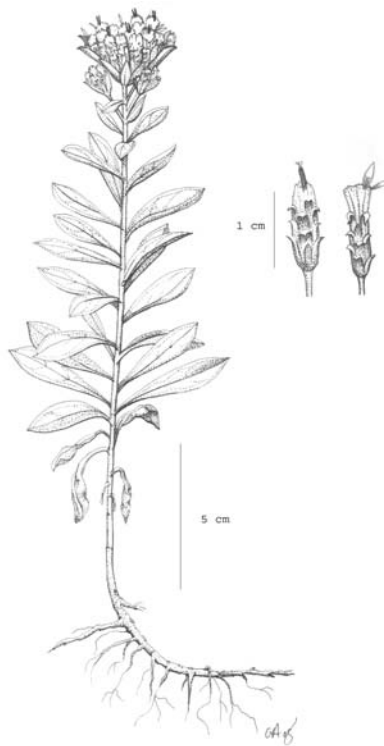


# COSEWIC Assessment and Update Status Report

on the

## **White-top Aster** *Sericocarpus rigidus*

in Canada



**SPECIAL CONCERN**  
2009

**COSEWIC**  
Committee on the Status  
of Endangered Wildlife  
in Canada



**COSEPAC**  
Comité sur la situation  
des espèces en péril  
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Previous reports:

COSEWIC. 2000. COSEWIC assessment and status report on the White-top Aster *Sericocarpus rigidus* 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)).

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## COSEWIC Assessment Summary

### Assessment Summary – April 2009

**Common name**

White-top Aster

**Scientific name**

*Sericocarpus rigidus*

**Status**

Special Concern

**Reason for designation**

This perennial species reproduces primarily asexually and is present at 22 discrete sites that include 14 recently discovered populations. The latter were previously unrecorded, but likely always present, and include the largest populations. The total population comprises many thousands of stems with most of the plants found in parks and on federal lands. In spite of the species' occurrence mainly in protected areas, it is at risk from increasing recreational activities and the spread of invasive exotic plants.

**Occurrence**

British Columbia

**Status history**

Designated Threatened in April 1996. Status re-examined and confirmed in May 2000. Status re-examined and designated Special Concern in April 2009. Last assessment based on an update status report.



## COSEWIC Executive Summary

### White-top Aster *Sericocarpus rigidus*

#### Species information

White-top Aster (*Sericocarpus rigidus*) is a rhizomatous perennial herb that produces many upright, leafy stems 10 to 30 cm tall. Flower heads are produced in a terminal cluster and on short branches in mid-summer. Flowers are pale yellow and white and inconspicuous except for the protruding purple anthers.

#### Distribution

White-top Aster is found from southern Vancouver Island south through the Puget Lowlands of Washington State and the Willamette Valley of Oregon. In Canada, it is found at 22 locations from Victoria to Nanaimo, including one location in Port Alberni and one location on Hornby Island. This Extent of Occurrence is estimated at 4750 km<sup>2</sup>. Within this, White-top Aster has a total Index of Area of Occupancy of 70 km<sup>2</sup> (based on two-kilometre grid squares), although the individual populations actually cover a total area of only 0.0075 km<sup>2</sup>.

#### Habitat

In Canada, White-top Aster occurs in meadows and forest openings in the Coastal Douglas-fir Biogeoclimatic Zone and the driest parts of the Coastal Western Hemlock Zone. These habitats are known as Garry Oak and associated ecosystems and are characterized by warm, dry summers, mild, wet winters, and a distinctive flora. Less than 5% of the original extent of these ecosystems still exists in a near-natural state.

Outside of Canada, White-top Aster is found in meadows, Puget and Willamette prairies, and openings in Garry Oak and Douglas-fir woodlands.

#### Biology

The species is long-lived and reproduces primarily through vegetative growth from rhizomes. Few flower heads are produced and few of these produce viable seed. Germination and seedling establishment in the wild appears to be a rare event.

## **Population sizes and trends**

The 22 Canadian populations total 46,100 to 87,950 stems, including an estimated 4290 to 8270 flowering stems. Several populations contain many thousands of stems, while other populations consist of small numbers with no flowering stems. Nine historic populations are believed to have become extirpated in Canada, mostly early in the agricultural and residential development of southern Vancouver Island.

Sixteen of 22 known populations are in protected areas. Many populations appear to be declining because of a combination of threats within protected areas. Populations outside of protected areas are declining because of habitat disturbance.

## **Limiting factors and threats**

All populations of White-top Aster on private land are at risk of destruction through conversion of habitat to residential and commercial uses. Many populations located within protected areas face chronic or acute threats from trampling and resulting erosion and from competition with woody species, particularly exotic shrubs. In some areas, White-top Aster may be declining due to grazing by deer and rabbits. In the long-term, very low reproductive rates may pose a threat to this species, especially as many populations are isolated from each other.

## **Special significance of the species**

White-top Aster is part of a distinctive flora that is found only in a very restricted area in Canada within the Garry Oak Ecosystem. The habitats that support this species support many other rare plants and species at risk. White-top Aster is of conservation concern throughout its global range.

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

The majority of Canadian populations of White-top Aster are located in protected areas, where provincial laws or local bylaws prevent the deliberate destruction of native vegetation. Plants are, nevertheless, impacted by recreational activities and exotic plants. White-top Aster is also listed as Threatened (2000) on Schedule 1 of the *Species at Risk Act*, making it unlawful to destroy individuals on federal land. Two populations are located at least partly on federal lands. White-top Aster is listed as a species of concern in the United States, a sensitive species in Washington, and a threatened species in Oregon. None of these designations confer protection.



