

COMMITTEE ON THE
STATUS OF ENDANGERED
WILDLIFE IN CANADA

OTTAWA, ONT. K1A 0H3
(819) 997-4991

COMITÉ SUR LE STATUT
DES ESPÈCES MENACÉES
DE DISPARITION AU
CANADA

OTTAWA (ONT.) K1A 0H3
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**STATUS REPORT ON THE GOLDEN PAINTBRUSH
*CASTILLEJA LEVISECTA***

IN CANADA

BY

MICHAEL RYAN

AND

GEORGE W. DOUGLAS

**STATUS ASSIGNED IN 1995
THREATENED**

**REASON: HIGHLY RESTRICTED RANGE WITH LOSS OF NEARLY HALF
OF THE HISTORIC POPULATIONS AND CONTINUED
THREATS FROM SPREAD OF EXOTIC PLANTS.**

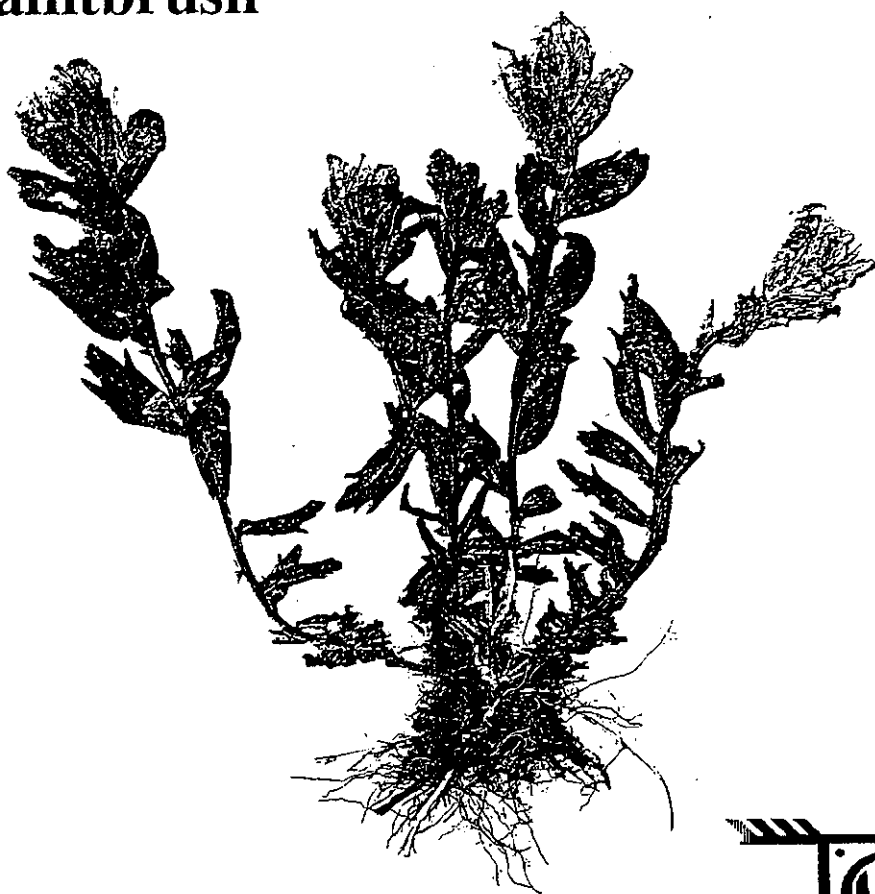
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STATUS REPORT ON ENDANGERED WILDLIFE IN CANADA

Golden Paintbrush



**COMMITTEE ON THE STATUS
OF ENDANGERED WILDLIFE
IN CANADA**



COSEWIC

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CASTILLEJA LEVISECTA**

IN CANADA

BY

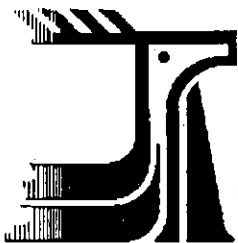
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VICTORIA, B.C.
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JUNE 1994

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DEFINITIONS

SPECIES:	"Species" means an indigenous species, subspecies, variety or geographically defined population of wild fauna and flora.
VULNERABLE: (V)	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
THREATENED: (T)	A species likely to become endangered if limiting factors are not reversed.
ENDANGERED: (E)	A species facing imminent extirpation or extinction.
EXTIRPATED: (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
EXTINCT: (X)	A species that no longer exists.
NOT AT RISK: (NAR)	A species that has been evaluated and found to be not at risk.
INDETERMINATE: (I)	A species for which there is insufficient scientific information to support status designation.

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Executive Summary

Description

Castilleja levisecta (golden paintbrush) is a multistemmed perennial herb, 10-50 cm tall, in which the non-showy, two-lipped flowers are enclosed in bright yellow bracts. The glandular-pubescent leaves are entire to lobed.

Distribution

Historically, *C. levisecta* ranged from southern Vancouver Island to central Oregon. Today, it is only known from southern Vancouver Island, some of the Gulf and San Juan Islands, and the Puget Trough area of Washington State.

Population Size and Trends

In Canada, *C. levisecta* is known from nine sites. It is believed to be extirpated at four of these sites. Since 1991 it has been verified at three sites. These sites have populations of 2560, 1000 and 3 plants. Populations at the two remaining sites could not be confirmed because their exact locations are not known. In the United States only seven of the 17 sites from which this species has been collected are extant and are confined to northwestern Washington. Approximately 18,000 plants are known from the United States. No populations have been monitored so that historical trends in the sizes of populations are not known.

