicated in Table 1. An additional 27 species not included in Table 1 were associated only once with *Lomatium grayi*.

Among the associates, the only species considered rare in British Columbia were *Allium amplexans* (S3, Vulnerable) and *Yabea microcarpa* (S1, Critically Imperiled).

## Habitat trends

There is little conclusive information on habitat trends for *Lomatium grayi* in the United States as the species is relatively common. In Canada, no observations on habitat trends are available as only one in-depth survey has occurred (Janszen and Roemer 2002) and the species has only been recognized to occur in British Columbia for about two decades (see Table 1).

A number of similar habitats occur within 50 km of the occupied sites. However, it is questionable if they could be defined as “available habitats” due to the intervening distribution barriers of forested land and marine waters. Fourteen additional localities, all with promising habitats in this zone and beyond have been surveyed without finding further populations (Janszen and Roemer, 2002).

## Habitat protection/ownership

The larger but less densely occupied habitat on Saltspring Island is located in a complex of provincially protected areas. About 13% of the total Canadian population occurs on these protected lands. The habitat on Galiano Island, which is smaller but more densely occupied by *Lomatium grayi*, is located in a series of private seafront properties.

# BIOLOGY

## Life cycle and reproduction

Active growth of *Lomatium grayi* is restricted to spring when sufficient moisture is available. In the Canadian populations, leaf growth is complete between mid- and late April and flowering occurs between late April and late May. Seeds mature between early and mid-July. At the same time, the foliage is yellowing and starts drying off by the end of July. Ideal survey time is therefore from the end of April to the end of May. However, prior to drying-off, the basal tufts of leaves turn golden yellow and make counts nearly as easy as during flowering. Dried leaves are in evidence into the fall and dead leaf stalks are persistent to the next season, a diagnostic feature of this species (compare Fig. 1). The phenology is similar for the main distribution in the United States (Hitchcock *et al.* 1955-1969; Thompson 1984).

Seeds germinate early in the spring (author's observations; Thompson and Moody 1985) and develop two or three leaves and sizable roots in their first season. In cultivation, flowering specimens can be obtained in the third year after germination, but this likely takes longer in natural habitats. According to Thompson and Moody (1985) a plant usually remains vegetative for one to several years, increasing each year the size and number of leaves produced, as well as the size of the taproot. When the plant reaches a size sufficient enough to allow flowering, it produces 1-20 umbels, which have either male flowers or a combination of male and hermaphroditic flowers, making this species andromonoecious. Thompson (1984) found that small plants produce mostly male flowers, while larger plants produce a higher proportion of hermaphroditic flowers, likely because male flowers are less costly to produce. The sex ratio varies among umbels within the same plant, among years, and among plants of the same age. One umbel can contain several hundred flowers (Thompson 1984). Only some of the hermaphroditic flowers develop into mature schizocarps, which then separate into two winged mericarps. One study found 35 to 70% of the schizocarps matured (Thompson 1987). Individuals often do not flower in consecutive years, and the frequency of flowering varies among populations (Thompson and Moody 1985).

Thompson (1984) studied variation in seed mass between *Lomatium grayi* plants, and found differences (almost 16-fold) among 2-yr-old plants that were grown from seedlings under similar conditions. Variance was greatest among seeds within an individual umbel, and between plants. Plants growing in rock crevices and very shallow soils tend to be smaller yet longer-lived than plants in deeper soils (Thompson 1987). Plants usually live five to seven years.

In Utah, *L. grayi* is one of the most common species visited by the bee, *Halictus farinosus* (Nye 1980). This is the only pollinator recorded in the literature. Other mechanisms and the distance of dispersal of pollen have not been studied. No information is available about pollination of Canadian populations.

## Herbivory

*Lomatium grayi* seeds in southeastern Washington are attacked by larvae of two species of weevil and one species of moth, all of which feed parasitically within developing seeds (Ellison and Thompson 1987). For example, adult weevils of the genus *Smicronyx* emerge from the soil in spring, feed and mate on *L. grayi* stems and floral tissues, and oviposit in developing schizocarps. The overall effect of this parasitism and predation by *Smicronyx* sp. larvae and adults included both the direct killing of seeds by larvae and a reduction in the mass and the viability of seeds that escaped larval attack (Ellison and Thompson 1987). Insect-damaged seeds were also observed in the Canadian populations, but the seed-eating organisms remain unidentified (author's observations, ca. 1996).

