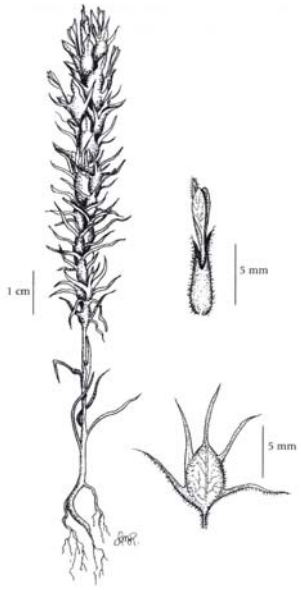
COSEWIC
Assessment and Status Report

on the

Grand Coulee Owl-clover
Orthocarpus barbatus

in Canada



ENDANGERED
2005

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:

COSEWIC 2005. COSEWIC assessment and status report on the Grand Coulee Owl-clover *Orthocarpus barbatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 17 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Production note:
COSEWIC acknowledges the late George W. Douglas and also Ms. Shyanne J. Smith for writing the status report on the Grand Coulee Owl-clover, *Orthocarpus barbatus.* This status report was produced with the initiative and funding of the British Columbia Conservation Data Centre. The COSEWIC status report review was overseen by Erich Haber, co-chair (vascular plants) of the COSEWIC Plants and Lichens Specialist Subcommittee, with input from members of COSEWIC. That review may have resulted in changes and additions to the initial version of the report.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur l'orthocarpe barbu (*Orthocarpus barbatus*) au Canada.

Cover illustration:
Grand Coulee Owl-clover — Line drawing by Lora May Richards in Pojar 2000 (by permission).

Catalogue No. CW69-14/443-2005E-PDF
ISBN 0-662-40640-0
HTML: CW69-14/443-2005E-HTML
0-662-40641-9


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COSEWIC
Assessment Summary

Assessment Summary – May 2005

Common name
Grand Coulee Owl-clover

Scientific name
Orthocarpus barbatus

Status
Endangered

Reason for designation
A semiparasitic annual restricted to a small area east of the Cascade Mountains. The few small populations are subject to extreme fluctuations in numbers of mature plants and at continued risk from introduced weeds, overgrazing and housing developments. One population in South Okanagan Grasslands Protected Area is protected from development.

Occurrence
British Columbia

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

COSEWIC
Executive Summary

Grand Coulee Owl-clover
Orthocarpus barbatus

Species information

Grand Coulee owl-clover (*Orthocarpus barbatus*) is a member of the broomrape family (Orthocarpaceae) and one of nine members of the genus *Orthocarpus*, of which five species occur in British Columbia and Canada. The species is a yellowish annual herb, reaching 8-25 cm in height. The alternate leaves are stalkless and 2-4 cm long. The yellow flowers are 10-12 mm long, tube-shaped, with yellowish-green bracts. The fruits are elliptical capsules containing several seeds with tight-fitting, netted coats.

Distribution

Orthocarpus barbatus occurs east of the Cascade Mountains in western North America from the southern Okanagan Valley in south-central British Columbia south to Grant County in south-central Washington. In British Columbia, *O. barbatus* is known from four sites in the southern Okanagan and Similkameen valleys.

Habitat

The populations in British Columbia are found in the Bunchgrass Biogeoclimatic Zone of southern British Columbia. This zone, particularly in the southern Okanagan Valley, has a cold, semi-arid steppe climate. The Bunchgrass Zone occupies less than one percent of the total area of British Columbia and is one of the most populated and developed areas in the B.C. interior. *Orthocarpus barbatus* is restricted, within this zone, to extremely dry, open, big sagebrush (*Artemisia tridentata*) communities at lower elevations in the southern Okanagan Valley, often on sites with sandy to gravelly soils.

Biology

Orthocarpus barbatus is an annual with germination likely occurring in May and with plants senescent by the end of July. *Orthocarpus barbatus* is likely an outbreeder, primarily pollinated by honeybees and native bee species. Members of the genus *Orthocarpus* are hemiparasites, and are capable of growing and producing flowers in the absence of a host, but tend to have enhanced growth and reproduction in the presence of a host.