Habitat

Castilleja levisecta is restricted to grass-dominated meadows which, in Canada, are confined to southeastern Vancouver Island and adjacent islands where the average annual rainfall is low and summer drought conditions are prevalent. Associated species include *Ranunculus occidentalis*, *Camassia quamash*, *Plantago lanceolata*, *Achillea millefolium*, *Cynosurus echinatus*, *Festuca rubra*, and several species of *Bromus*.

General Biology

Extremely little information is available on the general biology of *Castilleja levisecta*. It is likely this species parasitizes the roots of other species occurring in the same habitat although these species have not yet been identified. Many aspects of the population dynamics of *C. levisecta* are not known including the average life-span, the frequency with which seeds germinate and become established, and the competitive ability of *C. levisecta* with other species.

Limiting Factors

In the past, the most direct threat to populations of *C. levisecta* was that of habitat destruction. Grass-dominated meadows occur on gentle slopes near the most climatically-favourable coastal areas of British Columbia and have been subjected to extensive agricultural and residential development. Although known Canadian populations occur in protected areas, the pressure to develop unprotected meadows is intense and their loss seriously reduces the potential number of sites in which this species may be introduced.

Today, less direct factors threaten known Canadian populations and include competition with aggressive introduced species and fire suppression.

Protection

The two largest Canadian populations occur on small islands located off the Victoria waterfront. Both populations are protected in ecological reserves and the inaccessibility of these sites likely protects them from most forms of human disturbance. A third population numbering three plants is located in a municipal park in Victoria and is in immediated danger of extirpation. No attempts have been made to introduce this species into new habitats.

Conclusions

Castilleja levisecta is rare throughout its limited range in Canada and the United States and should be considered as an endangered species. The prognosis for this species is not good given the extent to which it has disappeared from much of its historical range. Although two of the three Canadian populations are protected in ecological reserves, these populations remain potentially threatened by aggressive introduced species which now dominate many meadows. It is essential that research on the biology and ecology of *C. levisecta* be completed so that suitable actions may be taken to ensure the survival of this species in Canada.

NOTE:

Although the authors recommended a status of endangered for this species, consensus among COSEWIC members was that the risks to this species are best reflected by a threatened status.

E. Haber, Chairman, Plants Subcommittee
Sept. 1995

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I. SPECIES INFORMATION

1. Classification and Nomenclature

Scientific name:

Castilleja levisecta Greenman

Bibliographic citation:

Botanical Gazette 25:268, 1898. (Howell 279, Mill Plain (Fort Vancouver) Wash.; lectotype)

Pertinent synonyms:

none

Common Names:

Golden paintbrush

Golden Indian-paintbrush

Family Name:

Scrophulariaceae

Major Plant Group:

Angiosperm

History of taxon:

Castilleja levisecta is atypical of the genus in that it is a distinct species and does not appear to intergrade with other species¹. Ownbey (1959) assigned this species to the Chrysanthae where it is most closely aligned with *C. cusickii*. Since it is rare and presents no taxonomic problems, workers of *Castilleja* have ignored *C. levisecta* other than providing taxonomic descriptions in regional floras (e.g. Ownbey 1959, Pennell 1951, Rickett 1971).

¹Sheenan and Sprague (1984) reported that *C. levisecta* appeared to be hybridizing with *C. hispida* at one site in the United States.

2. Description

Taxonomic Description

Castilleja levisecta

(Description from Ownbey (1959)).

- General:** Herbaceous perennial, 10-50 cm tall.
- Stems:** Several, erect, more or less decumbent or creeping at the base, usually unbranched, softly viscid-villous.
- Leaves:** Viscid-villous to hispidulous, lower ones linear-lanceolate, entire, upper ones oblong-ovate or -obovate, with mostly 1-3 pairs of short lateral lobes from the distal 1/3 of the blade.
- Bracts:** About the width of the upper leaves, oblong, obtuse, entire or more usually with 1-3 pairs of short lateral lobes from near the apex, puberulent and more or less viscid-villous, golden-yellow.
- Flowers:** In a strict and ultimately elongate inflorescence, the flowers remote and mostly hidden by the overlapping bracts; calyx 15-18 mm long, deeply and subequally cleft above and below, its primary lobes again rather deeply divided into 2 linear obtuse segments; corolla 20-23 mm long, its galea rather slender, puberulent, about 3-4 times the length of the unpouched lower lip.

Illustrations

- 1) see p. 311 in Ownbey, M. 1959. *Castilleja* In, Hitchcock, C.L., A. Cronquist, and M. Ownbey. Vascular Plants of the Pacific Northwest Part 4: Ericaceae to Campanulaceae. University of Washington Press, Seattle. 614 pp.
- 2) see plate 163 (p. 485) in Rickett, H.W. 1971. Wildflowers of the United States. Vol. 5. Part 2. New York Botanical Laboratory, New York. 362-666 pp.
- 3) see Figure 4864 (p. 831) Pennell, F.W. Scrophulariaceae In, Abrams, L. 1951. Illustrated Flora of the Pacific States. Vol. III. Stanfield University Press, Stanford. 866 p.
- 4) see p. 28 in Taylor, T.M.C. 1974. The figwort family of British Columbia. Handbook No. 33. British Columbia Provincial Museum, Victoria. 237 pp.