The nearly exclusive occurrence of Canadian *Lomatium grayi* on inaccessible habitats suggests that herbivory by mammals limits the species' occurrence. The few plants that were found in places that could be accessed by the native coast blacktail deer (Saltspring and Galiano Islands) or by feral sheep (Saltspring Island only) were small, despite their location on less rocky, deeper soils. This suggests that in those places *Lomatium grayi* plants could either not survive very long, or that continual grazing prevented them from growing to full size (Janszen and Roemer 2002). In one case about 60 small seedlings were found crowded on easily accessible, nearly flat soil about 2 m below a large, mature plant growing in a vertical rock wall (Fig. 2). While the seedlings were accessible, the parent plant was out of reach of deer and sheep. No larger specimens were growing on the accessible substrate, an indication that the new seedlings are eliminated by grazers upon germination each year.

The conclusion that herbivory is an important limitation for this species is supported by the author's observation of cultivated specimens. Their strong parsnip-like smell makes it easy for herbivores to detect these plants and it was observed that they were eaten by native mice, introduced rats and introduced eastern cottontails.

## **Physiology**

Nutritional requirements have not been studied. The Canadian occurrences are mostly on Cretaceous conglomerates and sandstones. These rocks offer higher calcium levels than the igneous rocks that are prevalent elsewhere in the region. It is unknown if this could be a factor favouring the occurrence of *Lomatium grayi*.

## **Dispersal**

Mechanisms of seed dispersal and dispersal distances have not been studied. In the high cliff locations of the Canadian populations wind dispersal over short distances is assumed to occur, but intervening forested areas may prevent colonization of more distant habitats.

## **Interspecific interactions**

In Utah and other U.S. states, *Lomatium grayi* is a host plant for the larvae of the rare Indra Swallowtail Butterfly, *Papilio indra* (Whaley, pers. comm. 2001 ex Schaefer 2002), which is red-listed (S2) in British Columbia, but only known from the interior of the province and a moth, *Depressaria multifidae* (Thompson 1983). Thompson (1989) also mentions that the Anise Swallowtail, *Papilio zelicaon*, oviposits on *Lomatium grayi* and only one other plant species.

Partial defoliation of some *Lomatium grayi* plants by Anise Swallowtail larvae was observed by the author in the Saltspring Island population.

## **Adaptability**

As a species with its main distribution in semi-arid regions on the east side of the Cascades and Sierras, *Lomatium grayi* is drought-tolerant. This allows it to survive on sheer south-facing rock walls in its Canadian habitats where summer precipitation totals only 75 mm from May to August. The high winter rainfall does not appear to affect the dormant plants due to good drainage on these precipitous slopes.

The species is easily germinated and raised horticulturally in average garden soil (author's experiments). Transplanting back into natural habitats has not been attempted. Attempts to establish the young plants in the prevailing habitats on rock walls would appear doomed to failure, unless pockets of soil on ledges and in cracks could be found.

## **POPULATION SIZES AND TRENDS**

### **Search effort**

Discounting duplicates, there are only nine herbarium collections of Canadian *Lomatium grayi*, most of them from Saltspring Island and deposited at the RBCM herbarium in Victoria. The earliest collection dates back only to 1980 and the first correct identification only to 1982. Search efforts in the last 22 years were accordingly sporadic. The second Canadian locality for the species was found in 1982 by H. Janszen who has conducted many floristic inventories of the Gulf Islands in the intervening years.

In the spring and early summer of 2002, a comprehensive survey for this species was made (Janszen and Roemer 2002). More than 11 person-days were devoted to search for additional occurrences beyond the two known locations. This involved 14 discrete localities with comparable cliff faces and included Hornby and Denman Islands, 125 km to the northwest, where similar south-facing conglomerate cliffs as on Saltspring Island are found. Seaside cliffs, such as the one where the Galiano Island population occurs, proved to be easier to survey from a boat and with the help of binoculars. No additional locations for *Lomatium grayi* were found.

Population estimates presented here are based on actual counts of individuals. As certain portions of cliffs cannot be viewed, either from above or below, the counts were extrapolated by the percentage area that remained hidden to view, provided this appeared to be suitable habitat.

## **Abundance**

The total number of plants in the two Canadian populations of *Lomatium grayi*, 1,900 individuals, is known with a relatively high level of accuracy, approximately within +/- 5%. However, the accuracy of counts and estimates differs between the two populations as follows:

The Saltspring Island population occurs on high cliffs that had to be accessed on foot and had the problem of hidden habitat described above. At this location, about 150 individuals were counted in 2002 (Janszen and Roemer 2002) and an additional 40 plants were found in smaller subpopulations in 2004, for a combined total of 190 individuals. It was estimated that between one quarter and one third of the suitable habitat that occurred between counted plants of the population could not be viewed at all. On this basis it was concluded that only about 75% of the population was counted, for a resulting estimated total of 240 plants.