## COSEWIC HISTORY

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

## COSEWIC MANDATE

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

## COSEWIC MEMBERSHIP

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

## DEFINITIONS (2009)

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

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

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

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



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

**Update  
COSEWIC Status Report**

on the

**White-top Aster**  
*Sericocarpus rigidus*

in Canada

2009

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## SPECIES INFORMATION

### Name and classification

- Scientific name: *Sericocarpus rigidus* Lindl.  
Synonyms: *Aster curtus* Cronq.  
Common names: White-top Aster, White-topped Aster, Columbian Whitetop Aster  
Family: Asteraceae  
Major plant group: Eudicot flowering plant

The genus *Sericocarpus* was described in 1832, reduced to a subgenus of *Aster* in 1947 (Cronquist 1947) and reinstated as a genus in 1993 (Nesom 1993). *Sericocarpus* can be distinguished from other asters by the colour of the disk and ray florets (whitish) and the small number of ray florets (Nesom 1994). There are three species of *Sericocarpus* in eastern North America and two in western North America (Nesom 1994).

When *Sericocarpus* was originally included in the genus *Aster*, *Sericocarpus rigidus* was called *Aster curtus*. This name is still in use today (e.g., BC Conservation Data Centre 2007), and is common in popular botanical reference books (Douglas *et al.* 1998 and Pojar and Mackinnon 1994).

### Morphological description

The morphology of *Sericocarpus rigidus* is described in Douglas *et al.* (1998) and illustrated in Figure 1. *Sericocarpus rigidus* is a perennial herb that grows from a creeping rhizome. Stems are erect and 10 to 30 cm tall. Basal leaves are reduced and soon wither. Stem leaves are oblanceolate, unstaked, and entire. They are 2.5 to 3.5 cm long, gradually reduced upwards. Flower heads occur in a terminal cluster and often on additional short branches. Each head bears 9-21 pale yellow disk flowers with purple anthers and one to three inconspicuous white ray flowers. Each flower head is surrounded by a series of 7-9 mm long bracts, graduated in several series, that comprise the involucre. The bracts have a strong midrib or slight keel, are obtuse to abruptly sharp-pointed, white and papery below, with a spreading light green tip. Fruits are densely grey-hairy achenes (dry indehiscent fruitlets) surmounted by a fringe of white bristles (the pappus), which assist in fruit dispersal.

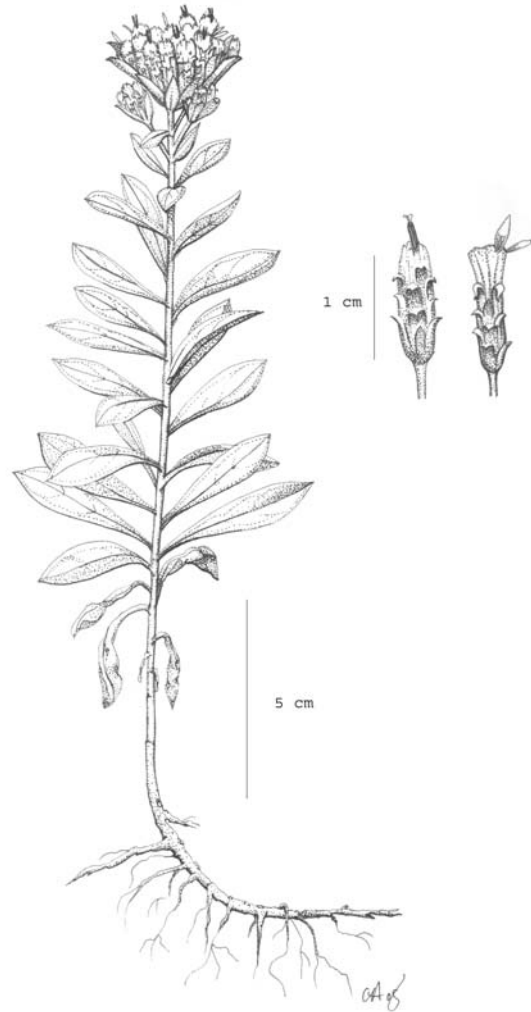


Figure 1. Growth form of *Sericocarpus rigidus*. Inset shows the protruding anthers and the very few ray florets. Illustration by Clare Aries.

### Genetic description

The base chromosome number for the genus *Sericocarpus* is  $x=9$  and the NOR (nucleolar organizing region) chromosome morphology is the so-called primitive type, with the satellite and proximal portions equal (Nesom 1994).

### Designatable units

*Sericocarpus rigidus* has a restricted range, both nationally and globally. No infraspecific taxa are recognized. This species occurs within a single COSEWIC ecological area (Pacific), thereby representing a single designatable unit.

## DISTRIBUTION

### Global range

*Sericocarpus rigidus* is found to the west of the Coast and Cascade Mountains in western North America (Figure 2). It ranges from southeastern Vancouver Island south through the Puget Trough of Washington State to the Willamette Valley of Oregon State (USDA 2007).

