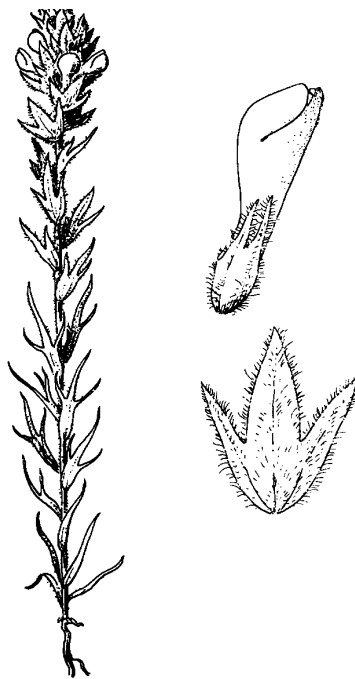


**COSEWIC**  
**Assessment and Status Report**

on the

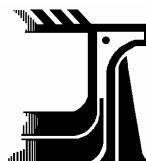
**Rosy Owl-clover**  
*Orthocarpus bracteosus*

in Canada



**ENDANGERED**  
**2004**

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



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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:

COSEWIC 2004. COSEWIC assessment and status report on the rosy owl-clover *Orthocarpus bracteosus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 18 pp. ([www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)).

Fairbarns, M. 2004. COSEWIC status report on the rosy owl-clover *Orthocarpus bracteosus* in Canada in COSEWIC assessment and status report on the Rosy owl-clover *Orthocarpus bracteosus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-18 pp.

Production note: COSEWIC acknowledges Matt Fairbarns for writing the status report on the rosy owl-clover *Orthocarpus bracteosus* in Canada. COSEWIC also gratefully acknowledges the financial support of the Garry Oak Ecosystem Recovery Team and 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.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur l'Orthocarpe à épi feuillu (*Orthocarpus bracteosus*) au Canada.

Cover illustration:

Rosy owl-clover — J.R. Janish from Hitchcock and Cronquist 1973, with permission.

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Catalogue No. CW69-14/397-2004E-PDF  
ISBN 0-662-37367-7  
HTML: CW69-14/397-2004E-HTML  
0-662-37368-5



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## COSEWIC Assessment Summary

### Assessment Summary – May 2004

**Common name**

Rosy owl-clover

**Scientific name**

*Orthocarpus bracteosus*

**Status**

Endangered

**Reason for designation**

An annual herb of vernal pools and damp depressions present at a single remaining location where population size fluctuates widely with low numbers that may be fewer than 100 plants a year. Expansion is limited due to lack of suitable habitats and apparent low dispersal abilities. The population is at risk from spread of nearby invasive exotic plants, from trampling due to hiker traffic and local maintenance activities related to the nearby communications site and consequences of possible oil spills occurring in the busy shipping lanes surrounding the island site.

**Occurrence**

British Columbia

**Status history**

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



**COSEWIC**  
**Executive Summary**

**Rosy Owl-clover**  
*Orthocarpus bracteosus*

**Species Information**

Rosy owl-clover (*Orthocarpus bracteosus*) is a small, annual herb. Its leaves are alternate and unstalked. The tube-shaped rose-purple flowers are grouped in a dense terminal spike among prominent bracts. A white-flowered form is occasionally encountered, usually among purple-flowered plants.

**Distribution**

Rosy owl-clover occurs in western North America, mainly from Vancouver Island south to Oregon west of the Cascades, and southward east of the Cascades to northern California. In Canada, it has been found in the vicinity of Victoria, British Columbia. Populations in the adjacent islands of Washington State have disappeared.

**Habitat**

Rosy owl-clover favours moist vernal pools and depressions that are moist in the winter and dry out in the summer. It is found with a variety of small herbs, in the absence of robust herbs, shrubs or trees.

**Biology**

Rosy owl-clover is an annual plant that germinates, grows, flowers and produces seed in the spring/early summer, and then withers and dies. Most seeds are probably dispersed in the vicinity of the parent plant, as the seeds lack adaptations for long-distance dispersal. It forms root-connections with a number of other species of plants, from which it obtains water and nutrients but it also contains chlorophyll and is autotrophic.

**Population Sizes and Trends**

A maximum of nine historic records are known. Eight of these presumably different populations dating from 1887 to 1954 are now extirpated. A single population remains on Trial Island, near Victoria, B.C. This population has fluctuated from 40 to about 940 individuals between 1998 and 2002 but the plants have not spread to occupy new habitat, even in favourable years.

## **Limiting Factors and Threats**

Urbanization in the vicinity of Victoria, B.C. has eliminated many former populations and continues to pose a threat to suitable, unoccupied habitat. Invasions by aggressive, alien weeds have reduced the capability of habitats to support rosy owl-clover and threaten the remaining population on Trial Island. Foot traffic associated with the Canada Coast Guard lighthouse on Trial Island and incidental use by boaters also threaten the current population. Marine pollution presents a constant threat as this species occurs near sea level along a busy oil tanker route.

## **Special Significance of the Species**

The British Columbia population of *O. bracteosus* is about 300 km disjunct from the northern extent of their main range in California, Oregon and southern Washington State.

