

## **Status of White-top Aster in British Columbia**

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by  
George W. Douglas  
and  
Jeanne M. Illingworth

Wildlife Bulletin No. B-96

**March 1999**

*British Columbia, Canada's most westerly province, has a bounty of biological diversity. British Columbia's snowclad peaks, rain-drenched forests, arid grasslands, all sizes of rivers, lakes, and wetlands, and a long and rugged coast provide habitats for more species of living organisms than are found anywhere else in Canada. However, this very diversity means that there is much to be discovered about these organisms — their distribution, abundance, habitat requirements, and interrelationships with their environment. Increasing our knowledge of this biodiversity will help us with the complex task of sustainably managing our land and waters.*

*In 1992, the Provincial Government initiated a co-operative biodiversity research program with funding from the Corporate Resource Inventory Initiative, the British Columbia Ministries of Forests (Research Branch), Environment, Lands, and Parks (Wildlife and Habitat Protection Branches), and Tourism and Culture (Royal B.C. Museum); and the Forest Resource Development Agreement (FRDA II). In 1996, funding from Forest Renewal BC (FRBC) was received for a biodiversity research extension proposal. One goal of the original research program, and more recently the FRBC extension project, is to extend information to scientists, resource managers, and the public through biodiversity publications. These publications are intended to increase awareness and understanding of biodiversity, promote the concepts and importance of conserving biodiversity, and communicate provincial government initiatives related to biodiversity. We hope that they will be used as tools for the conservation of British Columbia's rich, living legacy.*

*For more information contact:*

B.C. Ministry of Environment, Lands and Parks, Wildlife Branch, 780 Blanshard St.,  
Victoria, BC V8V 1X4

*or*

B.C. Ministry of Forests, Research Branch, 31 Bastion Square, Victoria, BC V8W 3E7

*or*

Royal B.C. Museum, P.O. Box 9815, Stn Prov Govt, Victoria, B.C. V8W 9W2

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by  
George W. Douglas  
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Jeanne M. Illingworth



Ministry of Environment, Lands and Parks  
Wildlife Branch  
and  
Resources Inventory Branch  
Victoria, B.C.

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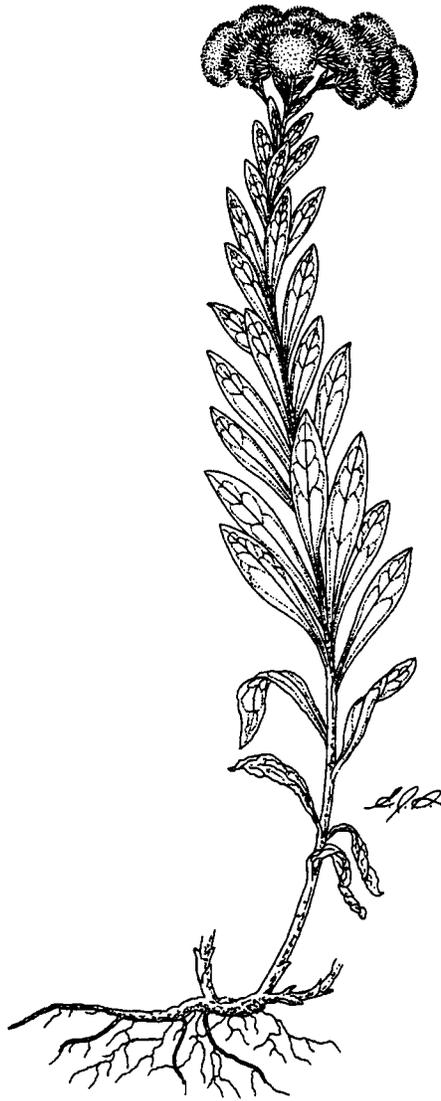
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FRONTISPIECE

*Aster curtus*



by Elizabeth Stevens



## **FOREWORD**

In cases where a Wildlife Bulletin is also a species' status report, it may contain a recommended status for the species by the author. This recommendation is the opinion of the author and may not necessarily reflect that of the Wildlife Branch.

Official designation will be made by the Wildlife Branch in consultation with experts, and the data contained in the status report will be considered during the evaluation process.