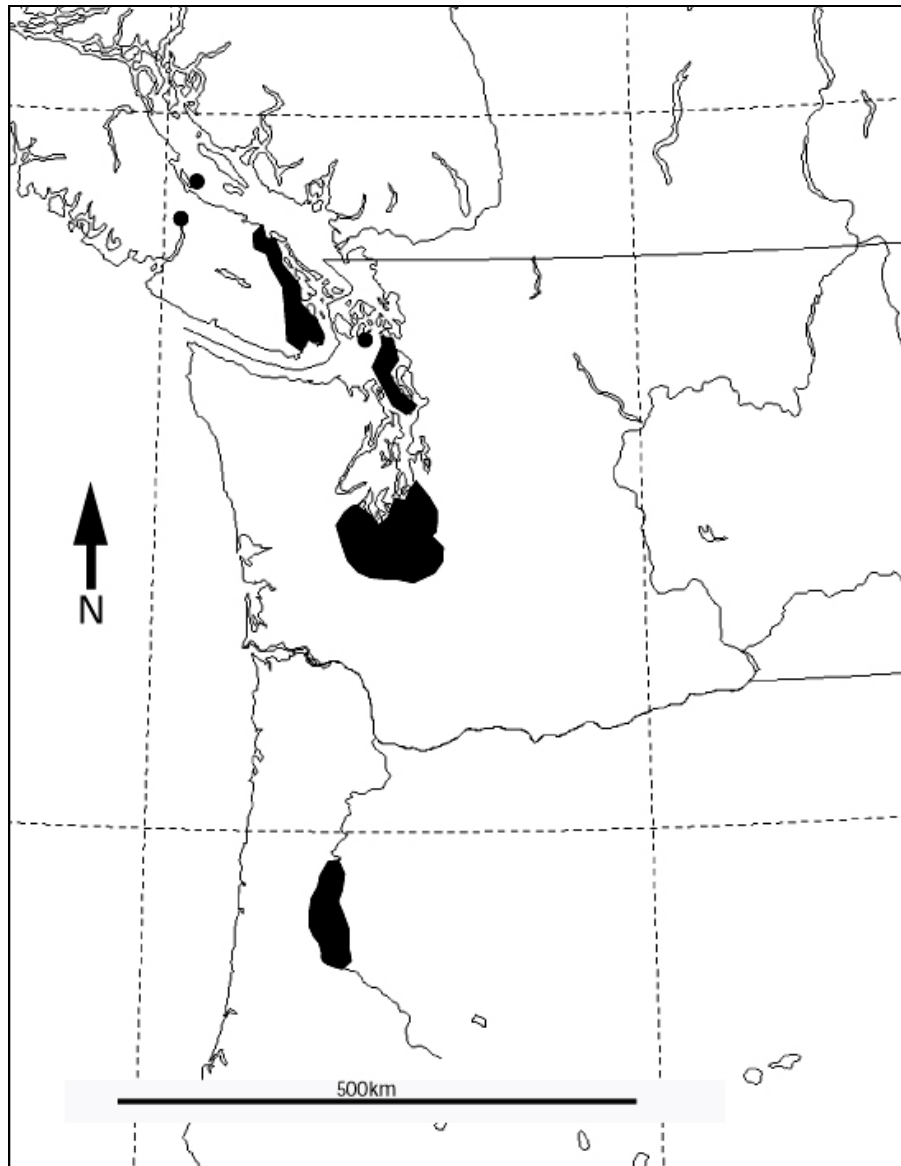


Figure 2. Southwestern British Columbia and western Washington and Oregon, showing the global distribution of *Sericocarpus rigidus*.

## Canadian range

In Canada, *Sericocarpus rigidus* is found on southeastern Vancouver Island and Hornby Island. Most populations occur in the area from Victoria to Nanaimo, with additional populations on Hornby Island and in Port Alberni (Figure 3). The sum of the area physically occupied by each population is 7500 m<sup>2</sup>. The Index of Area of Occupancy, based on the number of two-kilometre grid squares containing populations, is 70 km<sup>2</sup>, and based on one-kilometre grid squares is 24 km<sup>2</sup>. The 22 Canadian populations are spread over a total Extent of Occurrence of 4750 km<sup>2</sup> determined using a convex polygon to include all occurrences.

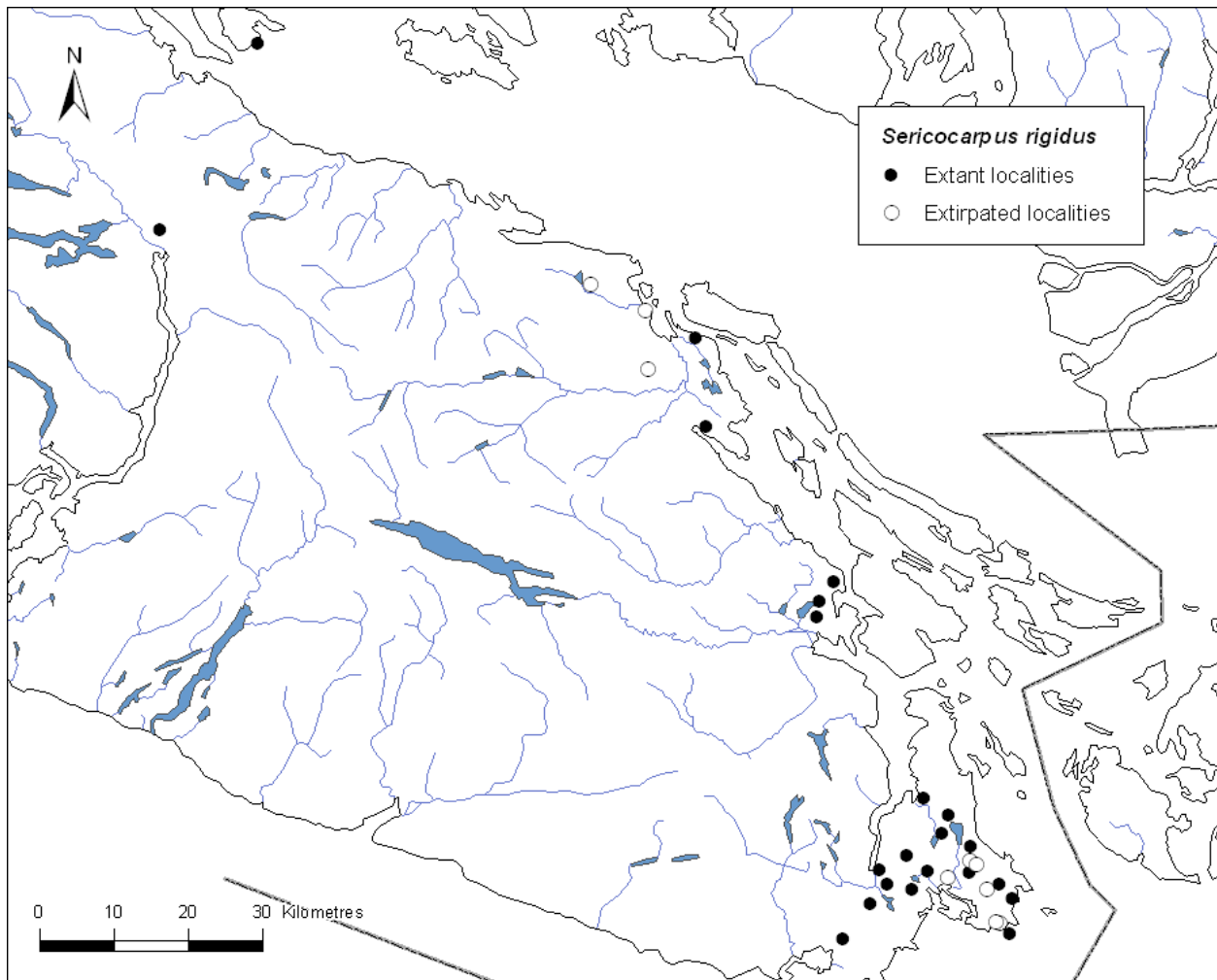


Figure 3. Southern Vancouver Island, showing the entire Canadian range of *Sericocarpus rigidus*.