The Galiano Island population also occurs on high cliffs. However, these face the ocean and allowed relatively accurate counts from a boat. A total of 1,650 plants was obtained for this population with an estimated margin of error of 100. The total Canadian occurrence of *Lomatium grayi* is thus estimated to be 1,900 individuals.

In both populations, it was estimated that between one half and two thirds (950-1,300) of the plants were mature and flowering (Janszen and Roemer 2002). Small seedlings were not found on the cliff faces in places where these could be inspected at close range. However, in one case small seedlings were found on more gentle terrain, as described in the "Herbivory" section.

## **Fluctuations and trends**

Population trends cannot be established at this time as no complete surveys of the two Canadian populations were carried out before the summer of 2002. Fluctuations in the populations are assumed to be small as this is a relatively long-lived perennial.

It is conceivable that at a time before domestic grazing occurred and when native deer were kept in check by their natural predators *Lomatium grayi* may have been less restricted to extreme habitats and therefore more abundant. Grazing by sheep has been common on the Gulf Islands since pioneer days, especially on Saltspring Island.

## **Rescue effect**

Although large and presumably healthy populations exist south of the border, natural dispersal of propagules from the nearest U.S. occurrence of about 250 km distance is highly unlikely. Even if it occurred, plants originating from one of the U.S. interior ecotypes might be poorly adapted to survive under coastal conditions. If rescue occurred with human intervention, the latter uncertainty would also apply.

## LIMITING FACTORS AND THREATS

In general, herbivory appears to have been the major limiting factor for Canadian populations. Seedlings of *Lomatium grayi* at the base of Mt. Maxwell at the Saltspring Island site were seen to have been grazed (author's observation). This activity no doubt has been ongoing for some time, restricting the spread of this species at the site. Substrate is not a limiting factor for *Lomatium grayi* since it can be cultivated readily in normal soil and away from rocky cliffs (author's observations, 1987 to present). Restriction of habitats to sites inaccessible or only poorly accessible to herbivores appears to be a limiting factor. It is also possible, but not documented, that the dry summer conditions in the Canadian habitats are limiting by preventing seedling survival in some years on the more extreme cliff habitats.

Indications are that neither pollination nor seed maturation present a problem as seed-set is plentiful, both in the wild and in cultivation. A potential future threat to the species could be the loss of specialized pollinators through pollution and/or pesticide use in the surrounding agricultural and residential landscape.

Barriers to seed dispersal may be limiting colonization away from these two populations, especially if one assumes that the species depends on the cliff habitats where reduced herbivory and less shading by tall vegetation occurs. Similar cliffs are present throughout the Gulf Islands and on adjacent southern Vancouver Island, but they are separated by expanses of forest and/or marine waters.

On the basis of the Canadian occurrences on the far northwestern edge of the species' geographic range and the habitat on steep south faces, the conclusion could be drawn that climatic limitations restrict the distribution further north. However, as local winter temperatures are far higher here than in the more continental parts of the species' range, it may be a lack of summer heat, rather than low winter temperatures, that might be limiting.

Habitat degradation by non-native species has the potential to negatively impact on this *Lomatium*. For instance, scattered individuals of the invasive Scotch Broom (*Cytisus scoparius*) and of other introduced species such as Barren Brome (*Bromus sterilis*), Hedgehog Dogtail (*Cynosurus echinatus*), Cleavers (*Galium aparine*) and Ribwort Plantain (*Plantago lanceolata*) grow with *Lomatium*. However, there is no prime habitat for these invasives to become overwhelming in the vicinity of *Lomatium grayi*.

Limitations due to human management of the habitat are largely absent due to the extreme nature of the growing sites on steep cliffs. Recreational rock climbing on Saltspring Island, however, could be a potentially significant threat. This activity occurs within the limits of this population and requires monitoring. Collecting for horticultural purposes could be a potential future threat.

Over 80% of the provincial population (in terms of number of plants) occurs on private residential properties on Galiano Island. Residences and gardens are located directly above the vertical cliffs where *Lomatium* grows in crevices and on ledges of the sandstone. This makes a large proportion of the population vulnerable to any dumping of materials (for instance garden clippings) over the edge of the cliffs. Such activities have not been observed.