## ABSTRACT

In British Columbia, White-top aster (*Aster curtus*) is restricted to south eastern Vancouver Island and adjacent small islands around Victoria. These populations represent the northern range limit of the species. There are 16 extant sites, and half of them are located in the Greater Victoria area. Colonies at 12 sites have been confirmed in recent years, but the status of the four other sites remains unknown. An additional six sites are likely extirpated. Although some colonies are partially protected from direct habitat destruction, introduced species pose a serious threat to the persistence of most colonies, particularly those that have small numbers of plants. Management of this species is difficult given the lack of information regarding the biology and ecology of this plant, its competitive interactions with other species, and factors controlling the establishment, growth and maintenance of colonies. Therefore, it is recommended that *A. curtus* be considered Threatened in British Columbia.

## **ACKNOWLEDGEMENTS**

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## INTRODUCTION

The status report on the white-top aster (*Aster curtus*<sup>1</sup>) is part of an ongoing program of the British Columbia Ministry of Environment, Lands, and Parks, Wildlife Branch, designed to manage species at risk more effectively for long-term viability.

*Aster* belongs to the tribe Astereae, has nine subgenera and 250 species, most of which occur in North America (Cronquist 1955). *Aster curtus* Cronq. (white-top aster) is a member of a the subgenera, *Seriocarpus*, and is one of approximately 23 species occurring in British Columbia (Douglas 1989; Douglas et al. 1998).

*Aster curtus* is a leafy, erect perennial, ranging from 10 to 30 cm tall, with broadly lanceolate, alternate leaves, 2.5 to 3.5 cm long (Figure 1). Both the lower and upper leaves are reduced. The 5 to 20 flower heads are borne on short stalks in a terminal inflorescence. The involucre bracts are narrow and the ray flowers are white, few and inconspicuous. The disk flowers are pale yellow with purple anthers.

The coastal prairie meadow habitat in which *A. curtus* occurs has been deeply disturbed by agricultural and urban development since European settlement. Occurrences outside parks and ecological reserves face serious threats. Concern for this species resulted in the basis for this report, which was provided by a national status report submitted in 1996 to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

## GENERAL BIOLOGY

*Aster curtus* shoots emerge in April from rhizomes. In Washington, Gamon and Salstrom (1992) found that a typical colony covered 1-2 m<sup>2</sup> area with 5-30% of the stems bearing flowers. Populations surveyed in British Columbia in July and August had slightly higher counts of 30-50%. Seedlings were not observed in the field. This species likely reproduces primarily by vegetative means. Since seed viability is very low, growth of seedlings is extremely slow and the seedlings are poor competitors (Clampitt 1987). The successful establishment of seedlings is infrequent.

## HABITAT

### Description

*Aster curtus* most often occurs in very dry microsites where soils are shallow and sites are exposed or partially shaded by individual trees. *Quercus garryana* and *Arbutus menziesii*, are often present, but do not form a closed overstorey. Sites are usually characterized by an open understorey of shrubs (e.g., *Cytisus scoparius*, *Holodiscus discolor* and *Symphoricarpos albus*). These shrubs do not form dense thickets, as they do in other areas, possibly because soils are too shallow. The ground tends to be dominated by a mixture of introduced grasses including *Aira praecox*, *Dactylis glomerata*, *Poa* sp., *Cynosurus echinatus* and *Anthoxanthum odoratum*. The latter species are usually frequent in the meadows in which *Aster curtus* also occurs. Soils vary from shallow, dark-brown brunisols to brownish-red brunisols.

### Ecoprovince and Biogeoclimatic Zone

*Ecoprovinces* – *Aster curtus* occurs in one ecoprovince in British Columbia, the Georgia Depression (GED), and in the following ecoregions: Juan de Fuca Strait (JDF), Leeward Island Mountains (LIM), Nanaimo Lowlands (NAL), Southern Gulf Islands (SGI), and Strait of Georgia (SOG). The ecoregions of British Columbia have been delineated by Demarchi (1995).

*Biogeoclimatic zones* – All occurrences of *A. curtus* in the province fall in the Coastal Douglas-fir (CDF) and the Cedar-Western hemlock (CWH) zones of southeastern Vancouver Island. Biogeoclimatic zones were delineated by the B.C. Ministry of Forests Research Branch (1992).