Diagnostic Features

Castilleja levisecta is distinguished from other species by the glandular-pubescent herbage and yellow bracts. The corollas are about 2 cm long with relatively short "beaks" (cf. Chuang and Heckard 1991). The lower lip of the corolla is only 1-3 mm long and the lobes are reduced to small teeth. Of the twenty species that occur in British Columbia, only two other species are known from southwestern British Columbia: *C. hispida* var. *hispida* and *C. miniata* (Douglas 1991). The latter species usually have red bracts although those of *C. miniata* may also be orange or yellow. However, *C. miniata* is distinguished from *C. levisecta* by having longer "beaks" and herbage that is slightly puberulent but not glandular.

There are a number of species of *Orthocarpus* which may also superficially resemble *Castilleja levisecta* but in these species the galea is equal in length or slightly greater than that of the lower lip. Likewise, characteristics of the leaves and bracts usually differ significantly from those of *C. levisecta*.

3. Distribution

Historically, the range of *C. levisecta* extended along the west coast of North America from southern Vancouver Island to the Willamette Valley in Oregon (Peck 1961) (Fig. 1). Sheenan and Sprague (1984) reported that the only recently verified United States populations were restricted to the Puget Trough area and San Juan Island in Washington State. All other populations in Washington and Oregon were extirpated.

4. Climate

The climate on the southeastern side of the island is characterized by mild wet winters and warm dry summers in which the bulk of the rainfall (95%) occurs during the winter months. Annual rainfall is particularly low in the southeastern corner of Victoria. This area receives about one-third of the rainfall to that west of Victoria (Fig. 2).

5. Habitat

As a result of the unique climate, the vegetation on the eastern side of Vancouver Island and some of the Gulf Islands is markedly different to that found elsewhere along the west coast and other places in Canada. On mesic sites the vegetation is dominated by *Pseudotsuga menziesii*, a dominant fire-climax species. In dry areas, where rainfall is low or soils are shallow, particularly in the Victoria region, the vegetation is characterized by open stands or discontinuous clumps of *Quercus garryana* mixed with grass-dominated meadows or rock outcrops.

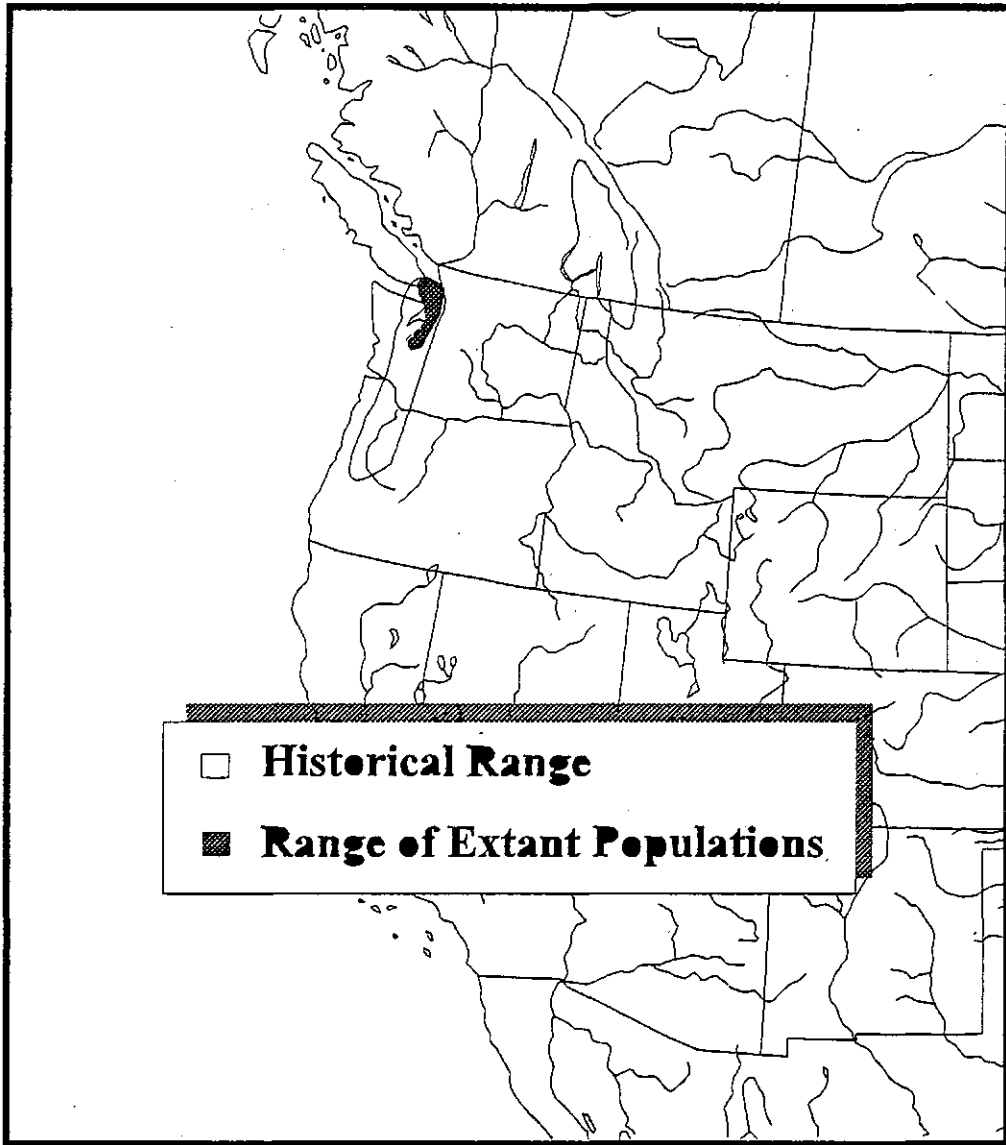


Figure 1. The historical and current ranges of *Castilleja levisecta*.