## HABITAT

### Habitat requirements

In British Columbia, *Sericocarpus rigidus* is found in the Coastal Douglas-fir biogeoclimatic zone (CDFmm) and the driest subzone of the Coast Western Hemlock biogeoclimatic zone (CWHxm1). These zones are characterized by mild, wet winters, and warm, dry summers, with a pronounced moisture deficit (Green and Klinka 1994).

Habitats throughout the range of *Sericocarpus rigidus* include lowland meadows, glacial outwash prairies, and openings in dry woodland (Washington Department of Natural Resources 2007, GOERT 2002). There is one population known in a wetland prairie in Oregon's Willamette Valley (Alverson 1991). In British Columbia, habitats are generally meadows associated with Garry Oak (*Quercus garryana*) and Douglas-fir (*Pseudotsuga menziesii*) woodland (also known as Garry Oak and associated ecosystems). Canopy cover ranges from almost absent to largely closed. An open understory of shrubs, including Common Snowberry (*Symphoricarpos albus*), Oceanspray (*Holodiscus discolor*), and non-native Scotch Broom (*Cytisus scoparius*), is usually present. The herb layer is variable, but usually includes California Oatgrass (*Danthonia californica*), Long-stoloned Sedge (*Carex inops*), Common Camas (*Camassia quamash*), and non-native Sweet Vernalgrass (*Anthoxanthum odoratum*). Other commonly co-occurring species include Yarrow (*Achillea millefolium*), Gairdner's Yampah (*Perideridia gairdneri*), Woolly Sunflower (*Eriophyllum lanatum*), and non-native Kentucky Bluegrass (*Poa pratensis*). The bryophyte layer is often well developed and includes mosses in the genera *Rhytidiadelphus*, *Polytrichum*, and *Dicranum* (habitat information is based on 2007 fieldwork).

### Habitat trends

Ninety percent of the extent of Garry Oak ecosystems that occurred in Canada at the time of Euro-Canadian colonization had been destroyed by 2006 (Lea 2006). Conversion of Garry Oak ecosystems to residential and commercial uses continues today, and development pressures outside of protected areas are very high. The open habitats favoured by *Sericocarpus rigidus* are probably even more reduced than Garry Oak ecosystems as a whole, as there has been significant tree and shrub encroachment into these habitats as a result of fire exclusion. Many of these ecosystems were regularly burned by pre-contact First Peoples to maintain various food resources, especially *Camassia* bulbs (Turner and Bell 1971). These practices were terminated with Euro-Canadian settlement in the 1800's, resulting in woody encroachment into formerly fire-maintained meadows (Fuchs 2001).

### Habitat protection/ownership

Of the 22 populations known in Canada, 16 are located mostly or entirely within parks. These include provincial ecological reserves, provincial parks, regional parks, and municipal parks. Two populations (Observatory Hill and Trial Island) are located

at least partially on federal lands and one is located on provincial crown land. Five populations are located at least partially on private land. Several populations span boundaries between private lands and parks or between provincial and federal lands (Table 1). Since the majority of Canadian populations of White-top Aster are located in provincially protected areas, provincial laws or local bylaws prevent the deliberate destruction of native vegetation. White-top Aster is also listed as threatened on Schedule 1 of the federal *Species at Risk Act*, making it unlawful to destroy individuals on federal land.

**Table 1. Habitat protection/ownership for known populations of *Sericocarpus rigidus* in Canada.**

<b>Location</b>	<b>Protection/ ownership</b>
Bear Hill	Regional Park
Boulderwood Park	Municipal Park
Camas Hill	Provincial Crown Land
Christmas Hill	Municipal Park
Cowichan Preserve	Nature Conservancy of Canada
Downes Point	Private
Francis-King Park	Regional Park and Private
Gore Park	Municipal Park
Harmac	Private
Maple Mountain	Municipal Park
Mill Hill	Regional Park
Miniskirt Mountain	Private
Mount Finlayson	Provincial Park
Mount Tolmie	Municipal Park
Mount Tzouhalem	Provincial Ecological Reserve
Mount Wells	Regional Park
Observatory Hill	Federal Land
Port Alberni	Private
Stewart Mountain	Regional Park
Trial Island	Provincial Ecological Reserve and Federal Land
Uplands Park	Municipal Park
Woodley Range	Provincial Ecological Reserve

## BIOLOGY

Available information on *Sericocarpus rigidus* relates mostly to reproductive biology and propagation. Much of this research has been done in Washington State (referenced below). Research in British Columbia has focused on reproduction, demography, and herbivory.

## Life cycle and reproduction

*Sericocarpus rigidus* is a stress-tolerant, slow-growing, long-lived species that reproduces primarily through spreading rhizomes that produce clonal shoots (Clampitt 1987). This vegetative reproduction allows a patch of shoots to expand over a larger area. The annual cycle of this species is described in Fairbarns (2005a). Shoot buds on the rhizomes break dormancy between November and February, with foliage fully developed by March or April. Foliage begins to senesce between May and September and flowers are present between July and September. The shoots die back to the rhizomes between September and November.

*Sericocarpus rigidus* is self-fertile, but produces more seed with cross-fertilization (Giblin and Hamilton 1999). Seed production is significantly reduced by excluding insect pollinators (Clampitt 1987). The rate of successful pollination by insects in Washington State varies greatly between sites (Bigger 1999). In one study, 25-30 viable seeds were produced per reproductive stem, but this number is expected to be highly variable (Bigger 1999). A study on BC plants concluded that most plants do not produce viable seed (Fairbarns 2005a), while Clampitt (1987) found that seed production in Washington State plants is not unusually low and does not appear to be a limiting factor. Seed viability estimates range from 13% to 39% in Washington State (Bigger 1999), but have been estimated as high as 60% to 80% at the Cowichan Garry Oak Preserve (Banman pers. comm. 2008). These differences suggest that seed production and viability may vary according to site.