Population sizes and trends

There are four locations for *Orthocarpus barbatus* in Canada, all in the southern Okanagan Valley and the southern Similkameen Valley. Population sizes range from 185 to approximately 8000 plants on areas of 22 m² to approximately 2000 m². Population trends are not well known and fluctuations are likely natural and due to the annual nature of the genus.

Limiting factors and threats

Orthocarpus barbatus is limited to dry, open, *Artemisia tridentata* communities at lower elevations, often on sites with sandy to gravelly soils. Alien species, especially newly arrived species, are a major threat to *O. barbatus*. Currently, the most significant threat to *O. barbatus* is land development.

Special significance of the species

Populations of *Orthocarpus barbatus* in British Columbia are unique in that they are at the northern extent of their geographic range. The species has a limited range in North America, and is restricted to the foothills on the east side of the Cascade Mountains of British Columbia and Washington.

Existing protection or other status designations

Orthocarpus barbatus is not covered under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Endangered Species Act (USA) or the IUCN Red Data Book. NatureServe has designated a global rank of G2G4 for the species (imperiled/vulnerable). In Canada, *O. barbatus* has a national and provincial rank of N1 and S1 (critically imperiled) respectively. Recent changes in legislation brought about by the passage of the Wildlife Amendment Act of British Columbia allow for the listing and protection of plants under the Act. At this time however, the necessary regulations for the Act are not in place and this species does not occur on the list of four species currently protected under the Act. One of the populations of *O. barbatus* in British Columbia, however, is protected by the Provincial Park Act.

COSEWIC HISTORY

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

COSEWIC MANDATE

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

COSEWIC MEMBERSHIP

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

DEFINITIONS (NOVEMBER 2004)

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

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.
** Formerly described as “Not In Any Category”, or “No Designation Required.”
*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

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

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2005

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SPECIES INFORMATION

Name and classification

Scientific name: *Orthocarpus barbatus* Cotton[1]
Common name: Grand Coulee Owl-clover
Family: Orobanchaceae (broomrape family)
Major plant group: Dicot flowering plant

Keck (1927) recognized 25 annual species of *Orthocarpus* within the subtribe Castillejinae (family Scrophulariaceae). Many of these species have now been placed within *Castilleja* or *Triphysaria*, leaving nine species in *Orthocarpus* as it is now recognized (Chuang and Heckard 1991). Five of these species occur in British Columbia and Canada (Pojar 2000).

Orthocarpus was considered part of the family Scrophulariaceae until recent work determined that all parasitic Scrophulariaceae should be separated into the family Orobanchaceae (Olmstead *et al*., 2001).

Description

Orthocarpus barbatus is a yellowish annual herb (Figure 1) from an erect stem 8-25 cm tall, slender, simple or with erect branches above (Pojar 2000). The plant has a mixture of long and short hairs and is tinged yellowish-green. The leaves are alternate, stalkless, linear to narrowly lanceolate, spreading-hairy and 2-4 cm long. The leaves are entire or deeply cleft into 3 to 5 long, narrow lobes. The flowers are grouped in a dense, prominently bracted terminal spike. The bracts are green or yellowish-green, 3 to 5 cleft into narrow lobes. The flowers are yellow and 10-12 mm long, exerted from the bracts and tube-shaped. The calyces are tube-shaped. The fruits are capsules that are elliptical in shape and contain several seeds with tight-fitting, netted coats.

Two other yellow-flowered species of *Orthocarpus*, *O. luteus* and *O. tenuifolius*, occur in the same area as *O. barbatus* in south-central British Columbia. They may be distinguished by their inflorescence bracts, 3 to 5 cleft into long narrow lobes in *O. barbatus* versus 3-lobed bracts with shorter lobes in *O. luteus* and *O. tenuifolius.*

DISTRIBUTION

Global range

Orthocarpus barbatus occurs east of the Cascade Mountains in western North America, from the southern Okanagan Valley in south-central British Columbia

[1]Taxonomy and nomenclature follows Douglas *et al.* (1998c, d; 1999; 2001) and Pojar (2000).

