COSEWIC
Assessment and Update Status Report

on the

Macoun's Meadowfoam
Limnanthes macounii

in Canada

THREATENED
2004

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

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COSEWIC
Assessment Summary

Assessment Summary – November 2004

Common name
Macoun's Meadowfoam

Scientific name
Limnanthes macounii

Status
Threatened

Reason for designation
A Canadian endemic highly restricted within a narrow coastal fringe of seasonally wet microhabitats where it is at risk from continued competition with a wide range of exotic plants. Its presence in a highly urbanized area results in habitat disruption and population losses.

Occurrence
British Columbia

Status history
Designated Special Concern in April 1988. Status re-examined and designated Threatened in November 2004. Last assessment based on an update status report.

COSEWIC
Executive Summary

Macoun's Meadowfoam
Limnanthes macounii

Species information

Macoun's meadowfoam (*Limnanthes macounii*) is an annual species whose reclining stems with upturned tips arise from a fibrous root system. Its alternate leaves are pinnately divided. The inconspicuous white flowers have four sepals and petals and eight stamens; the pistil is four-lobed with the style having four stigmas. The fruit consists of up to four nutlets.

The species is endemic to southern Vancouver Island and several adjacent islands. It is the only native species of the genus *Limnanthes* in Canada and, with False Mermaidweed, *Floerkea proserpinacoides*, one of two Canadian representatives of the family Limnanthaceae.

Macoun's Meadowfoam is unique in the family by having floral parts in multiples of four, whereas all other species of meadowfoam (*Limnanthes*) have floral parts in multiples of five.

Distribution

Macoun's meadowfoam is known only from southern Vancouver Island and several other islands close to Vancouver Island. It has not been found on the mainland of British Columbia nor in Washington State.

In 1998, a large population of a plant originally identified as Macoun's meadowfoam was found in California in a cabbage field, but so far it has not been found in natural habitats. Californian plants differ from those in British Columbia in a number of features and likely represent an undescribed species.

Habitat

Plants occur in seasonally wet depressions or along intermittent seeps in low elevations and usually close to the ocean. The majority of the sites are in open areas of Garry oak ecosystems.

Biology

Macoun's meadowfoam is a winter annual. It germinates in the fall after the first heavy rains and grows throughout the winter. It flowers in March and April. The ovary develops into a maximum of four nutlets that are shed by the beginning of June. At that time, the plants wither and die.

Population sizes and trends

Macoun's meadowfoam is now known from 28 extant populations. The original 1988 status report listed 52 "populations" many of which should be treated as mere subpopulations. Applying the present concept of populations, the original 1988 COSEWIC report would have consisted of 24 populations. Four populations known in 1988 have been destroyed and seven previously overlooked populations have been found.

Of the 52 occurrences that were reported in the 1988 COSEWIC report (as "populations"), 29% (15) disappeared, 27% (14) declined, 19% (10) remained about the same and 23% (12) increased.

Limiting factors and threats

Macoun's meadowfoam requires sufficient moisture in winter months and open soil. Threats include human activities and competition from introduced perennial grasses.

Special significance of the species

Macoun's meadowfoam is a species endemic to British Columbia.

Existing protection

In 1988, Macoun's meadowfoam was designated as vulnerable by the Committee on the Status of Endangered Wildlife in Canada (changed to Special Concern in 1999). In British Columbia, the Conservation Data Centre includes this species on its tracking list, as a BLUE-listed species.

Macoun's meadowfoam grows in areas with various legal protections. One site is a part of an ecological reserve (with one subpopulation legally excluded from the reserve, but managed as being a part of it). Two populations (7 sub-populations) are in provincial parks, three are in regional parks and three populations (8 sub-populations) are in municipal parks. Three large populations (27 sub-populations) occur in Department of National Defence (DND) lands, four (17 sub-populations) on Indian Reserves and eight (25 sub-populations) on private lands.

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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Canada

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

Update
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2004

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SPECIES INFORMATION

Name and classification

Scientific name:	*Limnanthes macounii* Trelease - *Memoirs of the Boston Society of Natural History*, 4: 85. 1887.
Type specimen(s):	"In ditches at Victoria," Vancouver Island; May 7, 1875, John Macoun, coll.no. *2877* (CAN, Canadian Museum of Nature).
Pertinent synonyms:	*Floerkea macounii* (Trelease) Trelease in A. Gray - *Synoptical Flora of North America,* 1: 363. 1897.
Common name:	Macoun's meadowfoam
Family name:	Limnanthaceae (Meadowfoam family)
Major plant group:	Dicot flowering plants

A monograph of the genus *Limnanthes* was published by Mason (1952) and was used in documenting some of the early collections of the species in the Victoria area.

Description

Small annual plant, 2-5(-15) cm tall, small plants erect, taller ones with the hairless stems reclining with upturned tips and unbranched or with one or more branches; leaves hairless, both basal and arising from the stems, 1 - 7 cm long, pinnate with 3-13 toothed or lobed segments; flowers single, with parts in 4s (occasionally in 5s), funnelform or rotate, about 7-10 mm in diameter, with anthers maturing before the pistils are receptive; sepals 4, ovate, acute, 3-4 mm long, green; petals 4, obovate, slightly notched at the rounded apex, 4-5 mm long, white, with 2 rows of hairs at the base; stamens 8, 2.5-3 mm long; pistil 1, 4-lobed, with carpels almost separate, but with a common style, and 4 elongated stigmas; fruit of (1-) 3-4 nutlets, 3 mm long, obconical, tuberculate on the tip, yellow-green to brown (Figure 1, 2).