## DISTRIBUTION

*Aster curtus* occurs on the west coast of North America from southwestern British Columbia along the western slopes of the Cascade Mountains from

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<sup>1</sup> Nomenclature follows Douglas et al., (1989-1994).

Washington to southern Oregon. In British Columbia, it is restricted to southern Vancouver Island (Figure 1).

## POPULATION SIZE AND TRENDS

*Aster curtus* has been collected at 18 sites in British Columbia, all of which are located on southern Vancouver Island (Table 1). During this study, nine of the sites were re-surveyed. Of the remaining nine sites, six are likely extirpated.

## Trends in Recently Verified Populations

*Uplands Park (Victoria)* – A single population of *A. curtus* was located within a large meadow in the west-central portion of this municipal park. This group covered an area of 42 m<sup>2</sup> and totalled 600 plants in 1994 (Table 1). Although *A. curtus* was observed at this site in 1972, no demographic information was recorded until a later visit in 1993 when 300 plants were counted.

*Mill Hill (Victoria)* – Four groups of *A. curtus* were observed on Mill Hill. A visit in 1993 located three of the four sites of *A. curtus*, with approximately 850 stems over 200 m<sup>2</sup> recorded. A later visit in 1994 indicated an overall increase to approximately 1200 plants over 250 m<sup>2</sup>, including a new site for this species. One of these sites visited in 1993, indicated 700 stems scattered into several groups over 60 m<sup>2</sup>. In 1994, these groups had combined, and increased in size to more than 1000 stems over 90 m<sup>2</sup>.

## Sites with Status Unknown

*Wellington* – This site is located south of Nanaimo. Although the collection was made in 1916, it is still possible that *A. curtus* may be found in some of the openings on the hills of the area.

*Port Alberni* – *Aster curtus* was collected in pockets of a rock bluff in Port Alberni in 1983.

*Downes Point (Hornby Island)* – This island is located in the Gulf Islands, southeast of Comox. The population was located in 1986.

## Extirpated Populations

Records of *A. curtus* from Nanaimo (1887), Cedar Hill, Victoria (1897), Foul Bay, Victoria (1914), Gonzales, Victoria (1924), Lost Lake, north of Victoria (1945), and Knockan Hill, west of Victoria (1968) are likely extirpated. There have been no reports of *A. curtus* from these sites for many years, and it is very unlikely that this species has survived through the extensive residential development that has occurred in these areas. The vegetation in these areas has been completely altered. The Knockan Hill site was recently destroyed by a subdivision next to the park (H. Roemer, pers. comm.).

## Changes in Populations

In British Columbia, *A. curtus* populations have not been monitored over time thus it is not possible to identify their decline or increase. It is possible that existing populations of *A. curtus* are remnants of a more contiguous distribution along the southeastern portion of Vancouver Island.

Given the extent to which *Quercus garryana* stands have been altered or destroyed in British Columbia, it is almost certain that the size and number of *A. curtus* populations have declined over time, particularly in the last 100 years with the rapid expansion of European settlements and the introduction of resilient competitive species.

## PROTECTION

Currently there is no specific legislation for the protection of rare and endangered vascular plants in British Columbia. Pending federal, endangered species legislation may eventually protect a few special cases. However, most of rare vascular plants would not be conserved under this legislation, whereas pending under the *Forest Practices Code Act of British Columbia*, more species could be protected; some red-listed vascular plants may be protected as *Identified Wildlife*.