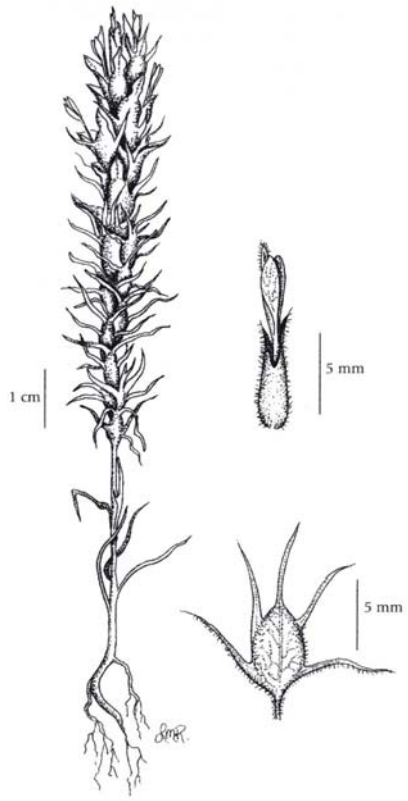

Figure 1. Illustration of *Orthocarpus barbatus:* plant habit (left), flower (top right) and characteristic bract subtending the flowers (Line drawing by Lora May Richards in Pojar 2000; by permission).

south to Grant County in south-central Washington (Figure 2, Hitchcock *et al.* 1959, Pojar 2000, Douglas *et al*. 2002).

Canadian range

In British Columbia, *Orthocarpus barbatus* is known from four extant occurrences in the southern Okanagan Valley and the southern Similkameen Valley. All of the sites are within a 2.5 by 16 km band along the United States border (Figure 3). The first collection of this species in British Columbia was recorded by G.W. Douglas in 1994 (Douglas *et al.* 1998a, 1998b) at "Veronica Lake"[2]. The fourth, and most discovered in 2003 by J. Fenneman in the Kilapoola Lake area in South Okanagan Grasslands Protected Area.

[2]Veronica Lake is a local name given to a privately owned water storage pond and has not been formally gazetted.