In Washington State, 5-30% of stems within a patch produce flowers (Gamon and Salstrom 1992). In British Columbia, the number of stems bearing flowers within a patch in 2007 (see Table 2) ranged from 0% to 62%, with an average of 9%. Previous studies at Observatory Hill and Trial Island have found an average of only 2% of stems producing flowers, but that very few flowering stems produce seeds (Fairbarns 2005b). Seeds are produced readily if *Sericocarpus rigidus* is grown in a garden setting with supplemental watering during seed development (Fairbarns 2005b).



**Table 2. Size of known populations of *Sericocarpus rigidus* in Canada.**

Location and first report	Area occupied (m <sup>2</sup> )	Number of stems	Most recent observation*
Bear Hill (1996)	40	830-980	Miskelly 2007/ Douglas 1999*
Boulderwood Park (1984) (= "Cordova Bay" site)	8	500	Miskelly 2007
Camas Hill (1985)	12	230	Miskelly 2007
Christmas Hill (2007)	20	300	Miskelly 2007
Cowichan Preserve (1997)	71	2855	Douglas 2000
Downes Point (1986)	590	2500-4000	Fairbarns 2007
Francis-King Park (1968)	57	1450	Miskelly 2007/ Douglas 1999*
Gore Park (2006)	13	730	Miskelly 2007
Harmac (1998)	31	850	Miskelly 2007
Maple Mountain (1976)	3	20	Douglas 2004
Mill Hill (1993)	650	5000-6000	Roemer 2007
Miniskirt Mountain (2003)	135	60	Ceska 2003
Mount Finlayson (1993)	44	280	Miskelly 2007
Mount Tolmie (2003)	3	1280	Miskelly 2007
Mount Tzouhalem (1985)	121	1550	Miskelly 2007
Mount Wells (2006)	8	490	Miskelly 2007
Observatory Hill (1977)	1600	12500-46000	Fairbarns 2003
Port Alberni (1983)	4	300-1000	Ceska 2003
Stewart Mountain (2006)	110	1395	Miskelly 2007
Trial Island (1964)	3000	3000-8000	Fairbarns 2005
Uplands Park (1953)	35	350	Miskelly 2007
Woodley Range (1992)	945	9630	Miskelly 2007/ Backland 2002*

\*If patches of plants known to be extant could not be located in 2007, supplemental data have been added from the BC Conservation Data Centre. Observations other than Miskelly 2007 have been supplied by the BC Conservation Data Centre 2007, M. Fairbarns pers. comm. 2007, and A. Ceska, pers. comm. 2007.

The seed of *Sericocarpus rigidus* germinates over a range of temperatures when exposed to light, but germinates little in the dark (Clampitt 1987). Germination rates are increased by scarification and by cold stratification (Kaye and Kuykendall 2001). Germination and seedling establishment in the wild in British Columbia is thought to be a rare event (Fairbarns 2005a). Seeds collected from two populations in Victoria and planted in a garden setting did not germinate (Fairbarns 2005b). Seedling establishment has been thought to be limited by competition with other plants (Clampitt 1987), but remains low when competitors are removed (Kaye *et al.* 2003). Seedlings planted as small plugs at the Cowichan Garry Oak Preserve do not survive because of competition with grasses, while larger individuals outplanted at two years of age do survive (Banman pers. comm. 2008). Some studies have found that *Sericocarpus rigidus* grows slowly under all conditions (Clampitt 1987), but in British Columbia, plants grown from seed have produced flowers in their first year under garden conditions (Banman pers. comm. 2008). Generation time in the wild is unknown.

## Herbivory

*Sericocarpus rigidus* is grazed by native Black-tailed Deer (*Odocoileus hemionus*) and introduced Eastern Cottontail Rabbits (*Sylvilagus floridanus*) in the Victoria area (Engelstoft 2006). In one study of a large *Sericocarpus rigidus* population in Mill Hill Regional Park, 76% of shoots were grazed, some up to three times in one season (Engelstoft 2005). Densities of deer in Victoria's urban parks are extremely high, but rabbits appear to be the primary grazer of *Sericocarpus rigidus* (Engelstoft 2005). One study found no significant difference in the levels of grazing when both grazers were excluded compared to when only deer had access (Byrne 2005). Where both deer and rabbits have access, populations of *Sericocarpus rigidus* are declining (Engelstoft 2006). Inside grazing exclosures, shoots are larger and more numerous (Byrne 2005). Biomass of *Sericocarpus rigidus* inside grazing exclosures doubled in three years in one study (Engelstoft 2006). Herbivory increases with increasing shrub cover. Grazing damage is reduced following removal of non-native shrubs (Engelstoft 2005, 2006). Taken together, these studies show that grazing by both introduced rabbits and native deer contributes to declines of *Sericocarpus rigidus*, but that rabbits contribute to a greater degree.

In Washington State, larvae of both an unidentified beetle and a tephritid fly (*Urophora* sp.) feed on the seeds of *Sericocarpus rigidus*. Each larva of one of these insects typically destroys all seeds within a single seed head (Bigger 1999). In the prairies of the south Puget Sound, an average of 12% of seeds are damaged by insects, although damage in large patches of *Sericocarpus rigidus* is double that in small, isolated patches (Bigger 1999). In British Columbia, unidentified insects sometimes cause significant damage to the foliage (Miskelly 2007 pers. obs.).

## Physiology

No specific information is available.

## Dispersal

The seeds of *Sericocarpus rigidus* are very small and bear a fluffy pappus. They could potentially travel some distance on the wind. However, this species grows slowly and rarely reproduces sexually.

Vegetative reproduction through the spreading rhizomes may result in an individual patch spreading over a larger area (Clampitt 1987), but does not constitute dispersal. There is no known natural mechanism whereby a rhizome fragment could break off and establish a new patch of shoots at another location.