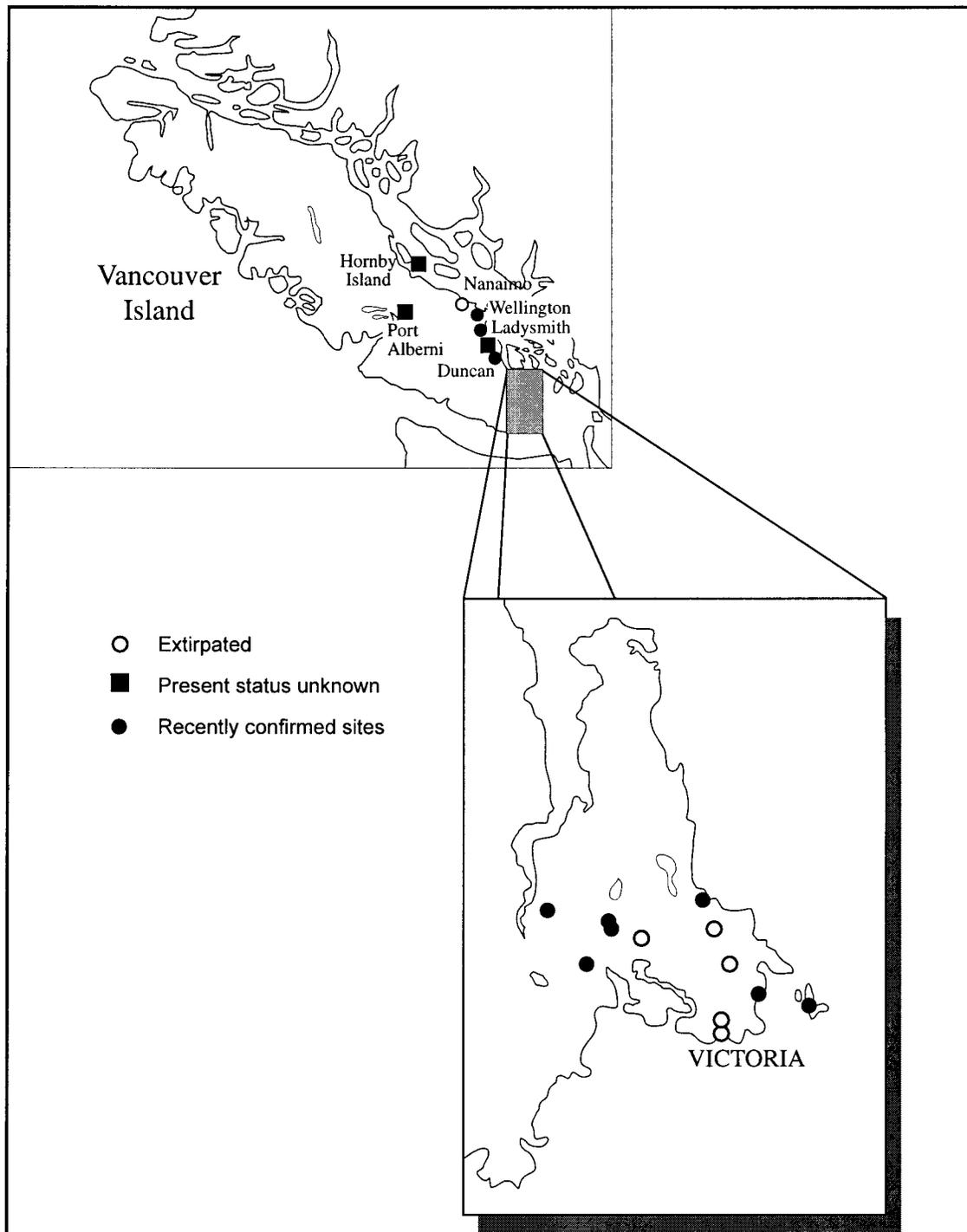


Figure 1. Distribution of the White-top Aster (*Aster curtus*) in British Columbia.

**Table 1. Locations of *Aster curtus* sites in Canada.**

Collection Site	Last Observation	Collector	Population (no./area)
Nanaimo	1887	Macoun	
Cedar Hill (Victoria)	1897	Anderson	
Foul Bay (Victoria)	1914	Macoun	
Wellington	1916	Carter	
Gonzales (Victoria)	1924	Hardy	
Lost Lake (Victoria)	1945	Hardy	
Knockan Hill Park, west of (Victoria)	1968	Roemer	
Port Alberni	1983	Van Dieren	
Downes Point (Hornby Island)	1986	Ceska	
Woodley Range (Ladysmith)	1992	Cadrin	500+/300 m <sup>2</sup>
Trial Island	1993	Douglas	200+/30 m <sup>2</sup>
Francis-King Park, south of (Victoria)	1993	Ryan	
Mt. Finlayson (Victoria)	1993	Ryan	200/4 m <sup>2</sup>
Cordova Bay (Victoria)	1993	Ryan	600/36 m <sup>2</sup>
Uplands Park (Victoria)	1994	Douglas	600/42 m <sup>2</sup>
Mt. Tzuhalem E. R. (Duncan)	1994	Douglas	1250/132 m <sup>2</sup>
Mill Hill (Victoria)	1994	Illingworth	1200+/250 m <sup>2</sup>
Francis-King Park (Victoria)	1994	Douglas	450/16 m <sup>2</sup>

Some populations of *A. curtus* are protected to a certain extent by their location on public property.