Castilleja levisecta appears to be restricted to grass-dominated meadows on southeastern Vancouver Island and adjacent Gulf Islands. These meadows usually occur on relatively deep soils in areas receiving very little precipitation in comparison to other coastal regions; drought conditions are prevalent during the summer months. *Castilleja* populations located in the United States also occur in similar meadow habitats. It is believed *C. levisecta* can withstand very little shading by trees and shrubs (Sheenan and Sprague 1984).

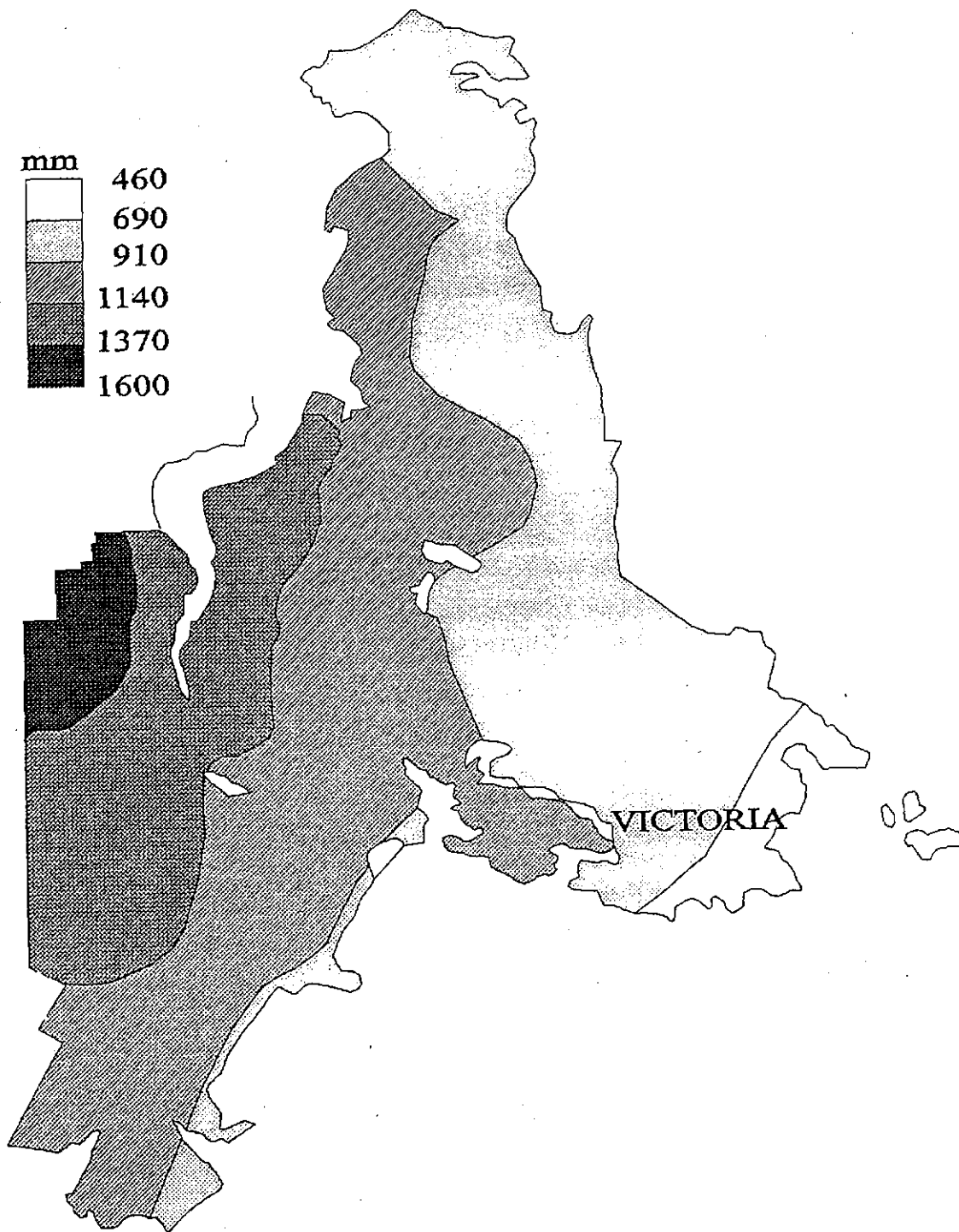


Figure 2. Average annual rainfall in the Victoria region. Redrawn from McMinn et al. (1976).

6. Population Size and Trends

Canadian Populations

Table 1 and Figure 3 identify the locations where *C. levisecta* has been collected in Canada. All populations have been found on southeastern Vancouver Island except for two populations located on small islands (Alpha Islet and Trial Island) off the Victoria waterfront. Of the nine locations, four populations are likely extirpated and three populations are extant. The locations cited on the herbarium labels for two other populations are too general and it is has not been possible to verify them.

Table 1. *Castilleja levisecta* sites in Canada.

Collection Site	Last Observation	Collector/ Observer	Population (no./area)
Alpha Islet (Victoria)	1994	Cannings	1000/100 m ²
Beacon Hill (Victoria)	1991	Brayshaw	3 plants
Cedar Hill (Victoria)	1887	Macoun	
Dallas Cliffs (Victoria)	1969	Clark	
Foul Bay (Victoria)	1918	Carter	
Lost Lake (Victoria)	1945	Hardy	
Trial Island (Victoria)	1992	Douglas	2560/4900 m ²
Sidney	1927	Goddard	
Wellington	1898	Fletcher	

Recently verified populations

Alpha Islet (Victoria)

Alpha Islet, located off the Victoria waterfront, supported about 1000 plants of *C. levisecta* in 1994. This small islet (.28 ha) is an open and exposed grass-dominated site lacking trees and subject to wind and saltspray (B.C. Ecological Reserves Program 1992).