## **Existing Protection or Other Status Designations**

The Trial Island population occurs in Trial Island Ecological Reserve within metres of its boundary with a commercial communications lease. The plants, like all species within an ecological reserve, are legally protected under the Protected Areas of British Columbia Act. The ecological reserve lacks a management plan to address management of the species and employees rarely visit the site. Rosy owl-clover is red-listed in British Columbia and has a provincial status of S1 (critically imperiled).



## 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.



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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

## **Rosy Owl-clover** *Orthocarpus bracteosus*

in Canada

Matt Fairbarns<sup>1</sup>

2004

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## SPECIES INFORMATION

### Name and classification

Scientific name: *Orthocarpus bracteosus* Benth.  
Synonyms: none  
Common name: rosy owl-clover  
Family: Scophulariaceae  
Major plant group: Angiospermae (flowering plants)

In the typical variety of *Orthocarpus bracteosus* plants have rose-purple flowers. Keck (1927) also described variety *albus* in which the flowers are white. Chuang and Heckard (1992) considered this colour variation to have no taxonomic significance, observing that the two colour forms sometimes grow in close proximity. This may not be strong evidence of genetic identity, however, since Atsatt (1970) observed that two or more species of *Orthocarpus* often occur on the same site – sometimes separated by microhabitat differences but mostly intermixed as individuals or clusters. This is manifest on Trial Island, where *Orthocarpus bracteosus* contains both colour forms as well as a large intermixed population of *Castilleja ambigua* (formerly *Orthocarpus castillejoides*).

Keck (1927) placed 25 annual species in the subtribe Castillejinae of the genus *Orthocarpus*. Many of these species have since been re-assigned to *Castilleja* or *Triphysaria* leaving nine species in *Orthocarpus* as it is now constituted (Chuang and Heckard 1991).

### Description

A rose-purple annual herb from an erect stem 10-40 cm tall, slender, simple or branched above. Plant is short-hairy and usually purple-tinged. Leaves are alternate, stalkless, linear to lance-shaped and 1.5-3.5 cm long. Leaves have short spreading hairs and sometimes have gland-tipped hairs. The upper part of each leaf is 3-cleft; the upper leaves in the flower head have wide 3-lobed bracts. Flowers are grouped in a dense, prominently bracted (small leaves), densely hairy and glandular terminal spike 3-15 cm long. The bracts are either all green or are purple-tinged in the upper part. Flowers are rose-purple or occasionally white to cream coloured, hairy, 12-20 mm long, exerted from the bracts and tube-shaped. Sepals are tube-shaped, 6-10 mm long, green and glandular-hairy. Fruit is a capsule, elliptical in shape, 5-7 mm long and containing 8 – 15 seeds about 3 mm long (Douglas *et al.* 2000). Plants of the remaining Canadian population at Trial Island averaged 5 cm tall and reached a maximum of 9 cm in 2001 (pers. obs.). White-flowered plants are not easy to distinguish in vegetative condition but their leaves are less likely to be purplish-tinged so they tend to be paler than foliage of the typical variety (pers. obs.).

Yellow owl-clover (*Orthocarpus luteus*) is the British Columbia species most closely related to rosy owl-clover. Both have glandular-hairy bracts and calyces, and the upper leaves gradually grade into bracts in both species. *Orthocarpus luteus* does

not occur west of the Coast-Cascade Mountains and its golden-yellow flowers cannot be confused with the rose-purple (occasionally white) flowers of rosy owl-clover (Douglas *et al.* 2000).

In the field, *Orthocarpus bracteosus* may be confused with several annuals within the Castillejinae that potentially co-occur with it including: paintbrush owl-clover (*Castilleja ambigua*), narrow-leaved owl-clover (*Castilleja attenuata*), dwarf owl-clover (*Triphysaria pusilla*) and bearded owl-clover (*Triphysaria versicolor* ssp. *versicolor*). Members of *Triphysaria* can be immediately separated when in flower because their anthers are 1-celled and their lower corolla lip is strongly three-pouched. In both *Castilleja* and *Triphysaria* the tips of the beak-like upper corolla lips are open and the stigma is expanded, while *Orthocarpus* has closed tips and a dot-like stigma. *Castilleja ambigua*, *C. attenuata*, and *Triphysaria versicolor* spp. *versicolor* have white or yellow corollas (sometimes with purple markings and/or fading pinkish) in contrast to the rose-purple corollas typical of *O. bracteosus*. The red-purple corollas (4-6 mm) of *Triphysaria pusilla* are much smaller than corollas of *O. bracteosus* (12-20 mm) (Douglas *et al.* 2000).

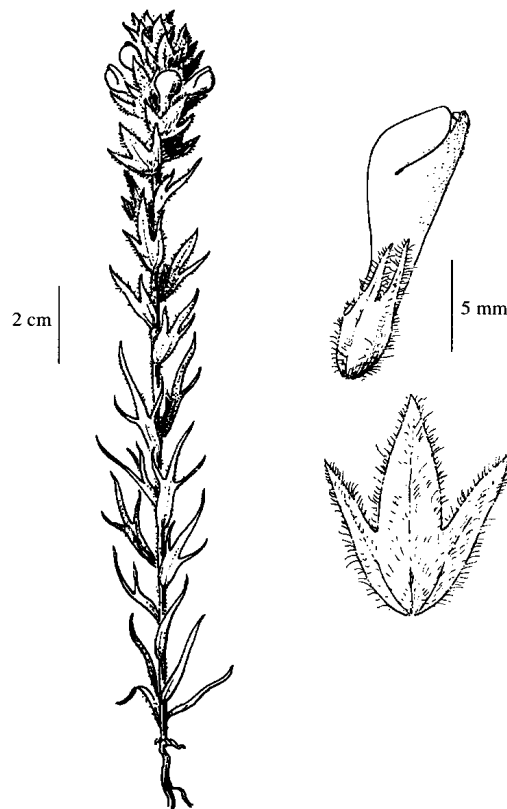


Figure 1. Illustration of *Orthocarpus bracteosus* (Illustration by J.R. Janish from Hitchcock and Cronquist 1973, with permission).