*Trial Island (Victoria)* — This Ecological Reserve probably provides the greatest degree of protection for any of the *A. curtus* populations. This reserve, despite its nearness to Victoria, has very limited access since it may be reached only by boat and requires a government permit for landing.

*Woodley Range (Ladysmith)* — This site is presently on Crown Land with much of it included within a forest harvest area. The presence of a number of rare plants, including the only recently confirmed site for *Lotus pinnatus* in Canada, has made this area a candidate for Ecological Reserve

status. Until a reserve has been formally established, the continued presence of *A. curtus* at the site will remain in jeopardy.

*Mount Finlayson (Victoria)* — This site, an extremely rich area for rare plants, is located west of Victoria and was designated as a Provincial Park in 1994. When management plans are in place, rare plants will receive a much higher degree of protection than they previously had on private land.

*Francis-King Park (Victoria)* — The *A. curtus* population at this site is located in a small regional park west of Victoria. The population is somewhat threatened since a main trail goes through the middle of the population.

*Mount Tzuhalem (Duncan)* — Of all the *A. curtus* populations known in British Columbia, those located on Mount Tzuhalem and Trial Island receive the greatest degree of protection because of their location within ecological reserves. The Mount Tzuhalem Reserve encompasses 18 ha of *Quercus garryana* woodland, spring-flowering meadows, and rock outcrops which have been preserved to represent an example of *Q. garryana* woodlands and associated spring-flowering herbs. Unfortunately, the reserve is adjacent to a residential area and some human disturbance has occurred within the reserve in the form of trampling caused by hikers and mountain bikes. Furthermore, *Cytisus scoparius* has become a dominant species at this site and threatens many herbaceous species, including *A. curtus*. All of the populations in this reserve are located along trails thus there is some danger from trampling.

*Mill Hill (Victoria)* — *Aster curtus* receives a certain amount of protection at this site since all populations are located in the regional park at Mill Hill. The populations, however, are located along a main trail thus there is a potential threat from trampling.

*Uplands Park (Victoria)* — Uplands Park is a municipal park located along the eastern shoreline of Victoria and is surrounded by residential development. It is a mixture of rock outcrops, *Quercus garryana* stands, and seasonally flooded meadows which support a number of rare species including *Psilocarphus elatior*, *Centaurium muhlenbergii*, *Ranunculus alismaefolius* var. *Alismaefolius* and *Viola praemorsa*. Most of the park receives little active management, hence, the vegetation has not been altered to the same extent as that seen in Beacon Hill Park. The park, however, is heavily utilized by pedestrian traffic and cyclists so that some trampling and disturbance of the vegetation has occurred. Much of the park is also heavily infested with *Cytisus scoparius* and other introduced species, which have eliminated most of the native vegetation.

## LIMITING FACTORS

The most direct and immediate threat to *A. curtus* is habitat destruction. This is of particular concern in the grass-dominated meadows often associated with *Quercus garryana-Bromus* stands that are limited to the southeastern side of Vancouver Island and some of the Gulf Islands. Both types of vegetation are believed to have been much more common before colonization by European settlers. Although few records indicate the extent of these communities prior to, and during, colonization by European settlers, it is likely they once encompassed much of the area now occupied by the city of Victoria (see map pp. 9-10 in McMinn et al. 1976). In fact, Roemer (1972) stated that the attractiveness of *Quercus garryana* vegetation was one of the reasons for the establishment of Fort Victoria. Their destruction has continued to the present resulting in the elimination of almost all sites occurring outside parks or ecological reserves. These sites are the most vulnerable to destruction because of their location on gentle slopes near the most populated and climatically favourable areas on Vancouver Island making them particularly susceptible to agricultural and residential development. The Conservation Data Centre (British Columbia Ministry of Environment, Lands, and Parks) considers *Quercus garryana-Bromus* vegetation to be critically imperiled because of extreme rarity (C. Cadrin, pers. comm.). Although grass-dominated meadows have not been given a ranking, they are probably even more limited in area and are just as much at risk as *Quercus garryana-Bromus* vegetation.