## Interspecific interactions

Important interspecific interactions relate to pollination, herbivory, and competition. These interactions are discussed above and under limiting factors and threats.

## **Adaptability**

New plants establish easily when grown from rhizome cuttings or seeds and planted out (Ennis pers. comm. 2007, Fairbarns 2005b, Kaye *et al.* 2003).

This species is probably not very adaptable to changes in biotic or abiotic conditions because of its habitat specificity and low rates of dispersal and reproduction.

## **POPULATION SIZES AND TRENDS**

### **Search effort**

Because of the number of rare species found on southern Vancouver Island, and the number of botanists living nearby, potential habitat for *Sericocarpus rigidus* is frequently the subject of botanical surveys. Between 1997 and 2007, probably more than 500 person days have been spent on botanical surveys within the geographic range of this species and during a time that it would be recognizable (based on seven person days per week for two months each year).

Surveys conducted by J. Miskelly in 2007 (Table 2) found several new patches of *Sericocarpus rigidus* in known locations, but only one new location (at Christmas Hill in Victoria). Repeated surveys at Mill Hill Regional Park find new patches of *Sericocarpus rigidus* almost every year (Roemer 2004, 2005, 2006, 2007). It is probable that in the future other new patches will be found at known locations, but that few other new locations will be found for this conspicuous species.

### **Abundance**

*Sericocarpus rigidus* is known from 22 extant populations in Canada (Table 2). Of these, 14 were previously unreported in the status report by Douglas and Illingworth (1996). Due to the clonal rhizomatous nature of this species, it is impossible to visually determine how many genetically distinct individuals (*i.e.*, genets) are present. It is likely that a patch of stems usually represents a single genet. The number of patches at most locations is between one and five, but ranges to as high as 43 at Mill Hill (Roemer 2007). At some sites, stems are spread over a large enough area that is not possible even to determine the number of patches (*e.g.*, Trial Island). In the case of very old plants, it is possible that multiple patches could represent a single genet that has become fragmented through soil disturbance or competitive interactions.

When determining the number of mature individuals in a clonal species, all stems are counted, as they are all capable of vegetative reproduction. The approximate number of stems is known for all Canadian populations. The number of stems per population ranges from only 20 to as high as 46,000 (Table 2). The total number of stems for all Canadian populations is estimated between 46,100 and 87,950. During 2007 fieldwork, some patches of *Sericocarpus rigidus* that are known to be extant could not be located, due to inaccurate location data. In these few cases, the estimate of the total number of stems for the site includes field data from 2007 and supplemental data from the BC Conservation Data Centre from previous surveys (Table 2).

Although all stems are counted as mature individuals, most populations have few flowering stems. In 28 patches of *Sericocarpus rigidus* that were surveyed in 2007, an average of 9.35% of stems reached maturity/flowering (95% confidence interval = 3.65% to 15.06%; Table 2). If this is extrapolated to the entire Canadian population, there were between 4,290 and 8,270 flowering stems in 2007 (95% confidence interval for lower estimate = 1675 to 6910 flowering stems. A 95% confidence interval for the upper estimate = 3,230 to 13,320 mature stems). The average percentage of flowering stems observed in 2007 is significantly higher than the values reported in previous studies in Canada (Fairbarns 2005b), but is based on a larger sample size and covers a larger geographic area. However, note that of the 28 patches that the present average of flowering stems is based on, only seven are above average, and many are well below (Table 3). The total number of flowering stems in Canada may, therefore, be overestimated.

**Table 3. Percentage of stems flowering in 28 patches of *Sericocarpus rigidus* in 2007\*.**

Patch	Flowering stems	Total stems	Percent stems flowering (%)
Bear Hill 1	17	400	4.25
Bear Hill 2	6	280	2.14
Boulderwood Park	147	500	29.40
Camas Hill	1	230	0.43
Christmas Hill	47	300	15.67
Francis-King Park 1	6	530	1.13
Francis-King Park 2	0	110	0
Francis-King Park 3	11	350	3.14
Gore Park 1	4	450	0.89
Gore Park 2	1	280	0.36
Harmac 1	145	800	18.13
Harmac 2	0	50	0
Mount Finlayson	0	280	0
Mount Tolmie 1	125	400	31.25
Mount Tolmie 2	12	30	37.50
Mount Tolmie 3	75	850	8.82
Mount Tzouhalem 1	13	180	7.22
Mount Tzouhalem 2	1	5	20.00
Mount Tzouhalem 3	11	180	6.11
Mount Tzouhalem 4	4	100	4.00
Mount Tzouhalem 5	14	1085	1.29
Mount Wells 1	0	130	0
Mount Wells 2	10	360	2.79
Stewart Mountain 1	11	195	5.70
Stewart Mountain 2	0	1200	0
Uplands Park	216	350	61.71
Woodley Range 1	0	163	0
Woodley Range 2	0	470	0

\* These data are based solely on 2007 fieldwork by J. Miskelly.

### Fluctuations and trends

*Sericocarpus rigidus* is believed to be extirpated from up to nine locations in Canada where it was previously recorded, mainly prior to 1982 (Table 4). Most of these extirpations occurred relatively early in the agricultural and residential development of southern Vancouver Island. One event was relatively recent; the population at Knockan Hill, last observed in 1968, was destroyed by residential development in 1996 (BC Conservation Data Centre 2007). This is 2 years after the submission of the status report on this species in 1994 by Douglas and Illingworth, a report not assessed by COSEWIC until 1996. There is no obvious explanation for the loss of the White Rapids Road population. Potential habitat at the site is relatively intact, with some off-road vehicle damage. However, the historic population could not be located by Ceska in 1995 (BC Conservation Data Centre 2007) or by Miskelly in 2007. It is possible that this population is extant and has simply not been relocated. However, the total area of available habitat is small enough that it has been thoroughly searched.