## DISTRIBUTION

### Global range

*Orthocarpus bracteosus* occurs in western North America, mainly from Vancouver Island south to Oregon west of the Cascades, and southward east of the Cascades to Plumas County, California (Douglas *et al.* 2000). In Washington, it is only known from Conboy Lake National Wildlife Reserve and Kreps Lane in Klickitat County (southern Washington) and three historical records from San Juan and Whatcom counties in northwest Washington State (1890, 1923, and 1904) (Florence Caplow, Botanist, Washington Natural Heritage Program, pers. comm. Nov 6, 2001). There have been two recent unconfirmed sightings in north-western Washington and botanists continue to search for it there (Terry Domico, Conservation Biologist, Puget Sound BioSurvey, pers. comm., Feb 25, 2001).

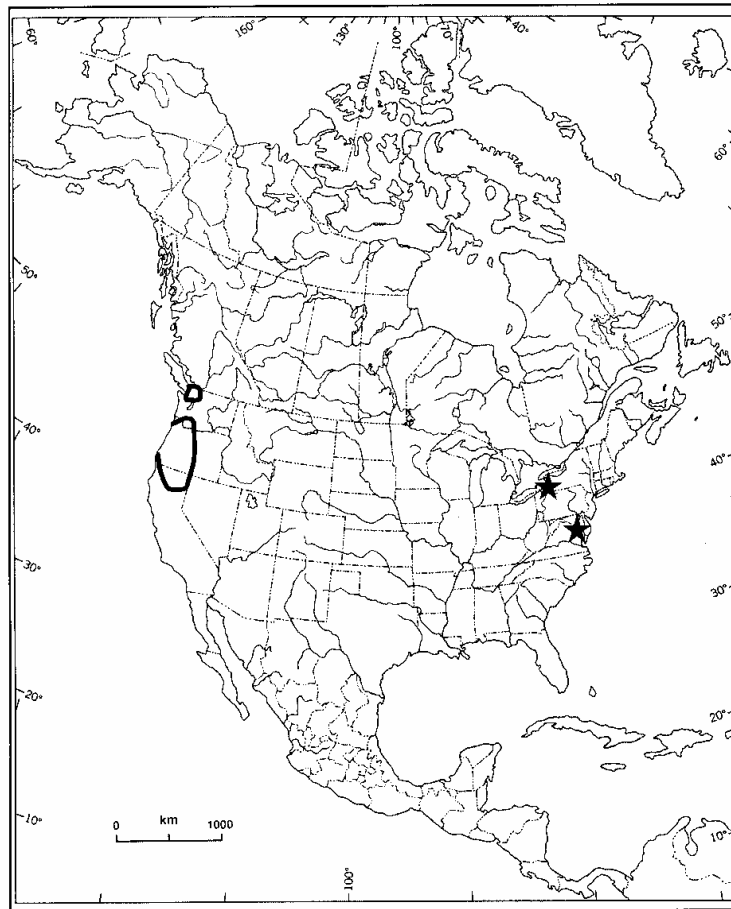


Figure 2. Global range of *Orthocarpus bracteosus* (stars indicate locations of historic, introduced collections).

*Orthocarpus bracteosus* has also been reported for two eastern states, Maryland and New York. The New York collection was from a canal lock in Cayuga County. It was collected in 1918 and was obviously a waif (Charles Sheviak, Curator of Botany, New York State Museum, pers. comm. Feb. 22, 2001). The Maryland collection also appears to be an introduction (Jim Reveal, Professor Emeritus, University of Maryland, pers. comm. Feb. 20, 2001).

### **Canadian range**

Currently in British Columbia *Orthocarpus bracteosus* is known from 1 extant occurrence and 9 unconfirmed historic localities, all in the Victoria area (BC Conservation Data Centre, February 18, 2002).

*Orthocarpus bracteosus* has been known in the Victoria area since 1893. Historical records for Sidney, Oak Bay, Victoria and the Patricia Bay Highway are unmappable because the locality is too vague. Historical records of populations at Rollin's Farm, Blenkinsop (Lost) Lake, Mount Douglas (Cedar Hill) and Beacon Hill are at least 90 years old and no populations have been reported in recent years. They have probably been extirpated.