At this time, pressures to develop unprotected grass-dominated meadows and *Quercus garryana* stands for the expansion of the urban infrastructure of Victoria, and other population centres on Vancouver Island, are intense. Currently a number of stands are threatened or are in the process of being destroyed as a result of residential development and the expansion of services associated with it. Loss of these habitats severely limits the availability of sites for the establishment of *A. curtus* and imposes severe limitations on the long-term survival of this species in British Columbia.

Fortunately, the steep rocky xeric sites located to the west and north of Victoria are less at risk. These sites have no agricultural potential and are unsuitable for most forms of development. However, their value for residential development may increase given the rapid expansion of Victoria and many eastern Vancouver Island communities. Despite the steep rocky terrain, these sites may become very valuable real estate because of the broad panoramas they provide of the surrounding landscape.

Historically, *Quercus garryana* communities and grass-dominated meadows have always been heavily influenced by human activity. Aboriginal peoples set fire to these stands to maintain them as an important habitat for wildlife and for harvesting *Camassia*, a member of the Liliaceae whose bulbs were an important source of starch in the diet of aboriginal people (Turner and Bell 1971; Roemer 1972). Roemer (1972) believed that without human interference some of these stands would have eventually been replaced by Douglas-fir forests.

The suppression of fire within the past century may have contributed to the demise of *A. curtus* populations. Most of the sites in which *A. curtus* has been collected were likely maintained in the past as a result of periodic fires. This would have destroyed much of the competing vegetation resulting in newly created habitats where *A. curtus* might become established. However, since that time, these sites have experienced little disturbance, resulting in the invasion and expansion of other species at these sites including the shrubs *Symphoricarpos albus* and *Cytisus scoparius*.

The introduction of European species has resulted in substantial changes not only to the grass-dominated meadows associated with *Quercus garryana* but also the rocky xeric sites north and west of Victoria where *A. curtus* has been collected in the past. One of the most troublesome species is *Cytisus scoparius* which has become a dominant species on xeric, exposed sites throughout much of eastern Vancouver Island and the Gulf Islands.

Similarly, the herbaceous vegetation observed today in grass-dominated meadows and rocky xeric sites is substantially different from that which occurred before Europeans colonized coastal British Columbia. Much of the vegetation is composed of introduced grasses which likely make up greater than 90% of the biomass of the herb layer. These species include *Anthoxanthum odoratum*, *Dactylis glomerata*, *Cynosurus echinatus*,

*Aira praecox*, and several species of *Bromus*. As noted by Roemer (1972) regarding *Quercus garryana* vegetation, it is not possible to know which native species and to what extent they have been displaced because all sites are now composed primarily of introduced species and there are no longer any examples of "pre-European" vegetation. This would also apply to the rocky xeric sites west and north of Victoria where *A. curtus* had been previously collected.

## SPECIAL SIGNIFICANCE OF THE TAXON

*Aster curtus* is a member of a relatively small group of species with a restricted Pacific Coast range that have their northern limits in southern British Columbia. The significance of these peripheral populations, especially with respect to their genetic characteristics, has yet to be studied adequately. This species may prove to be a good subject for genetic research.

## RECOMMENDATIONS AND MANAGEMENT OPTIONS

Volunteers are attempting to control competing species at some *A. curtus* sites. This may not be enough, however, to prevent the decline of these populations since they were few in number and lacked immature plants. Unfortunately, there is no information available on the management of *A. curtus* populations.

Attempts to control or remove *Cytisus scoparius* in *Quercus garryana* stands have been difficult and have so far met with failure. Unfortunately, *Cytisus scoparius* will readily resprout from roots if the aerial portion of the plants are removed. Alternatively, removing whole plants, including the roots, disturbs the soil resulting in the germination of *Cytisus* seeds which quickly become established and eventually dominate the site (W. MacGillivray, pers. comm.). In a recent examination of seed germination of *C. scoparius*, Bossard (1993) reported that both fresh and stored seed were found to be 98% viable. The hard, impervious seed coat limited the germination of > 65% of the seeds for several months or years, hence, a large amount of dormant viable seed would be present in the soil throughout the year.