**Table 4. Populations of *Sericocarpus rigidus* believed extirpated in Canada.**

<b>Location</b>	<b>Last Observation*</b>
Between Blenkinsop Lake and Rithet's Bog	Hardy 1956
Blenkinsop Lake	Hardy 1945
Cedar Hill	Anderson 1897
Foul Bay	Macoun 1914
Gonzales	Hardy 1924
Knockan Hill	Roemer 1968
Nanaimo	Macoun 1897
Wellington	Carter 1916
White Rapids Road (Wellington)	Ceska 1982

\*Records from Douglas and Illingworth 1996, Hardy 1956, and the BC Conservation Data Centre.

In addition to the known extirpations, *Sericocarpus rigidus* numbers have been significantly reduced at several other sites. Patches of plants growing just outside of protected areas have been destroyed by residential development adjacent to Mill Hill Park between 2003 and 2005 (Roemer 2003, 2004, 2005) and near Boulderwood Park in 1999 (BC Conservation Data Centre 2007). At the Harmac site, an industrial site (pulp mill), a patch of plants that was estimated at 14,000 stems in 1998 was counted at 850 stems in 2007, representing a 94% loss in this population. The meadow where this patch occurs is on private land and has been partially excavated and an access road has been routed through the patch. This loss likely represents a decline of under 20% of the total Canadian population of the species.

In protected areas, most populations of *Sericocarpus rigidus* are probably declining due to a combination of threats (discussed under **Limiting factors and threats**). At eight locations visited in 2007, the condition during the previous most recent survey could be determined from BC Conservation Data Centre records. At two of these, the condition was unchanged, while at six the number of stems, number of flowering stems, and/ or vigour of stems had decreased and the degree of damage from trampling and/or erosion had increased.

In contrast, a comparison of population data between the eight populations reported by Douglas and Illingworth (1999), based on their 1996 COSEWIC report, and the same sites in 2007, shows that four sites have increased in number of stems, three have remained roughly stable and one has declined.

In a few areas, invasive species are controlled and trampling is not a significant problem, such as at Trial Island, the Cowichan Garry Oak Preserve, and at Mill Hill. At Trial Island, the number of stems of *Sericocarpus rigidus* fluctuates from year to year without a significant trend towards increase or decrease (Fairbarns pers. comm. 2008). At the Cowichan Garry Oak Preserve, stem numbers are stable or increasing (Banman, pers. comm. 2008). At Mill Hill, all patches of *Sericocarpus rigidus* that are not protected from grazing are believed to be decreasing (Engelstoff 2006).

The data available do not allow for an accurate determination of percent decline in the last or next ten years. This is partly because 14 new occurrences have been documented since the status report by Douglas and Illingworth (1996), including newly reported patches within populations as well as previously unreported populations, such as the largest population on Observatory Hill, that have always been present. Some populations have declined in numbers of stems, others have increased and some remained more or less stable. Because most populations are located in protected areas, few are threatened with outright habitat destruction. However, many populations within protected areas should be expected to decline as a result of increasing recreational use in parks. The few populations that are located on private lands will likely become extirpated in the future, possibly within the next ten years. For example, in 2007, the habitat of the Harmac population was being prepared for conversion to residential and commercial purposes. Overall, a population decline may have occurred over the last 10 years of <20% taking into account that all 22 populations currently known have always been present, but some unreported, and a sizable loss has occurred at the Harmac site.

### **Rescue effect**

The nearest United States population is located at Iceberg Point, Lopez Island (Miskelly and Fleckenstein 2006). This population is more than 30 km from the nearest Canadian population. Given the reproductive potential of this species, there is very little chance of seed from Lopez Island reaching suitable habitat in Canada and successfully establishing. The majority of American populations are found far from the international border.

## **LIMITING FACTORS AND THREATS**

Competition, especially from woody plants, is a major threat to *Sericocarpus rigidus*. Invasion of open habitats by non-native shrubs such as Scotch Broom and Gorse (*Ulex europaeus*) have been repeatedly identified as a threat (Washington Department of Natural Resources 2007; Roemer 2006; Fairbarns 2005a). Scotch Broom is present at all *Sericocarpus rigidus* populations in Canada (Miskelly 2007 pers. obs.). Where these woody shrubs are removed, *Sericocarpus rigidus* responds with an increase in the total number of shoots (Roemer 2006) and an increase in flowering (Byrne 2005). The duration of this increase is unknown, but could potentially last until shading once again begins to decrease the vigour of a given patch. Competition from native trees as a result of forest encroachment may also pose a threat, as it does in Washington State (Washington Department of Natural Resources 2007). In one study of 33 *Sericocarpus rigidus* patches, all were at least partially under a tree canopy, and some were declining in vigour as a result of shading (Roemer 2003). In the past, frequent fire would have controlled forest encroachment into meadows, maintaining habitat for meadow-associated species (Fuchs 2001).

Trampling may pose a threat to *Sericocarpus rigidus* in Canada. Many populations are located in parks that receive numerous visitors. Many of these populations are located adjacent to trails, where erosion and trampling threaten the long-term persistence of the population. In some instances (for example, Mount Wells Regional Park), the severity of the problem threatens the short-term persistence of the population (Miskelly 2007 pers. obs.). In addition to the immediate damage from trampling, soil disturbance has been found to result in the replacement of *Sericocarpus rigidus* by non-native species (Clampitt 1993).

The very low rates of seed production and seedling establishment described above may pose a long-term threat to *Sericocarpus rigidus* in Canada. Bigger (1999) found that a lack of cross-pollination in very isolated patches could be a limiting factor. Many Canadian populations are small and very isolated.

All populations found on private land should be considered to be at considerable risk of destruction from urbanization. Population growth on southern Vancouver Island creates enormous pressure to convert unprotected land into residential and commercial areas. This has resulted in the loss of several occurrences of *Sericocarpus rigidus* in the Victoria area and severe declines in Harmac (described under **Fluctations and trends**).

As discussed under **Herbivory**, grazing by mammals may represent a long-term threat to this species.

There is no information available on the potential effects of climate change on *Sericocarpus rigidus*.

## **SPECIAL SIGNIFICANCE OF THE SPECIES**

*Sericocarpus rigidus* is found in a very restricted area of Canada, and within restricted habitats within that geographic area. The dry meadows and woodlands where it occurs have been severely reduced in extent (through habitat loss, destruction, and fragmentation) and impacted by non-native species. These unique habitats support a high number of other species at risk in addition to *Sericocarpus rigidus*.