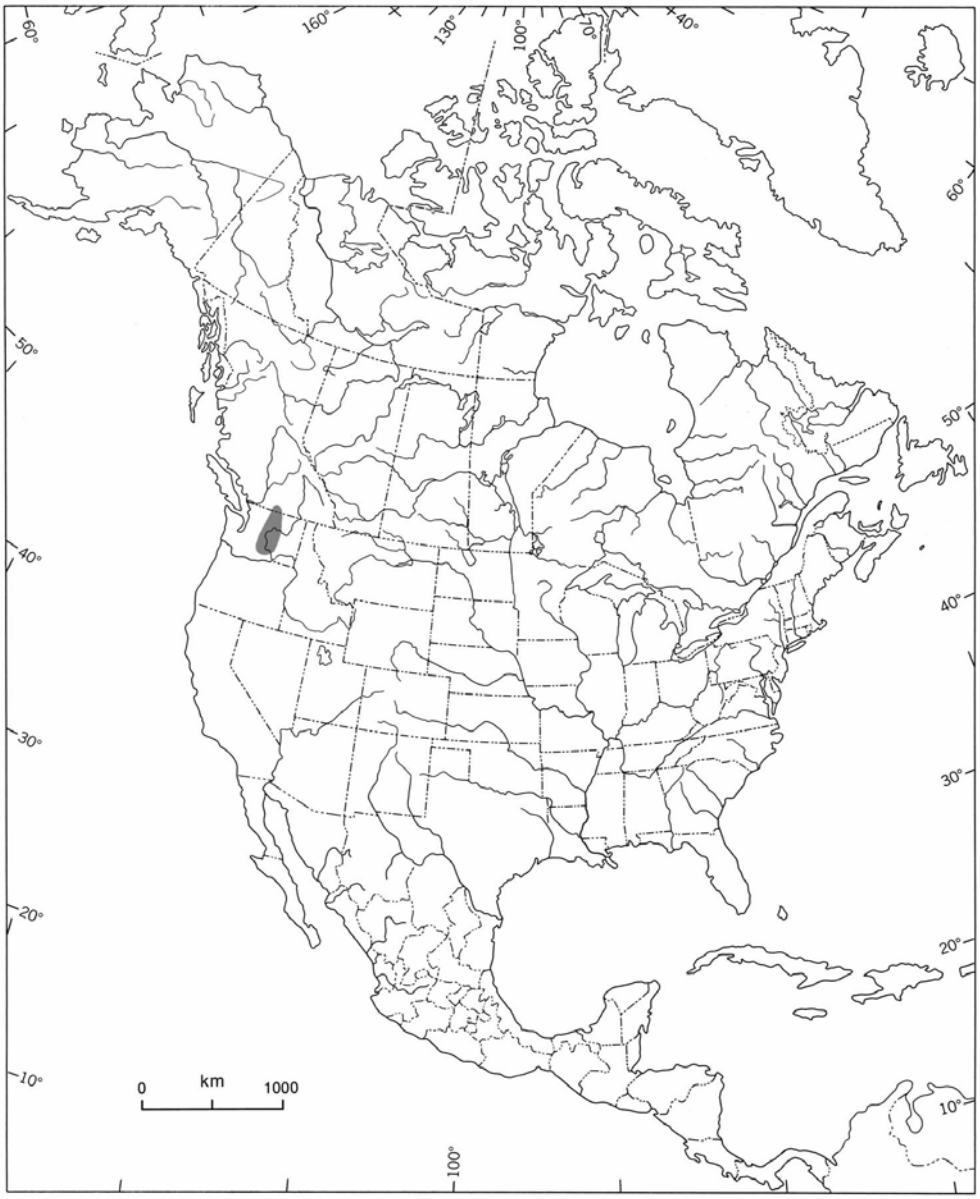

Figure 2. Distribution of *Orthocarpus barbatus* in North America.

The writers searched a number of apparently suitable habitats throughout the southern Okanagan Valley in 2003 and found no further populations. Other botanists (e.g., F. Lomer, pers. comm., 2003; M. Martin, pers. comm., 2003) have also searched the southern Similkameen and southern Okanagan valleys from 1996 to the present without success. The area (ca. 45 km²) supporting *Orthocarpus barbatus* was not visited by botanists until the early 1990s thus it is not surprising that this species was only recently discovered. Approximately 70% of the potential habitat area (Figure 3) has been searched to date.

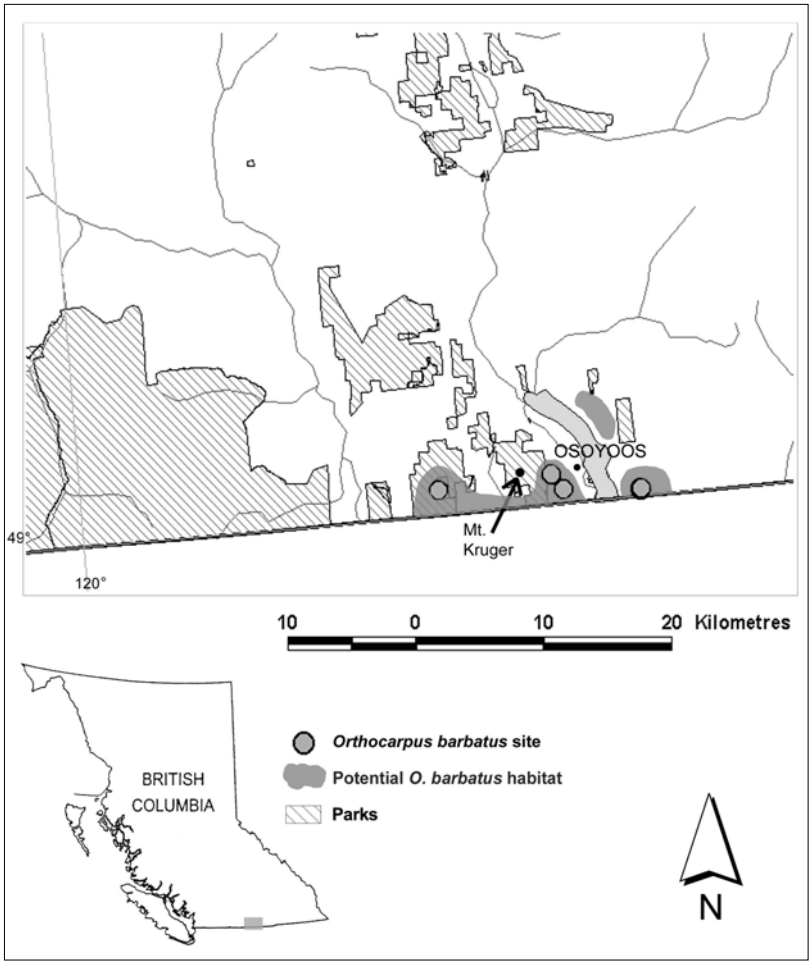

Figure 3. Range and potential habitat of *Orthocarpus barbatus* in the southern Okanagan and Similkameen valleys of British Columbia.