It is difficult to cross-reference vague collection locations. The Patricia Bay Highway, Blenkinsop Lake, Mount Douglas, Beacon Hill and Trial Island records all certainly refer to distinct populations separated by distances sufficient to ensure negligible genetic interchange. The Sidney collection may have come from the same population as the Patricia Bay Highway collection. The Elk Lake collection may have come from the same population as the Pat Bay collection, in which case the Sidney collection represents a separate population. The Oak Bay collection may have come from Trial Island, although this is unlikely. The Rollins Farm and Victoria collections are so vague that they could have come from the same populations as any of the other collections. In conclusion, collections indicate the past occurrence of possibly nine historic populations, but there is much uncertainty as to how many of these represent distinct populations.

The author searched a number of apparently suitable habitats in 2001, 2002 and 2003 and found no further populations. The search sites included:

All of Trial island, suitable areas on Discovery Island, Mount Douglas, Beacon Hill, Park/Dallas Road Bluffs, east side of Elk and Beaver Lakes, Uplands Park/Cattle Point, Glencoe Cove, Macaulay Point, Saxe Point, Fort Rodd Hill, Ten Mile Point, Little Saanich Mountain (Observatory Hill)

The only population known to be extant is that on Trial Island. The author most recently confirmed this site in August 2003.

In conclusion, there has been a consistent historic downward trend in the number of locations consistent with the urban growth and development of suitable areas on the shore and offshore islets around Victoria. The total extent of the occurrence and total

occupancy of *Orthocarpus bracteosus* in Canada has similarly declined historically and now consists of a single patch covering approximately 300 m<sup>2</sup> on Trial Island.

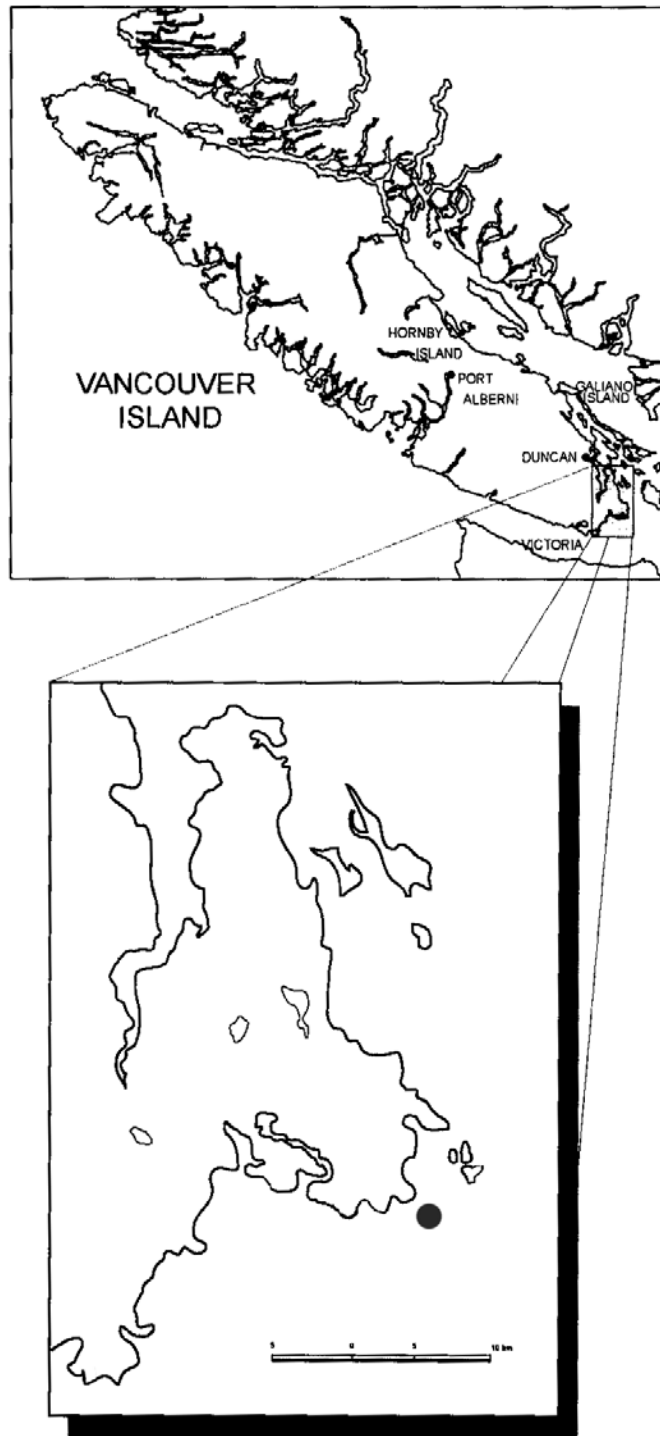


Figure 3. Canadian range of *Orthocarpus bracteosus*. The single extant island locality in Victoria Harbour is shown as a solid black circle.