Some introduced grass species which now dominate the understorey vegetation in many *Quercus garryana* stands, may also pose a threat to *A. curtus* by smothering or shading small immature plants or preventing the germination and establishment of

seedlings. Unfortunately, the control of most species is likely to be difficult, if not impossible, because they can resprout from the dense network of roots located in the soil. Furthermore, many species are likely to reappear after any form of soil disturbance from buried viable seeds.

Fire, as it was historically used by the aboriginal peoples of British Columbia, may have favoured the habitats in which *A. curtus* occurred by eliminating dense thickets of shrubs and maintaining a forb-rich understorey in *Quercus garryana* stands. Unfortunately, today, fire does not appear to be a viable management option for a number of reasons:

1. Most *Quercus garryana* stands are in parks or near residential areas where burning is not likely to be permitted.
2. The impact of burning sites inhabited by *A. curtus* is not known. Since this species is known from so few locations, it would be unwise to attempt such a drastic form of management without a better understanding of its ecology.
3. Most *Quercus garryana* stands have not been burned in many years, which has resulted in a buildup of woody fuels in the understorey. To burn these stands now would likely create fires of such intensity that many species would be killed as a result.
4. Burning is likely to encourage the germination and spread of many species introduced over the past 100 years, particularly species such as *Cytisus scoparius* whose seeds remain viable in the soil for many years.

## EVALUATION

*A. curtus* is ranked as a G3 species by The Nature Conservancy (U.S.). This ranking indicates that, on a global scale, it is considered to be "rare or uncommon (typically 21-100 occurrences); may be susceptible to large-scale disturbances (e.g., may have lost extensive peripheral populations)". It is known from 48 extant sites in Washington and is listed as an S3 species, or considered "rare or uncommon (typically 21-100 occurrences); may be susceptible to large-scale disturbances; e.g. may have lost extensive peripheral populations." In Oregon *Aster curtus* is known from 24 extant sites (Gamon and Salstrom 1992) and is ranked as an S2 species, indicating it is "imperiled

because of rarity (typically 6-20 extant occurrences or few remaining individuals) or because of some factor(s) making it vulnerable to extirpation or extinction."

In British Columbia, *A. curtus* is ranked by the Conservation Data Centre (British Columbia Ministry of Environment, Lands and Parks) as an S2 species. There are 18 extant occurrences in British Columbia.

## Status Recommendations

*Aster curtus* should be ranked as Threatened species for the following reasons:

1. Populations of *A. curtus* in Canada are few in number and, in some instances, cover only small areas.
2. Some populations are directly threatened by introduced species, which now dominate many of the habitats in which *A. curtus* occurs.
3. *Aster curtus* in British Columbia represents the northern limits of this taxon and may represent populations that are genetically distinct to those found elsewhere.

## Prognosis

The prognosis for this species is only fair. Although some recently verified populations are protected on public land, it is possible that some of these populations may disappear without some form of management. Some assurance would be provided if the stands in which *A. curtus* occur could be considered stable natural ecosystems. However, with the introduction and domination of these stands by many non-native species and the suppression of fire, the composition and structure of the vegetation are changing in some stands and it is difficult to predict what impact these changes will have on the success or failure of *A. curtus* populations. There are no existing *Quercus garryana* stands or adjacent meadows in which introduced species are not a significant component of the vegetation thus there is no baseline to compare existing stands with those that were present before Europeans settled on the west coast of British Columbia.

The management of *A. curtus* is hampered because our knowledge of the ecology of the species is limited. In particular, demographic information is lacking and it remains unclear as to which factors influence the establishment, growth and decline of populations.

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- No. B-50 Functional relationships between salal understory and forest overstory. D.J. Vales. October 1986. 122pp. (Also printed as IWIFR-32).
- No. B-51 Vancouver Island Roosevelt elk/intensive forestry interaction - phase I (1981-1986). Job completion Report. K. Brunt, D. Becker and J. Youds. March 1989. 176pp. (Also printed as IWIFR-33).
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