Orthocarpus barbatus is just one of a number of species recently discovered (since the 1980s) along the British Columbia border from the Princeton area to the Roosville area. Some of these species include: *Antennaria flagellaris, Carex vallicola, Collomia tenellus, Floerkea proserpinacoides, Hedeoma hispida, Lipocarpha micrantha, Orobanche ludoviciana, Phacelia ramosissima, Psilocarphus brevissimus, Silene spaldingii* and *Trichostema oblongum* (Douglas *et al.*1998a, 1998b). Most of these species have at least one thing in common; the areas in which they were found were never subjected to botanical collecting. Examination of collection localities in all major herbaria in Canada reveal that none of the many active field botanists working along the border ever collected in the immediate vicinity of the recently collected plants.

HABITAT

Habitat requirements

The British Columbia populations are found in the Bunchgrass Biogeoclimatic Zone of southern British Columbia. This area, particularly in the southern Okanagan Valley, has a cold, semi-arid steppe climate. Summers are hot and dry with mean July temperatures around 20°C. Precipitation is low with mean annual rainfall of about 300 mm. Growing seasons are relatively short with mean monthly temperatures falling below freezing from December to February in the valley bottoms.

Orthocarpus barbatus is restricted to extremely dry, big sagebrush (*Artemisia tridentata*) communities at lower elevations in the southern Okanagan Valley and the southern Similkameen Valley. The populations, at elevations of 370 to 930 m, receive little moisture after early summer, thus this species reaches senescence by mid-summer. The sites are often sandy to gravelly with open vegetation dominated by big sagebrush (Figure 4). Other frequent associates, with low cover values, include: *Artemisia tripartita, Bromus tectorum, Ericameria nauseosus* ssp. *speciosa, Plantago patagonica, Hesperostipa comata, Poa bulbosa, P. pratensis, Phlox longifolia, Erigeron filifolius* and *Vulpia octoflora*. *Bromus tectorum*, one of the most troublesome alien species in south-central British Columbia, is not as common in populations of *Orthocarpus barbatus* as it is elsewhere in the region.

Photo by Shyanne J. Smith

Figure 4. O*rthocarpus barbatus* habitat in the South Okanagan Grasslands Protected Area. *Artemisia tridentata* and *Ericameria nauseosus* ssp. *speciosa* are the conspicuous shrubs on this slope. The herb, *Orthocarpus barbatus* are small straw-yellow plants scattered throughout the habitat but not readily seen in this photo. This is the highest quality site for *O. barbatus* in Canada.

Trends

The Bunchgrass Zone occupies less that one percent of the total area of British Columbia and is one of the most populated and developed areas in the British Columbia interior (Ministry of Forests 1998). In general, trends for natural habitats in the Okanagan Valley have shown a marked decline during recent years due to various land developments. Natural habitats have been appropriated for orchard, vineyard, golf course, housing and industrial developments. The South Okanagan is currently experiencing the fastest population increase in the province (Nature Trust 2004). According to Environment Canada (2003), the population of the Regional District of the Okanagan-Similkameen increased by 18% between 1991 and 2002, to almost 81,000 people. In addition, the town of Osoyoos has seen a population increase of over 22% between 1986 and 1996, making it the fastest growing municipality in the South Okanagan-Similkameen Regional District (Town of Osoyoos 2004).

Development in the Osoyoos area is currently occurring at a rapid pace on the east slopes of Mount Kruger, above downtown Osoyoos. Natural habitat has been destroyed by mineral exploration and golf course, housing, and industrial development. All of these, with the exception of mineral exploration, have destroyed potential *Orthocarpus barbatus* habitat as well as other potential rare species habitat (Figure 5).