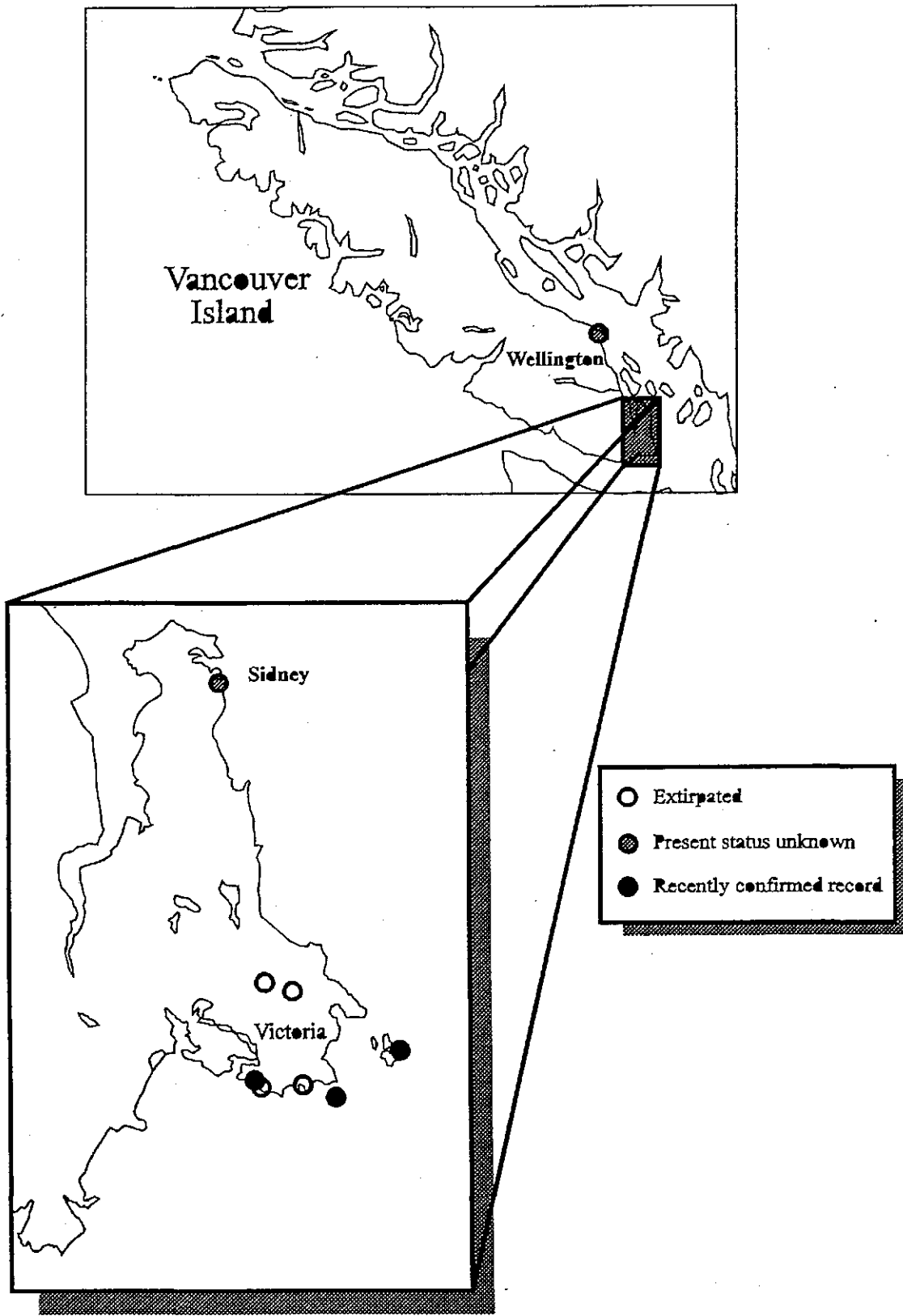


Figure 3. Location and status of *Castilleja levisecta* populations in Canada.

Beacon Hill (Victoria)

This collection site is within a grass-dominated meadow on a dry, exposed gentle slope (5%). Vegetation is largely composed of introduced grasses and herbs including *Anthoxanthum odoratum*, *Dactylis glomerata*, *Taraxacum officinale*, *Plantago lanceolata*, and *Hypochoeris radicata*. The rare species *Viola praemorsa* ssp. *praemorsa* is also located at this site. Although a total of three plants were verified in 1991, none were located at this site in 1993 or 1994. Since these plants may have been overlooked, the status of this population will have to be confirmed by future visits.

Trial Island (Victoria)

The largest Canadian population of *Castilleja levisecta*, comprising of several thousand plants, is located on Trial Island, off the Victoria waterfront. Although this island is subject to wind and saltspray, the plants are slightly sheltered from the predominant westerly winds by a slight rise in the topography. The population occurs on brunisolic soils in a meadow. Associated species include *Ranunculus occidentalis*, *Camassia quamash*, *Cynosurus echinatus*, *Festuca rubra*, and *Zygadenus venenosus*. Rare species include *Lotus formosissimus*, *Aster curtus*, and *Sanicula bipinnatifida* (B.C. Ecological Reserves Program 1992). *Quercus garryana* is also present on the island but occurs as stunted, wind-swept shrubs.