## HABITAT

### Habitat requirements

The single population of *Orthocarpus bracteosus* known in Canada occupies a very shallow vernal pool (simply a moist depression during dry winters). Soils are 15-30 cm deep and have a pronounced Ah horizon likely built up through the *in situ* decomposition of forb and grass roots. The soils are lightly churned in the winter, apparently by gulls pecking at the soil surface. The vegetation lacks trees, shrubs or robust herbs. Plant cover peaks in early summer, at about 20%. The dominant species include *Grindelia integrifolia*, *Plantago lanceolata*, *Hypochaeris radicata*, *Prunella vulgaris* and *Orthocarpus bracteosus*. Less abundant species include *Lotus unifolius* var. *unifolius*, *L. formosissimus*, *Plantago elongata*, *Mimulus guttatus*, *Fragaria chiloensis*, *Armeria maritima*, *Festuca rubra*, *Holcus lanatus*, *Vulpia bromoides*, *Geranium molle*, *Isoetes nuttallii*, *Dodecatheon pulchellum*, *Limnanthes macounii* and *Castilleja ambigua*. The vegetation is at a climax stage – encroachment by native trees, shrubs and robust mesophytic herbs is prevented by the shallow nature of the soils, their lack of aeration during the extended period of winter saturation, and the pronounced summer drought. There is a limited degree of invasion by a number of aggressive alien species including *Cytisus scoparius*, *Ulex europaeus*, *Daphne laureola*, *Holcus lanatus*, *Hedera helix*, *Plantago lanceolata*, *Hypochaeris radicata*, *Vulpia bromoides* and *Geranium molle*. The first four species may not represent a significant threat as they appear to be limited by the same factors preventing encroachment by native trees and shrubs. *Hedera helix* may be capable of advancing across the vernal pool, supported by moisture and nutrients obtained from roots outside the vernal pool. The other four species are now well-established in the vernal pool and it is not clear whether their populations can increase further.

The co-occurrence of *Lotus formosissimus*, *Limnanthes macounii* and *Castilleja ambigua* are of special importance - COSEWIC has designated *Lotus formosissimus* as Endangered and *Limnanthes macounii* as a species of Special Concern. *Castilleja ambigua*, known from fewer than 10 extant sites in Canada, is a likely candidate for future COSEWIC listing.

Older records suggest *Orthocarpus bracteosus* formerly occurred sporadically across a variety of open, winter wet/summer dry habitats including ditches, prairies and open fields. This is consistent with habitat descriptions for populations in Washington State (Florence Caplow, Botanist, Washington Natural Heritage Program, pers. comm. Nov. 6, 2001).

Vernal pools throughout the historic extent of occurrence tend to be quite isolated from one-another – an extreme case of fragmentation. The same is true of coastal prairies which it favours elsewhere. Ditches and fields likely no longer present suitable habitat as their vegetation has uniformly changed with the ubiquitous invasion of aggressive alien grasses.

## Trends

There is no specific information on the trend of vernal pool and coastal prairie habitats in the Victoria area although they almost certainly share the same trends as Garry oak systems with which they are closely associated. Three major trends have influenced Garry oak and associated ecosystems over the past century: (1) cultivation, (2) urbanization and (3) invasion by aggressive alien weeds. Overall, these factors have reduced Garry Oak systems to less than 5% of their original extent in the Victoria area. Garry oak ecosystems persist largely as isolated communities that are heavily fragmented and lack connections that would allow substantial genetic interchange (Lea 2002). Most remaining areas of coastal meadow and vernal pools have very little protection. Many are privately owned and most of the publicly owned areas lack management plans for species at risk or planning safeguards that ensure occurrences of species at risk are protected from management activities and land uses.

## Protection/ownership

The sole extant population occurs on Trial Island Ecological Reserve near its boundary with provincial land leased to Seacoast Communications for commercial radio broadcast antennae. The Canada Coast Guard owns the Trial Island Lighthouse station, less than 250 m from the existing population.

Trial Island Ecological Reserve offers nominal protection to all plant species found within its boundaries through the Protected Areas of British Columbia Act, which requires that a valid and subsisting park use permit be acquired before a plant can be destroyed, damaged or disturbed. B.C. Parks does not have any staff stationed on Trial Island and the legal protection afforded ecological reserves is not likely to actually protect the population from major habitat threats.

British Columbia does not have any legislation specifically protecting species at risk.

## BIOLOGY

### Reproduction

*Orthocarpus bracteosus* is a true annual, incapable of overwintering in British Columbia. Germination at Trial Island begins in March/April and plants die in July. All flowers are chasmogamous and there is no asexual means of reproduction.

It appears that owl-clovers (*Orthocarpus*, *Castilleja* in part, *Triphysaria*) are predominantly outbreeders although there are inbreeding self-compatible taxa such as *Triphysaria pusilla*. The two contrasting breeding systems may partition the host-environment of these parasitic plants with the showy outbreeders forming compact masses in order to improve the efficiency of cross-pollination while the inbreeders are

more dispersed (Atsatt 1970). It is uncertain whether *O. bracteosus* is an inbreeder or an outbreeder – the latter seems likely as it does have very showy flowers and at least the Trial Island plants are somewhat clumped. Outbreeding owl-clovers are primarily pollinated by honeybees and native bee species (Atsatt 1970).

Trial Island plants produced an average of 12 mature capsules per plant and there were an average of seven apparently viable seeds per capsule. The seeds have some form of dormancy mechanism – seeds collected and sown in September 2003 did not germinate in a controlled environment (natural light, 25°C, moist potting soil) over a six month period, and seeds grown in a garden environment only began germinating in early March.