### **SPECIAL SIGNIFICANCE OF THE SPECIES**

*Lomatium grayi* is among the rarest elements of the Canadian and British Columbian flora, even though it is widespread and under no known threat in several states of the U.S. Its Canadian range is very small and widely disjunct from its main distribution. Whether or not this disjunct occurrence is connected with genetic differences remains to be determined. Of special interest would be research that could establish the reasons for the disjunct occurrence.

The species is large and attractive with its finely dissected foliage and bright yellow umbels and could play a role in horticulture. It is a food plant for the larvae of some of our largest and most beautiful species of butterfly (genus *Papilio*).

For the Plateau Sahaptin people throughout the Columbia Basin *Lomatium grayi* was an important early-season food rich in vitamin C (Gene Hunn pers. comm. 2003). In other parts of the U.S. range, the roots are reported as having been used to prevent starvation by the Paiute (Compton, pers. comm. 2001 ex Schaefer 2002). Many other *Lomatium* species have sizable tubers and provided a food source for numerous North American indigenous groups (Norton *et al.* 1984). Several species of the genus were used and continue to be used by British Columbian groups, although no further uses of *L. grayi* are currently known (Compton, pers. comm. 2001 ex Schaefer 2002).

Although no studies have specifically tested the pharmacological uses of *Lomatium grayi*, several studies have been done on the closely related *L. dissectum*. The latter completely inhibits the cytopathic effects of bovine rotavirus (McCutcheon *et al.* 1995), completely inhibits the growth of *Mycobacterium tuberculosis* and *M. avium* (McCutcheon *et al.* 1997), and inhibit other bacterial and fungal growth (VanWagenen & Cardellina 1986; VanWagenen *et al.* 1988).



## EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

In its main distribution in the United States, *Lomatium grayi* has no special endangered or threatened status. The global rank is G5. On the eastern edge of its distribution in Wyoming *Lomatium grayi* has recently been downlisted from S2 (imperiled) to S3 (vulnerable to extirpation or extinction; Heidel pers. comm. 2001 ex Schaefer 2002). In British Columbia, the species is on the provincial Red list with a rank of S1 (critically imperiled). However this does not convey any legal protection.

The smaller of the two Canadian populations on Saltspring Island is located in a Provincial Park / Ecological Reserve complex. There is no on-site presence of park staff to enforce regulations. The larger population on Galiano Island occurs on privately owned land on the seaside cliffs below individual residential properties.

## TECHNICAL SUMMARY

### ***Lomatium grayi***

Gray's Desert-parsley

Lomatium de Gray

Range of Occurrence in Canada: Southern Gulf Islands, BC

#### **Demographic Information**

Generation time (average age of parents in the population)	4-6 yrs
Observed percent reduction in total number of mature individuals over the last 10 years.	Unknown
Projected percent reduction in total number of mature individuals over the next 10 years.	Unknown
Observed percent reduction in total number of mature individuals over any 10 years period, over a time period including both the past and the future.	Unknown
Are the causes of the decline clearly reversible?	
Are the causes of the decline understood?	
Have the causes of the decline ceased?	
Observed trend in number of populations	Unknown
Are there extreme fluctuations in number of mature individuals?	No
Are there extreme fluctuations in number of populations?	No

#### **Number of mature individuals in each population**

<b>Population</b>	<b>N Mature Individuals</b>
Saltspring Is: about 240 total (flowering and vegetative)	
Galiano Is: about 1650 total (flowering and vegetative)	
Grand Total	~900-1300 flowering

#### **Extent and Area Information**

Estimated extent of occurrence (km <sup>2</sup> )	50 km <sup>2</sup>
Observed trend in extent of occurrence	Unknown
Are there extreme fluctuations in extent of occurrence?	No
Estimated area of occupancy (km <sup>2</sup> ) 8 based on a 2x2 km grid; 2 based on a 1x1 km grid	2x2 grid = 8km <sup>2</sup> 1x1 grid = 2km <sup>2</sup>
Observed trend in area of occupancy	Unknown
Are there extreme fluctuations in area of occupancy?	No
Is the extent of occurrence or area of occupancy severely fragmented? Determined as unknown since the viable population size is unknown so that "severely fragmented" cannot be determined following IUCN guidelines.	Unknown
Number of current locations	2
Trend in number of locations	Stable
Are there extreme fluctuations in number of locations?	No
Observed trend in quality of habitat	Decline

#### **Quantitative Analysis**

	Ex.: % probability of extinction in 50 years
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#### **Threats (actual or imminent, to populations or habitats)**

Herbivory by domestic, feral and native grazing animals; habitat degradation by invasive plants; rock climbing on cliffs
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**Rescue Effect (immigration from an outside source)**

Status of outside population(s)? USA: widespread and secure	
Is immigration known or possible?	No
Would immigrants be adapted to survive in Canada?	Unknown
Is there sufficient habitat for immigrants in Canada?	Yes
Is rescue from outside populations likely?	No
Distance to nearest populations in the Washington State is about 250 km.	