Status Unknown

Sidney

Located north of Victoria on the Saanich Peninsula, the town of Sidney contains vegetation similar to that found in the Victoria area although *Pseudotsuga menziesii* forests are more prevalent. The specific location of the 1927 collection of *Castilleja levisecta* remains unknown. Given the extent of residential and agricultural development in this area, it is unlikely that *C. levisecta* is still in existence here.

Wellington

Wellington is a small rural community located south of Nanaimo on eastern Vancouver Island. While it is possible that *C. levisecta* is extant in the area, the 1898 collection site has likely been altered or destroyed as a result of residential or agricultural development. Sheenan and Sprague (1984) reported a search of Wellington, in 1984, failed to locate this species. The status of *C. levisecta* will have to be verified by checking existing potential sites.

Extinct Populations

Cedar Hill (Victoria)

It has been over 100 years since *C. levisecta* was collected at Cedar Hill. Except for some mature *Quercus garryana* trees, most of the native vegetation has since been eliminated in this residential area. It is therefore extremely unlikely that *Castilleja levisecta* is extant in this district.

Dallas Cliffs (Victoria)

C. levisecta was collected in 1969 on "dry ground" along the cliffs lining the southern shoreline of Victoria. Much of the vegetation in this area has been converted to mowed lawns, subject to heavy pedestrian traffic. Residual vegetation occurs near the cliff edges and is dominated primarily by introduced species. There no longer appears to be any suitable habitats in this area where *C. levisecta* is likely to be found.

Foul Bay (Victoria)

C. levisecta was collected in 1918 in the Foul Bay area from an "open meadow". Today this area is dominated by family residences and very little of the existing vegetation remains, particularly along the shoreline where almost all of the native vegetation has been replaced by introduced species. Given the extent to which this area has been altered and the length of time since it was last observed, it is very improbable that *C. levisecta* is extant in this area.

Lost Lake (Victoria)

The area surrounding Lost Lake has been drastically altered since *C. levisecta* was collected in 1945. Almost all of the land has been converted to pasture or vegetable fields and only a few scattered *Quercus garryana* remain. The vegetation immediately around Lost Lake is dominated by dense shrubs primarily composed of *Rubus discolor*. It is extremely unlikely that *Castilleja levisecta* is extant in this area. It is possible *C. levisecta* was never collected here since the habitat conditions noted on the herbarium label ("in peat meadow with *Ledum* and *Spiraea douglasii*") do not correspond to other habitats in which this species has been found.

United States Populations

Castilleja levisecta has been collected from a larger number of sites in Washington and Oregon than in Canada where grass-dominated meadows appear to be more prevalent. However, in a recent status report, Sheenan and Sprague (1984) stated that only seven of the 17 United States populations appeared to be extant (fig. 4) of which five occurred on Whidby Island, with single populations on San Juan Island and near Olympia. Table 2 identifies the size and area of extant populations in the United States.

Table 2. Extant *Castilleja levisecta* sites in the United States (information from Sheenan and Sprague (1984)).

Location	Population (no. / area)
Rocky Prairie (Olympia)	15,634 / 150,000 m ²
Admiralty Head (Whidby Island)	500-1,000 / 50,000 m ²
Bocker Environmental Preserve (Whidby Island)	1,300 / 9,000 m ²
Ebey's Landing (Whidby Island)	300-400 / 300 m ²
West Beach (Whidby Island)	150-200 / 6,600 m ²
Forbes Point (Whidby Island)	200-300 / 1,200 m ²
False Bay (San Juan Island)	20-25 / 100 m ²

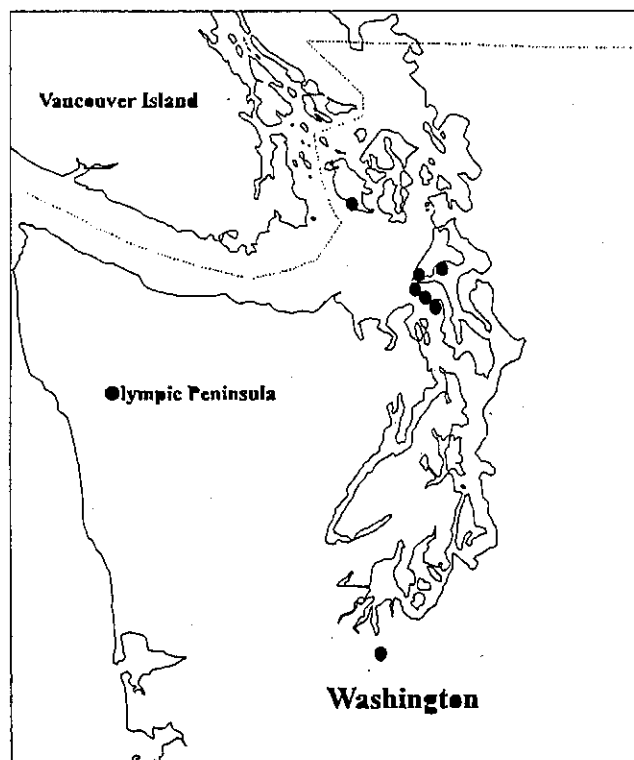


Figure 4. Sites of extant *Castilleja levisecta* populations in the United States. Redrawn from Sheenan and Sprague (1984).

Other populations, including all of those known from Oregon, appear to be extirpated. In almost every instance, Sheenan and Sprague (1984) believed that agricultural or residential development had resulted in the destruction of the sites in which this species had been previously collected.