Photo by Shyanne Smith 2003

Figure 5. Housing development near extant *Orthocarpus barbatus* populations on the slopes of Mt. Kruger. Remnants of *Artemisia tridentata* and *Purshia tridentata* dominated habitat are visible above the houses. It is likely that this particular development, and the nearby 27-hole golf course, eliminated populations of *O. barbatus*.

Over-grazing by cattle, although a major threat in the past in both the southern Okanagan and southern Similkameen valleys, has recently become a lesser threat, since the range has deteriorated markedly and far fewer cattle now occupy the rangeland. This, however, has not resulted in fewer alien species. In recent years, a number of new alien species have appeared and found a place in over-grazed habitats. Crown lands on the eastern slopes of Mount Kruger are presently under grazing leases (J. Hobbs, pers. comm., 2004).

Protection/ownership

The westernmost population of *O. barbatus* in Canada is in the southern Similkameen River drainage and is located in the South Okanagan Grasslands Protected Area. This area receives protection under the Provincial Parks Act which does not allow such activities as logging and mining. The Grasslands Protected Area still has grazing leases in effect and there is little if any weed control. The population on the southeast slope of Mount Kruger, above the golf course (above the town of Osoyoos), is on privately owned land. The second population on the southeast slope of Mt. Kruger (above the racetrack) is on Crown Land. The easternmost site, near Veronica Lake, is located on privately owned rangeland.

BIOLOGY

Reproduction

Orthocarpus barbatus is a true annual and over-winters as seeds in British Columbia. Germination probably takes place in May and because of the low available moisture in the *Artemisia tridentata* communities, plants begin to senesce by the end of July. All flowers are chasmogamous (with flowers that open to allow pollination) and there are no asexual means of reproduction.

It appears that *Orthocarpus* species are predominantly outbreeders. 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. barbatus* is an inbreeder or an outbreeder— the latter seems likely as it does have very showy flowers and the plants occur in relatively dense patches. Outbreeding *Orthocarpus* are primarily pollinated by honeybees and native bee species (Atsatt 1970).

Movements/dispersal

Seed dispersal is not well understood but it is likely that most seeds are not dispersed beyond the immediate vicinity of the parent (Chuang and Heckard 1983). The latter 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. Alternately, the loosely netted reticulations on the seed coat may trap air and thus add buoyancy to seeds during dispersal by water (Kuijt 1969).

The nearest USA population is about 80 km south, along highway 20 west of Okanogan in the Okanogan National Forest, Okanogan County, WA (Mark Egger, pers. comm., 2005). Based on the localized type of dispersal mechanism for this species, rescue from US populations is unlikely.

Germination and survival

No specific information is available on germination requirements for *Orthocarpus barbatus*.

Nutrition and interspecific interactions

Members of the genus *Orthocarpus* are hemiparasites, containing chlorophyll and fix carbon through photosynthesis but receive water and nutrients through parasitic root connections (Kuijt 1969). *Orthocarpus* species may also obtain photosynthates and secondary compounds from their hosts (Atsatt 1970). These secondary compounds 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 *et al*. 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, although 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 grass, aster and a number of other families. It is likely that research results with the closely related genus *Castilleja* (Heckard 1962), which also forms haustorial connections with host plants, are applicable to *Orthocarpus*. Heckard (1962) investigated the growth of eleven species of *Castilleja* with, and without, hosts. All species were capable of completing their life cycle in the absence of a host. However, when they were grown in culture with non-*Castilleja* species, all but one species exhibited faster growth rates, produced a larger number of branches, and flowered earlier than when they were grown in isolation.

POPULATION SIZES AND TRENDS

There are four locations for *Orthocarpus barbatus* in Canada, all in the southern Okanagan Valley and the southern Similkameen Valley (Figure 3, Table 1). Population numbers range from 185 to 8000 on areas of 22 m² to 2000 m². Population trends are not well known. Only one site (Mount Kruger, above the racetrack) has data from more than several years. At this site, a subpopulation had ca. 200, 1200 to 1500, 153 and 222 plants in 1995, 1997, 2003 and 2004, respectively. At the Kilapoola site (Subpopulation 1), plant numbers and the area covered increased by 100% between 2003 and 2004. It may be assumed that these fluctuations are natural and due to the annual nature of the genus. 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 annual species and such fluctuations may obscure population trends, especially if the increase in shoot numbers occurs through seed bank depletion.