**Current Status**

COSEWIC: Threatened 2008
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**Status and Reasons for Designation**

<b>Status:</b> Threatened	<b>Alpha-numeric code:</b> D2
<b>Reasons for designation:</b> A highly restricted perennial herb with a small population found on only two sites on the Gulf Islands of British Columbia. The presence of invasive species such as Scotch Broom reduces the quality of the fragile habitat and grazing deer and sheep likely restrict the species' ability to expand beyond its limited area of occupancy.	

**Applicability of Criteria**

<b>Criterion A</b> (Decline in Total Number of Mature Individuals): No specific data on long-term decline.
<b>Criterion B</b> (Small Distribution Range and Decline or Fluctuation):n/a Extent of occurrence and area of occupancy are well below critical levels for endangered for the two populations but the populations have not been demonstrated to be at significant risk in the short term from the presence of invasive plants and impacts from rock climbing that would cause the species to become at imminent risk of extirpation.
<b>Criterion C</b> (Small and Declining Number of Mature Individuals): n/a. Population size is within limits for threatened but no other factors are met.
<b>Criterion D</b> (Very Small Population or Restricted Distribution): Meets Threatened D2 with only two populations having an area of occupancy <<20 km <sup>2</sup> and on-going threats from invasive species such as Scotch Broom may result in substantial impacts on the population and habitat.
<b>Criterion E</b> (Quantitative Analysis): None available.

## ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED

A substantial part of this report is based on information supplied in the Species Stewardship Account prepared by Ms. Claudia Schaefer. Ms. Schaefer's work is gratefully acknowledged by the author. The author also would like to thank Mr. Harvey Janszen for his share of the 2002 field work, especially for his search in 16 potential habitats on very rough terrain and Dr. T. McIntosh for showing the author two additional subpopulations on Saltspring Island. Karen Golinski very kindly supplied photographs for Figures 1 and 2.

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Note: The vast majority of the consultations were carried out by Ms Claudia Schaefer in the process of preparing the *Lomatium grayi* Stewardship Account.

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Rob Alvo. November 2001. Conservation Biologist, Ecological Integrity Branch, Parks Canada, Room 375, 4th Floor, 25, rue Eddy, Hull (Québec) K1A 0M5.

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Hans Roemer received his M.Sc. from the Technical University of Hannover, Germany, in 1967 and his PhD from the University of Victoria, British Columbia, in 1972. He held a postdoctoral 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 now is an independent consultant in conservation assessments, plant ecology and field botany.



## COLLECTIONS EXAMINED

All collections listed in the following table 2 are in the herbarium of the Royal British Columbia Museum (V), Victoria BC. Two further collections by Penny *et al.* are at the herbarium of the University of British Columbia (UBC) in Vancouver, BC. They appear to be duplicates of those listed here.

**Table 2. Collections examined.**

<b>Year collected</b>	<b>Accession #</b>	<b>Collector(s)</b>	<b>Collection Locality</b>	<b>Identified by</b>	<b>Year identified</b>
1980	V107517	C. Brayshaw	Saltspring Is.	H. Janszen	1982
1981	V120121	H. Janszen	Saltspring Is.	H. Janszen	1982
1982	V177230	A. Ceska <i>et al.</i>	Saltspring Is.	A. Ceska	1998
1982	V177298	A. Ceska <i>et al.</i>	Saltspring Is.	A. Ceska	1999
1982	V120298	H. Janszen	Galiano Is.	H. Janszen	1982
1984	V129586	H. Janszen	Galiano Is.	H. Janszen	1984
1996	V162303	Penny <i>et al.</i>	Saltspring Is.	H. Janszen	1996
1996	V162304	Penny <i>et al.</i>	Saltspring Is.	H. Janszen	1996
1996	V178577	Penny <i>et al.</i>	Galiano Is.	H. Janszen	1996