*Sericocarpus rigidus* is listed as a threatened species in Oregon and a sensitive species in Washington (USDA 2007). As the species is vulnerable throughout its range, the Canadian populations have a vital role to play in the global conservation of this species. The Canadian populations are at the northern limit of the species' range. Peripheral populations like these may harbour genetic distinctiveness and their persistence may be important to the protection of genetic diversity and the conservation of the species as a whole (Lesica and Allendorf 1995).

There is no information available on Aboriginal Traditional Knowledge for this species.



## EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

*Sericocarpus rigidus* is not covered under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the United States *Endangered Species Act*, or the IUCN Red List of Threatened Species. Globally, the species is ranked as vulnerable (G3) by NatureServe (2009). It is listed as a species of concern in the United States, a sensitive species in the state of Washington, and a threatened species in the state of Oregon, but none of these designations confers legal protection.

*Sericocarpus rigidus* is listed as Threatened (2000) on Schedule 1 of the *Species at Risk Act* (SARA), providing legal protection to the species on federal lands in Canada. Although British Columbia currently has no legislation to protect rare plants, the majority of *Sericocarpus rigidus* populations are found within parks and protected areas, where either provincial laws or regional bylaws make their deliberate destruction unlawful.

## TECHNICAL SUMMARY

### ***Seriocarpus rigidus***

White-top Aster

Aster rigide

Range of Occurrence in Canada : SW British Columbia

### **Demographic Information**

Generation time (average age of parents in the population)	Unknown, likely several yrs
Observed percent reduction in total number of mature individuals over the last 10 years.	Likely <20%
Projected percent reduction in total number of mature individuals over the next 10 years.	Unknown
Observed percent reduction in total number of mature individuals over any 10 year period, over a time period including both the past and the future.	Unknown
Are the causes of the decline clearly reversible?	Unknown
Are the causes of the decline understood?	In part
Have the causes of the decline ceased?	No
Observed trend in number of populations	Mainly historic losses and discovery of many previously unreported populations.
Are there extreme fluctuations in number of mature individuals?	No
Are there extreme fluctuations in number of populations?	No
Is the total population severely fragmented?	No

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

<b>Population</b>	<b>N Mature Individuals</b>
See Table 2	
Total	46,100-87,950
Number of populations (locations)	22

### **Extent and Area Information**

Estimated extent of occurrence (km <sup>2</sup> )	4750 km <sup>2</sup>
Observed trend in extent of occurrence	Stable
Are there extreme fluctuations in extent of occurrence?	No
Estimated area of occupancy (km <sup>2</sup> ) Actual area occupied is 0.0075 km <sup>2</sup>	24 based on a 1x1 km <sup>2</sup> grid, 72 based on a 2x2 km <sup>2</sup> grid
Observed trend in area of occupancy	Stable
Are there extreme fluctuations in area of occupancy?	No
Is the extent of occurrence or area of occupancy severely fragmented?	No
Number of current locations	22
Trend in number of locations Stable since all of the 14 populations reported since 1996 have always been present but unreported.	Stable
Are there extreme fluctuations in number of locations?	No
Trend in area or quality of habitat decline in the quality	Decline

### **Quantitative Analysis**

	None available
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### **Threats (actual or imminent, to populations or habitats)**

Habitat destruction, trampling, invasive species, erosion, forest encroachment, grazing
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**Rescue Effect (immigration from an outside source)**

Status of outside population(s) USA: WA: sensitive species; Oregon: threatened	
Is immigration known or possible?	No
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	No
Is rescue from outside populations likely?	No

**Current Status**

COSEWIC: Special Concern (April 2009)
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Additional Sources of Information: none

**Status and Reasons for Designation**

<b>Status:</b> Special Concern	<b>Alpha-numeric code:</b> n/a
<b>Reasons for designation:</b> This perennial species reproduces primarily asexually and is present at 22 discrete sites that include 14 recently discovered populations. The latter were previously unrecorded, but likely always present, and include the largest populations. The total population comprises many thousands of stems with most of the plants found in parks and on federal lands. In spite of the species' occurrence mainly in protected areas, it is at risk from increasing recreational activities and the spread of invasive exotic plants.	

**Applicability of Criteria**

<b>Criterion A</b> (Decline in Total Number of Mature Individuals): Not applicable. A sufficiently high decline has not been demonstrated. The loss of 13,150 stems at the Harmac site results in >20% loss at the low end of the population estimate but only about 13% at the high end. Additional losses at some other sites have not been quantified.
<b>Criterion B</b> (Small Distribution Range and Decline or Fluctuation): Not applicable. EO and IAO are within limits for endangered or threatened but there are 22 locations that are not severely fragmented and do not undergo extreme fluctuations.
<b>Criterion C</b> (Small and Declining Number of Mature Individuals): Not applicable. Total number of mature individuals based on individual stem counts for this clonal species exceeds criterion maximum value.
<b>Criterion D</b> (Very Small Population or Restricted Distribution): Not applicable. Total number of stems exceeds criterion values; most populations are in protected areas where development is likely minimal although, in the long term, the species are still at risk from competition with invasive plants and recreational activities resulting in trampling, etc.
<b>Criterion E</b> (Quantitative Analysis): Not available.

## ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED

Clare Aries prepared the line drawing of *Sericocarpus rigidus* for Figure 1. James Miskelly is grateful to Adolf Ceska for providing information on the locations and past conditions of White-top Aster populations and to Matt Fairbarns for his encouragement.

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## **BIOGRAPHICAL SUMMARY OF REPORT WRITER**

James Miskelly has worked on a variety of projects related to the ecology of Garry Oak ecosystems since 2000. He serves on several subcommittees of the Garry Oak Ecosystems Recovery Team. James obtained his Master of Science in biology from the University of Victoria in 2005. Much of his previous work has focused on the conservation and management of plant communities that support rare invertebrates. This is his first COSEWIC status report.

## **COLLECTIONS EXAMINED**

None.