Table 1. Locations and population/subpopulation sizes for *Orthocarpus barbatus* in British Columbia.

Population	Last Observation	Observers	Number of Plants/Area
Mt. Kruger, above golf course	1997	Lomer	Unknown
"Veronica Lake"	2002	Penny & Donovan	367/1800 m²
Mt. Kruger, above racetrack, Subpopulation 1	2004	Douglas & Smith	222/22 m²
Mt. Kruger, above racetrack, Subpopulation 2	2004	Douglas & Smith	3000-3500/245 m²
Kilpoola Lake area, Subpopulation 1	2004	Douglas & Smith	5000-8000 /2,000 m²
Kilpoola Lake area, Subpopulation 2	2004	Douglas & Smith	185/57 m²
Kilpoola Lake area, Subpopulation 3	2004	Douglas & Smith	300/484 m²

LIMITING FACTORS AND THREATS

At one time, overgrazing was probably the most serious threat to *Orthocarpus barbatus* in Canada. Grassland habitats in the Bunchgrass Biogeoclimatic Zone in the southern Okanagan Valley have been seriously degraded over the years due to the prolific invasion by alien species such as *Acroptilon repens*, *Bromus tectorum* and *Centaurea diffusa*. Alien species, especially newly arrived species, are still a major threat to *O. barbatus* in the South Okanagan Grasslands Protected Area, especially since grazing leases still exist within the Protected Area.

The major habitat threat to *Orthocarpus barbatus* at this time is through increased land conversion. This land development includes orchards, vineyards, golf courses and housing. All of these have probably eliminated potential *O. barbatus* habitat. Two of the populations, on the slopes of Mount Kruger, are presently within a few hundred metres of an actively expanding housing development on private property (Figure 5).

A third population, near "Veronica Lake", is on private land. At the present time, this area is utilized as rangeland and is heavily infested with alien species. Since large tracts of private land in the Okanagan Valley are extremely desirable for vineyards or housing development, the potential for destruction of this population is high.

SPECIAL SIGNIFICANCE OF THE SPECIES

Populations of *Orthocarpus barbatus* in British Columbia are unique in that they are at the northern extent of their geographic range. *Orthocarpus barbatus* has a limited range in North America, restricted to the foothills on the east side of the Cascade Mountains of British Columbia and Washington. It has no commercial value and is not known in cultivation, nor is it known to have cultural, medicinal or spiritual uses.

EXISTING PROTECTION OR OTHER STATUS

International status

Orthocarpus barbatus 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 G2G4 rank for the species (NatureServe Explorer, 2003) also lists the species as having a rounded global rank of G3. The latter 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".

This species is not tracked as a rare species outside of British Columbia and is ranked S? in Washington by NatureServe Explorer (2003). The S? rank indicates that the species has yet to be ranked.

National and provincial status

Since the species is restricted to British Columbia, Canada, it has a national rank of N1. Provincially, *Orthocarpus barbatus* is ranked by the British Columbia Conservation Data Centre as S1 and appears on the British Columbia Ministry of Sustainable Resource Management red list (Douglas *et al*. 2002). This S1 rank is the most critical rank that can be applied to species at the provincial level and indicates that the species is "critically imperiled because of extreme rarity (typically five or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation or extinction".

There is currently no specific endangered species legislation in place for the protection of vascular plants in British Columbia that have been placed on the Ministry of Sustainable Resource Management red list. The largest population of *Orthocarpus barbatus* in British Columbia, however, is protected by the Provincial Park Act.

TECHNICAL SUMMARY

Orthocarpus barbatus
Grand Coulee Owl-clover orthocarpe barbu
Range of Occurrence in Canada: British Columbia