### **Movements/dispersal**

Seed dispersal is poorly understood although a number of hypotheses have been advanced. Atsatt (1965) proposed a ‘coordinated dispersal’ hypothesis in which *Orthocarpus* seeds get caught up in the pappus bristles of *Hypochaeris* (which often occurs with *Orthocarpus*) and are wind-dispersed as a result. Chuang and Heckard (1983) were skeptical of the coordinated dispersal hypothesis, believing most seeds are not dispersed beyond the immediate vicinity of the parent. Nevertheless, they did speculate that reticulations on the coats of the small, light-weight seeds may improve aerodynamic properties important to wind-dispersal, or add surface roughness aiding in animal dispersal (ibid.). Alternately, the loosely netted reticulations on the seed coat may trap air and thus add buoyancy to seeds during dispersal by water (Kuijt 1969). On October 16, 2001 – long after plants had withered and died – many capsules on Trial Island plants still contained abundant seeds. They appear to remain on the plant well into winter, rattling out as winter winds shake the capsules like a salt-shaker.

### **Germination and survival**

No specific information is available on germination requirements for *Orthocarpus bracteosus*. Another owl-clover (*Castilleja exerta*, formerly known as *O. purpurascens*) germinates readily after untreated seeds have been scratched into the soil in early fall ([http://wildflower.avartech.com/Plants\\_Online/Native\\_Plants/Detail.asp?ID=1010](http://wildflower.avartech.com/Plants_Online/Native_Plants/Detail.asp?ID=1010), Nov 26 2001).

As an annual, survival is limited to a single year. There is no information on early survivorship but most plants with six or more true leaves (“late juveniles”) survived to produce flowers and fruit in 2002.

### **Nutrition and interspecific interactions**

Species of *Orthocarpus* have been found to use a C3 photosynthetic pathway (Watson and Dallwitz 1992 and onwards).

Members of the genus *Orthocarpus* are hemiparasites, containing chlorophyll and fixing carbon through photosynthesis but receiving water and nutrients through parasitic



root connections (Kuijt 1969). Despite their photosynthetic abilities, owl-clovers may also obtain photosynthates from their hosts (Atsatt 1970). Many hemiparasites including species of *Orthocarpus* may obtain secondary compounds from their host plants. These can reduce herbivory without affecting pollinators. It appears that alkaloids may be taken up in the leaves and outer floral tissues of some species but not by their nectar, which has the ultimate effect of increasing seed production and improving fitness (Adler 2000, Adler and Wink 2001, Boros, Marshall, Caterino and Stermitz 1991).

Closely related species of *Orthocarpus* have been shown to be facultative hemiparasites capable of growing and producing flowers in the absence of a host, but shoot mass tends to be much higher in the presence of a host (Matthies 1997).

Grassland species of *Orthocarpus* form haustorial connections (root grafts) with a number of grassland associates including annuals and perennials of the legume, grass, composite and many other families. Not all plants are equally good hosts - some appear to reduce the reproductive potential of *Orthocarpus*. The parasitic habit is unlikely to be a limiting factor given the diversity of potential hosts intermixed within the Trial Island population.

Species of *Orthocarpus* (*sensu lato*) may serve as a secondary host for larvae of the Bay Checkerspot (*Euphydryas editha bayensis*) if its primary food source (*Plantago* spp.) withers before the onset of diapause (USEPA 2000). Coincidentally, the closely related *Euphydryas editha taylori* – a provincially and nationally rare butterfly – has also been recorded from Trial Island. Populations of this butterfly present a potential, but minor, herbivory threat to *Orthocarpus bracteosus* although they have not been seen on Trial Island for several years. *Orthocarpus bracteosus* may never have been a significant food source for the butterfly on Trial island because alternative secondary hosts such as *Castilleja levisecta* are much larger and more abundant.

## POPULATION SIZES AND TRENDS

There are nine historic collections for *Orthocarpus bracteosus* in Canada, all in the Victoria area, but it is uncertain as to how many of these, in fact, represent distinct populations due to the vague location data. One population is currently extant on Trial Island. The earliest record from Trial Island (1976) did not include an estimate of population size. The Trial Island population consisted of about 40 plants in 1998, at least 150 plants in 1999, 940 plants in 2001 and about 300 plants in 2002. Plants were present in 2003 but no counts were made. Atsatt (1970) observed that patterns of abundance and distribution in populations of grassland *Orthocarpus* show sizeable year-to-year fluctuations within sites. Wide population fluctuations are typical in many other annual species (Harper 1977) and such fluctuations may obscure population trends – particularly if the increase in shoot numbers occurs through seed bank depletion. The total number of mature plants has varied in recent years from 40 to nearly 1000.

**Table 1. Locations and Population Sizes for *Orthocarpus bracteosus* in British Columbia.**

Population	Last Observation	Observer	Number of Plants/Area	Land Status
Mount Douglas	1887	J. Macoun	Extirpated	Unknown
'Rollins Farm'	1893	J. Macoun	Unknown	Unknown
Beacon Hill	1893	J. Macoun	Extirpated	City of Victoria
Blenkinsop Lake	1908	J. Macoun	Extirpated	Unknown
Patricia Bay Hwy	1954	M.C. Melburn	Extirpated	Unknown
Sidney <sup>1</sup>	1912	J. Macoun	Unknown	Unknown
Elk Lake <sup>1</sup>	1933	J. Bridgman	Unknown	Unknown
Victoria	n.d.	J. Tolmie	Unknown	Unknown
Trial Island	2002	Matt Fairbarns	300 plants/ 0.03 ha	Provincial Ecol. Reserve
Oak Bay <sup>3</sup>	1924	G.A. Hardy	Unknown	Unknown