7. General Biology

There is no information in the literature on the biology and ecology of *C. levisecta* other than general habitat information. It is likely, however, that this species shares many of the same traits that are typical of the genus.

C. levisecta, like many other herbs which occur in grass-dominated meadows, emerge in spring and take advantage of the warm, moist conditions. Flowering occurs in late April or May followed by fruit maturation in June. It is believed that most, if not all, *Castilleja* species require cross-pollination to set seed. According to Duffield (1972) and Pennell (1948), many species appeared to be pollinated by hummingbirds, but bees may be important pollinators of other species (Bauer 1983, Duffield 1972). Evans *et al.* (1984, in Sheenan and Sprague 1984) observed the bumblebee *Bombus californicus* visiting *Castilleja levisecta* flowers. While the average number of seeds produced by an individual is not known, Sheenan and Sprague (1984) reported that it was not uncommon to observe more than 100 seeds produced by a single capsule. Seed production is likely to be of critical importance to *C. levisecta* since it does not appear to be capable of reproducing by any other means. During July, when drought conditions are prevalent in these meadows, the plants are senescent and remain dormant until the following year.

As with other species of *Castilleja*, it is likely that *C. levisecta* is a facultative parasite on the roots of other species. Heckard (1962) investigated the growth of eleven species of *Castilleja* with and without hosts. All plants were capable of completing their life cycle in the absence of a host. However, when they were grown in culture with other species, all but one *Castilleja* species exhibited faster growth rates, produced a larger number of branches, and flowered earlier than when are grown in isolation. Examination of the roots indicated that *Castilleja* species formed haustoria with the roots of other plants as well as other *Castilleja* plants (although they exhibited reduced vigour when grown with members of the same genus).

Evans *et al.* (1984, in Sheenan and Sprague 1984) reported that eight species of caterpillars were observed damaging *C. levisecta*; only three were identified and included *Occidryas editha*, a species of plume moth, and a species of parasitic wasp.

8. Limiting Factors

Specific Threats

Although few records are available indicating the extent of these meadow communities in the Victoria area prior to, and during, colonization by European settlers, it is likely they once formed a significant component of the area now presently occupied by residential and urban developments (see map pp. 9-10 in McMinn *et al.* 1976). The destruction of grass-dominated meadows, particularly by residential development, has continued to the present resulting in the elimination of almost all sites.

Similarly, in the United States, Sheenan and Sprague (1984) stated that there were few areas left which would provide suitable habitat for *Castilleja levisecta* and that the most likely areas in which this species may be found in the future were on some of the small islands in the San Juan and Gulf Islands. The disappearance of this species, from much of its historical range in the United States, was attributed to grazing by rabbits and livestock.

Less direct factors appear to be more important to the survival of known *Castilleja* populations in Canada. The degree of threat posed by these factors are difficult to judge, however, due to a multitude of human-related impacts. These have influenced the composition and structure of meadow communities to such an extent that there are no longer any "natural" sites in existence, which could be used to measure current threats and impacts.

The suppression of both natural and human-induced fires appears to have resulted in changes to some grass-dominated communities. An example is the population expansion of the shrub *Symphoricarpos albus* at the expense of herbaceous species. This shrub often forms dense thickets that are interconnected by a web of roots beneath the soil. These thickets increase in area with the production of young shoots from roots at the edge of the thicket, in turn shading out almost all of the surrounding herbaceous plants. Fortunately, *S. albus* appears to be better suited to shaded areas where *Quercus garryana* is more abundant, than in open meadows where *Castilleja levisecta* is found.

Another shrub to negatively impact herbaceous species is the introduced *Cytisus scoparius*, a dominant species often found at the perimeter of some meadows. This is a resilient shrub which invades sites, particularly after fire and other forms of disturbance, to form dense thickets, again resulting in the shading out of much of the pre-existing herbaceous vegetation. Additionally, it may alter soil conditions because its roots are associated with nitrogen-fixing bacteria.

Two other introduced woody species that may also threaten the native vegetation in meadows are *Rubus discolor* and *Ulex europaeus*. Once established at a site, either species have the ability to spread rapidly, resulting in the elimination of all other species.

While shrub species do not appear to be an immediate threat to known *Castilleja levisecta* populations in Canada, their abundance at other meadow sites signifies a loss of potential habitats and further imposes limits on the longterm survival of the species. In the United States, Sheenan and Sprague (1984) reported that invading trees and shrubs had eliminated some meadows and were presently encroaching upon two sites inhabited by *C. levisecta*. *Pseudotsuga menziesii* and *Cytisus scoparius* were identified as two common invasive species.

The herbaceous vegetation observed in all meadows has been drastically altered with the introduction of European species. Although a large number of native species persist in these stands, much of the vegetation is dominated to a large extent by introduced species, particularly grasses, including *Holcus lanatus*, *Anthoxanthum odoratum*, *Cynosurus echinatus*, *Dactylus glomerata* and a number of species of *Bromus*. It is likely that introduced species now account for greater than 90% of the herbaceous biomass. Because these stands are composed primarily of introduced species, with a distinct lack of "pre-European" vegetation, it is difficult to determine the type of species displaced, or the extent of the displacement (Roemer 1972).

While introduced grasses and forbs may pose an immediate threat to *Castilleja levisecta*, this is difficult to judge since nothing is known of the competitive interactions of *C. levisecta* with other species. It is possible that although *C. levisecta* may be able to parasitize other species, it may do poorly under crowded conditions as suggested by the results of Heckard (1962) for other *Castilleja* species.