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* **[area encompassing all known localities]**	45 km²
• *Specify trend in EO*	Unknown
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²)* **[actual area occupied by populations]**	<< 1 km² (0.004 km²)
• *Specify trend in AO*	Probably declining
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	4
• *Specify trend in #*	Unknown
• *Are there extreme fluctuations in number of locations?*	No
• *Specify trend in area, extent or quality of habitat*	Declining
Population Information	
• *Generation time (average age of parents in the population)*	3 months
• *Number of mature individuals*	9000-12,500
• *Total population trend:*	Unknown
• *% decline over the last/next 10 years or 3 generations.*	N/A
• *Are there extreme fluctuations in number of mature individuals?*	Yes
• *Is the total population severely fragmented?*	Yes, migration between present populations unlikely
• *Specify trend in number of populations*	Unknown
• *Are there extreme fluctuations in number of populations?*	No
• List populations with number of mature individuals lin each:	Mt. Kruger, golf course: ? "Veronica Lake": 367 Mt. Kruger, above track: 3222-3722 Kilpoola Lake area: 5485-8485
Threats (actual or imminent threats to populations or habitats)	
- alien species invasion, urban and agricultural development	
Rescue Effect (immigration from an outside source)	
• *Status of outside population(s)?* **USA: unknown**	
• *Is immigration known or possible?*	Unknown
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	Yes
• *Is rescue from outside populations likely?*	Low probability
Quantitative Analysis [provide details on calculation, source(s) of data, models, etc.]	N/A
Current Status COSEWIC: Endangered(May 2005)	

Status and Reasons for Designation

Status: Endangered	**Alpha-numeric code**: B1ab(ii,iii,iv,v) + 2 ab (ii,iii,iv,v)c(iv)

Reasons for Designation:
A semiparasitic annual restricted to a small area east of the Cascade Mountains. The few small populations are subject to extreme fluctuations in numbers of mature plants and at continued risk from introduced weeds, overgrazing and housing developments. One population in South Okanagan Grasslands Protected Area is protected from development.

Applicability of Criteria

Criterion A (Declining Total Population): Not applicable.

Criterion B (Small Distribution, and Decline or Fluctuation): Meets endangered (B1ab(ii,iii,iv,v)c(iv) + 2ab (ii,iii,iv,v)c(iv) based on extent of occurrence < 5,000 km^2 and area of occupancy <500 km^2 with only 4 populations and continuing decline projected in area of occupancy, extent and quality of habitat, possible loss of entire populations, and number of individuals (due to spread of exotics and expansion of development on private lands); it is also subject to extreme fluctuations in number of mature individuals.

Criterion C (Small Total Population Size and Decline): Meets threatened C2b with <10,000 plants subject to continued decline in numbers and extreme fluctuations in number of mature individuals.

Criterion D (Very Small Population or Restricted Distribution): Meets threatened D2 based on an area of occupancy <<20 km^2 and only 4 populations at risk from habitat loss due to continued spread of exotic plants and potential expansion of development activities on private lands in close proximity to existing populations.

Criterion E (Quantitative Analysis): Not applicable.

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED

Acknowledgements

We would like to thank Jamie Fenneman for his aid in the field. Frank Lomer also kindly provided information on his searches in the South Okanagan. Ted Lea, Pam Krannitz and Jenifer Penny reviewed the draft of the report and made valuable comments.

Funding for the preparation of this status report was provided by the Habitat Conservation Trust Fund through Okanagan Community College.

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BIOGRAPHICAL SUMMARY OF REPORT WRITERS

Dr. George Wayne Douglas (1938-2005), well-known and respected British Columbia botanist, whose contribution to COSEWIC has included over 30 status reports, died in Duncan, BC, on 10 February 2005, after a short battle with cancer.

George W. Douglas held an M.Sci. (Forestry) from the University of Washington and a Ph.D. (Botany) from the University of Alberta, Edmonton. George has worked with rare plants for over 20 years. He was senior author of *The Rare Plants of the Yukon* (1981), *The Rare Plants of British Columbia* (1985) and *Rare Native Plants of British Columbia* (1998, 2002). He was also the senior editor for the *Illustrated Flora of British Columbia* (1998-2002) and was the program botanist for the British Columbia Conservation Data Centre from 1991 until 2003. George wrote or co-wrote 33 COSEWIC status reports and three update status reports.

Shyanne J. Smith has a B.Sc. (Geography) from the University of Victoria. She has conducted botanical inventory, research, and mapping projects in British Columbia since 2001. Shyanne was a co-author of the National Recovery Plan for Southern Maidenhair Fern (2004), four COSEWIC status reports, and three stewardship accounts for rare plants.

COLLECTIONS EXAMINED

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