<sup>1</sup>may be synonymous with Patricia Bay Highway population

<sup>2</sup>may be synonymous with Patricia Bay Highway population, but different from Sidney population

<sup>3</sup>may be synonymous with Trial island population

## LIMITING FACTORS AND THREATS

Habitat degradation poses a critical and urgent threat to *Orthocarpus bracteosus* in Canada. The single remaining population occupies an area of less than 300 m<sup>2</sup> which already contains a number of alien species including *Plantago lanceolata*, *Hypochaeris radicata*, *Holcus lanata*, *Vulpia bromoides* and *Geranium molle*. In addition, English ivy (*Hedera helix*) has reached the margins of the population and may continue to spread in phalanx fashion across the site as a ground cover. Several introduced shrubs including Scotch broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), and spurge-laurel (*Daphne laureola*) also occur in the vicinity of the site and may pose a longer-term threat if they prove capable of invading the site or altering it by shading and litter deposition.

The second threat to the existing population comes from foot traffic. Trial Island is relatively inaccessible except to Coast Guard staff and recreational boaters from nearby Victoria. Nevertheless, the population is situated in a constriction between two rocky areas and attracts some foot traffic, likely attributable to kayakers.

The Trial Island population is also potentially threatened by marine pollution because it grows only a few metres above the high tide line along one of the most active shipping lanes in North America.

The Trial Island population has little potential for dispersal into suitable habitats. It appears to have little capability for long-distance dispersal. Many waterfront sites on nearby areas of Vancouver Island that were formerly capable of supporting the species have been irreversibly impacted by urbanization. Sites elsewhere on Trial Island and nearby areas of Vancouver Island which remain capable of supporting the species, are

currently unsuitable due to encroachment by highly competitive, non-native shrubs and grasses.

The very fact that the species is limited to a single, small site in Canada presents a serious limitation because stochastic forces could quickly eliminate the population. There is no opportunity for a rescue effect from elsewhere. All other populations in the Victoria area and Puget Sound appear to have been extirpated. The nearest known, extant populations are approximately 300 km away.

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

The distribution of historic records suggests that *Orthocarpus bracteosus* remained in the Victoria-Puget Sound area as a relict of past, warmer periods. The British Columbia population of *O. bracteosus* is about 300 km disjunct from the northern extent of their main range in California, Oregon and southern Washington State. The Canadian population may represent a genetically distinct element important for the long-term survival and evolution of the species.

### **EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS**

*Orthocarpus bracteosus* is not covered under the Convention on International Trade in Endangered Species (CITES), the Endangered Species Act (USA) or the IUCN Red Data Book. NatureServe has designated a G3? rank for the species. The G3 rank indicates that the species is classified as "rare or uncommon (typically 21-100 occurrences); may be susceptible to large-scale disturbances; e.g., may have lost extensive peripheral populations". The '?' indicates that limited information is available or the number of extant occurrences is estimated.

*Orthocarpus bracteosus* is currently on the B.C. Conservation Data Centre RED LIST, which includes any indigenous species or subspecies (taxa) considered to be Extirpated, Endangered, or Threatened in British Columbia.

In both British Columbia and Washington, *Orthocarpus bracteosus* is ranked as S1, "critically imperiled, because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction." In California and Oregon the species is ranked SR. This designation is supposed to indicate that the species is "reported for the state, but without persuasive evidence for either accepting or rejecting the report". In fact, Hickman (1993) and Peck (1941) report the species for California and Oregon respectively and neither claims it is rare. The proper ranking for California and Oregon is probably SU (essentially unranked).

Federal endangered species legislation has been passed in Canada. The Trial Island population may be eligible for protection if the species is officially listed as endangered, threatened or of special concern.

British Columbia does not protect endangered species through legislation. The Trial Island population has nominal protection through provincial legislation governing ecological reserves but Ecological Reserves employees rarely visit the site and are not familiar with the species.