Changes in Populations

It is not possible to determine if existing populations of *C. levisecta* are declining since none have been monitored for an extended period of time. An examination of pollen in soil cores sampled on southeastern Vancouver Island suggests that *Quercus garryana* stands, and grass-dominated meadows, were much more extensive several thousand years ago (R. Hebda pers. comm.). Existing populations of *C. levisecta* may represent remnants of a more contiguous distribution along the southeastern portion of Vancouver Island.

9. Protection

Regulatory Measures

There is no specific legislation for the protection of rare and endangered vascular plants in British Columbia. Existing populations, however, are protected to a certain extent by their location on public property.

Alpha Islet (Victoria)

Alpha Islet is part of the Oak Bay Islands Ecological Reserve, thus the population of *C. levisecta* is afforded the greatest degree of legal protection currently available in British Columbia. Because the site is only accessible by boat, it does not experience the same degree of disturbance by recreational activities that would otherwise result if this population was located in a more accessible area on Vancouver Island or on one of the larger Gulf Islands.

Beacon Hill (Victoria)

Beacon Hill Park is a municipal park managed by the City of Victoria. Because of its location near downtown Victoria, it is heavily utilized by the public and has been extensively altered with the construction of roads and recreational facilities. Many of the natural areas have been converted to landscaped, managed gardens and ponds. Unlike other areas within the park boundaries where the grass-dominated vegetation is often mowed, the site at which the three *Castilleja* plants were observed in 1991 has been left relatively untouched by park staff. While this site location may provide these plants with some protection from habitat destruction, the focus of park management is more on recreational activities than on the preservation of natural vegetation. Unfortunately this lack of concern has resulted in the elimination of several rare species by direct habitat destruction (A. Ceska pers. comm.). However, three naturalist groups, "The Friends of Beacon Hill Park", "The Garry Oak Meadow Preservation Society", and "The Victoria Natural History Society" have taken an active role in publicizing and promoting the preservation of the park's natural vegetation and rare species.

Given the fact that only three *Castilleja* plants were observed in 1991, this population is in immediate danger of extirpation, particularly if they rely on cross-pollination and seedling recruitment to maintain the population.

Trial Island (Victoria)

The largest Canadian population of *Castilleja levisecta* occurs in the Trial Island Ecological Reserve and is therefore provided with the greatest degree of legal protection that is presently available in British Columbia. This reserve, despite its proximity to Victoria, has very limited public access since it is only accessible by boat and permits are required by the Ecological Reserves Program before access is allowed.

United States

Of the seven populations known in the United States, Sheenan and Sprague (1984) reported that five occurred on private land, one was located in a state park, and a single population was located on land controlled by the Department of Defense. In addition to natural threats posed by invading trees and shrubs, other current and potential impacts included trampling by the general public, grazing by livestock and rabbits, and direct habitat destruction by housing developments.

II. ASSESSMENT OF STATUS

10. Comments on Status

Castilleja levisecta is ranked as a G1 S1 species by the Conservation Data Centre (B.C. Ministry of Environment, Lands, Parks). This ranking indicates that, on both a global and sub-national scale, it is considered to be critically imperiled because of extreme rarity (5 or fewer extant occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation or extinction.

11. Status Recommendation

Castilleja levisecta should be ranked as an endangered species for the following reasons:

- 1) Only three extant populations are known in British Columbia of which one (Beacon Hill) comprises of three plants and may soon be extirpated. Although the remaining two sites are in Ecological Reserves, these sites include numerous introduced species (mainly grasses) which may cause a further decline in population sizes.
- 2) Suitable habitats for *C. levisecta* are extremely rare and are restricted to southeastern Vancouver Island and adjacent islands. The potential of this species to become established at other sites is therefore greatly reduced and seriously limits its longterm survival.
- 3) The current range of *C. levisecta* is less than half the size of its historical range. In the United States, it is known from only seven sites in Washington of which five are located on private property and are subject to destruction.
- 4) *C. levisecta* in British Columbia represents the northern limits of this taxon and may represent populations that are genetically distinct to those found elsewhere (see p. IV-122, Forest Ecosystem Management Assessment Team 1993).

12. Prognosis

The prognosis for this species is poor. Although recently verified populations in Canada are protected on public lands, it is possible that some of these populations may disappear without some form of management. Some assurance would be provided if the meadows in which *Castilleja levisecta* occur were considered stable natural ecosystems. However, with the introduction and domination of these sites by many non-native species, and the suppression of fire, it is apparent that the composition and structure of the vegetation is changing in some stands. It is difficult to predict what impact these changes will have on the success or failure of *C. levisecta* populations. There are no existing meadows in which introduced species are not a significant component of the vegetation; hence, there is no basis with which to compare existing stands with those that were present before Europeans settled on the west coast of British Columbia. Furthermore, given the limited number of isolated extant populations in

Canada and the United States, it is likely that the potential to maintain genetic variability within these populations has declined. Since this variability may be necessary to respond to environmental changes, *C. levisecta* may be vulnerable to extirpation.

Management of *C. levisecta* is hampered because very little is known regarding the ecology of this species and its relationship to the environment. Furthermore, nothing has been reported regarding the identity of host species and its ability to compete with other species for resources. The lack of demographic information also impedes our ability to judge if existing populations are decreasing or increasing in numbers. A better understanding of the floral biology of this species is required, including the extent to which it relies on cross-pollination to produce viable seed.

III. INFORMATION SOURCES

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