## TECHNICAL SUMMARY

### ***Orthocarpus bracteosus***

Rosy owl-clover

orthocarpe à épi feuillu

Range of Occurrence in Canada: British Columbia

<b>Extent and Area Information</b>	
<ul style="list-style-type: none"> <li>• <i>Extent of occurrence (EO)(km<sup>2</sup>)</i> (Actual area of single population)</li> </ul>	<<1 km <sup>2</sup> (0.03 ha)
<ul style="list-style-type: none"> <li>• <i>Specify trend in EO</i></li> </ul>	Historic decline
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in EO?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Area of occupancy (AO) (km<sup>2</sup>)</i> (Actual area of single population)</li> </ul>	<<1 km <sup>2</sup> (0.03 ha)
<ul style="list-style-type: none"> <li>• <i>Specify trend in AO</i></li> </ul>	Historic decline
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in AO?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Number of known or inferred current locations</i></li> </ul>	1
<ul style="list-style-type: none"> <li>• <i>Specify trend in #</i></li> </ul>	Historic decline
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of locations?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>Specify trend in area, extent or quality of habitat</i></li> </ul>	Historic decline in extent of habitat but recent continued decline of quality due to encroachment by invasive plants and impact of trampling.
<b>Population Information</b>	
<ul style="list-style-type: none"> <li>• <i>Generation time (average age of parents in the population)</i></li> </ul>	1 year
<ul style="list-style-type: none"> <li>• <i>Number of mature individuals</i></li> </ul>	300 in 2002 but as low as 40 recorded in 1998
<ul style="list-style-type: none"> <li>• <i>Total population trend:</i></li> </ul>	Unkown (Numbers fluctuate)
<ul style="list-style-type: none"> <li>• <i>% decline over the last/next 10 years or 3 generations.</i></li> </ul>	Decline uncertain due to fluctuation in numbers
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of mature individuals?</i></li> </ul>	Large, if not extreme, fluctuations have been documented.
<ul style="list-style-type: none"> <li>• <i>Is the total population severely fragmented?</i></li> </ul>	Yes (Single population disjunct from Washington State population by 300 km)
<ul style="list-style-type: none"> <li>• <i>Specify trend in number of populations</i></li> </ul>	Stable (Historic decline)
<ul style="list-style-type: none"> <li>• <i>Are there extreme fluctuations in number of populations?</i></li> </ul>	No
<ul style="list-style-type: none"> <li>• <i>List populations with number of mature individuals in each: Trial Island: 300 in 2002</i></li> </ul>	
<b>Threats (actual or imminent threats to populations or habitats)</b>	
<p>Actual:</p> <ul style="list-style-type: none"> <li>- alien species invasion, foot-traffic</li> </ul> <p>Potential:</p> <ul style="list-style-type: none"> <li>- marine pollution</li> <li>- any stochastic event that would severely impact the small area occupied by the single population of this species</li> </ul>	

<b>Rescue Effect (immigration from an outside source)</b>	
<ul style="list-style-type: none"> <li>• <i>Status of outside population(s)?</i> <b>USA:</b> Extremely rare in Washington (S1)</li> </ul>	
<ul style="list-style-type: none"> <li>• <i>Is immigration known or possible?</i></li> </ul>	Unlikely
<ul style="list-style-type: none"> <li>• <i>Would immigrants be adapted to survive in Canada?</i></li> </ul>	Unknown
<ul style="list-style-type: none"> <li>• <i>Is there sufficient habitat for immigrants in Canada?</i></li> </ul>	Small amounts of unoccupied, suitable habitat remain
<ul style="list-style-type: none"> <li>• <i>Is rescue from outside populations likely?</i></li> </ul>	No
<b>Quantitative Analysis</b>	Not Applicable
<b>Other Status</b>	

### Status and Reasons for Designation

<b>Status:</b> Endangered	<b>Alpha-numeric code:</b> B1ab(iii)+2ab(iii); C2a(i, ii); D1
<p><b>Reasons for Designation:</b> An annual herb of vernal pools and damp depressions present at a single remaining location where population size fluctuates widely with low numbers that may be fewer than 100 plants a year. Expansion is limited due to lack of suitable habitats and apparent low dispersal abilities. The population is at risk from spread of nearby invasive exotic plants, from trampling due to hiker traffic and local maintenance activities related to the nearby communications site and consequences of possible oil spills occurring in the busy shipping lanes surrounding the island site.</p>	
<b>Applicability of Criteria</b>	
<p><b>Criterion A</b> (Declining Total Population): Not Applicable: Populations fluctuate greatly with no consistent trend evident.</p> <p><b>Criterion B</b> (Small Distribution, and Decline or Fluctuation): Endangered under B1 and B2 (a) + (b iii) due to small distribution with EO and AO of &lt;&lt;1ha at the single remaining site with continuing decline in quality of habitat due to encroachment by invasive plants.</p> <p><b>Criterion C</b> (Small Total Population Size and Decline): Endangered under C2 a(i, ii) based on an inferred decline of mature plants in the future due to the spread of invasive plants and all plants in one population.</p> <p><b>Criterion D</b> (Very Small Population or Restricted Distribution): Endangered under D1 due to presence in some years of &lt;250 plants.</p> <p><b>Criterion E</b> (Quantitative Analysis): Not Applicable.</p>	

## ACKNOWLEDGEMENTS

I would like to acknowledge the valuable assistance of my colleagues in the British Columbia Conservation Data Centre including Brenda Costanzo, George Douglas, Jenifer Penny and Marta Donovan. Adolf and Oluna Ceska first showed me the Trial Island population of *Orthocarpus bracteosus* and I gratefully acknowledge the many rewarding hours I have spent with them in the field. Shane Ford has provided field assistance and useful insights as we shared volunteer warden duties for Trial Island Ecological Reserve. I also appreciate the assistance provided by the Canada Coast Guard and the British Columbia Provincial Parks Program.

Funding for the preparation of this status report was provided by the Garry Oak Ecosystem Recovery Team and the BC Conservation Data Centre.

## AUTHORITIES CONTACTED

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## **BIOGRAPHICAL SUMMARY OF THE REPORT WRITER**

Matt Fairbarns has worked with rare plants for over 20 years. He has led three recovery action groups (RAGs) within the Garry Oak Ecosystems Recovery Team including the Plants-at-Risk RAG. He has authored or co-authored three other COSEWIC status reports for species in Garry oak and associated ecosystems. He has also conducted numerous surveys and reviews of rare plants in Alberta.

## **COLLECTIONS EXAMINED**

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