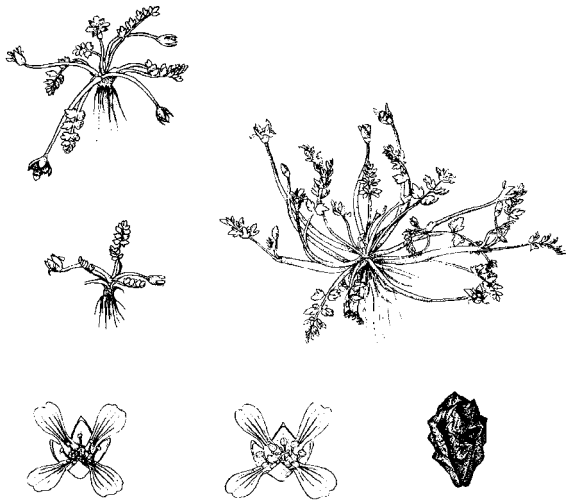

Figure 1. Macoun's meadowfoam; habit, flowers and nutlet (illustration by O. Ceska).

Figure 2. Dense population of Macoun's meadowfoam in Victoria.

When in flower, the species can be identified easily by its pinnate leaves and stems with single flowers with four sepals and petals. In fruit, the conspicuous, relatively large tuberculate nutlets, serve as good diagnostic features.

DISTRIBUTION

Global range

Macoun's meadowfoam is endemic to southern Vancouver Island and some adjacent islands in British Columbia, Canada (Figure 3).

In March 1998 Eva Buxton found a large population of a plant identified as Macoun's meadowfoam near Moss Beach, San Mateo Co., California (Buxton & Ornduff 1999, Ceska & Ceska 1999), where it is abundant on ca 9 ha of a seasonally fallow [cabbage] field. The Californian plants differ from Vancouver Island plants in their morphology (they are more erect and more robust than British Columbian plants, their leaves are usually double pinnate) and in their physiology (they are not as hardy as Vancouver Island plants and flower about a month earlier, in common garden experiments) and they most probably represent a new, yet undescribed taxon (Eva Buxton, pers. comm.).

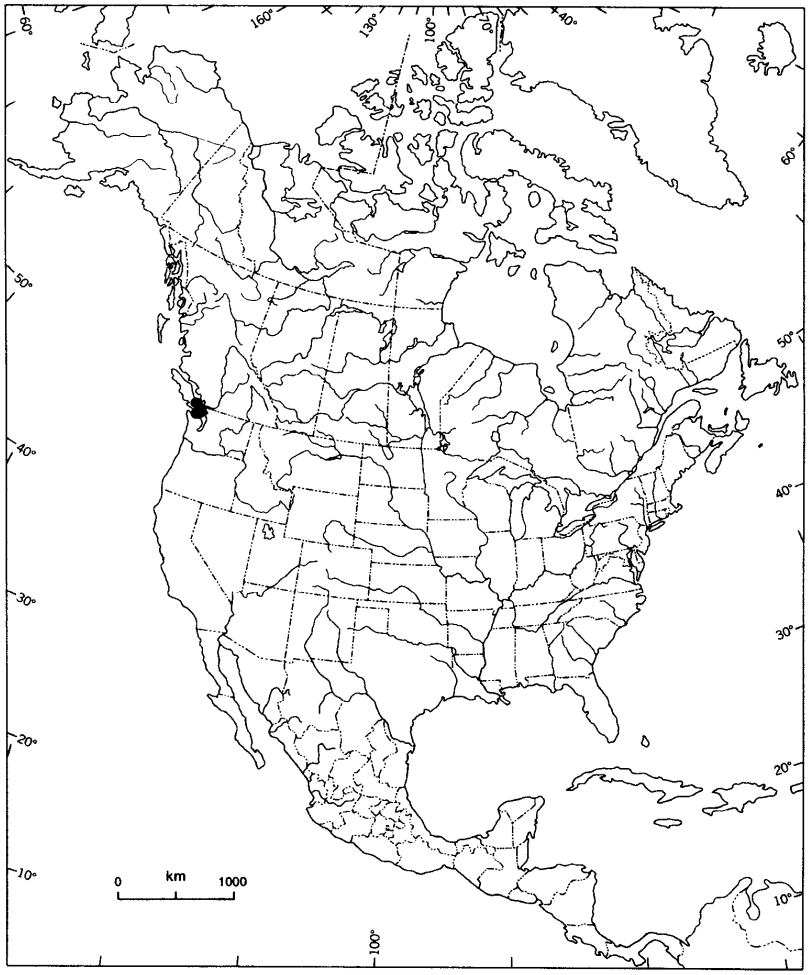

Figure 3. Global distribution of Macoun's meadowfoam.

Canadian range

Macoun's meadowfoam occurs only in southwestern British Columbia, on Vancouver Island and several adjacent islands (Figure 4). Its known range extends from East Sooke Park eastward to Victoria (including adjacent islands of Inskip, Chatham and Trial), to Yellow Point, the Gulf Islands (Saltspring, and Gabriola), and Hornby Island. The northernmost known location is on Hornby Island. The area of distribution is linear, which is typical for plants that grow close to the ocean. The majority of localities are on coastal bluffs not farther than 200 metres from the coastline. The exceptions are populations in the Montreul Hill area **[10]**[1]**,** Pearson's College **[9]** and Government House **[19]** that are all within about two kilometres of the shore. On Montreul Hill they reach almost 200 m elevation **[10.4]**.

[1]Bold numbers in squared brackets refer to 2004 population numbers in Appendix.

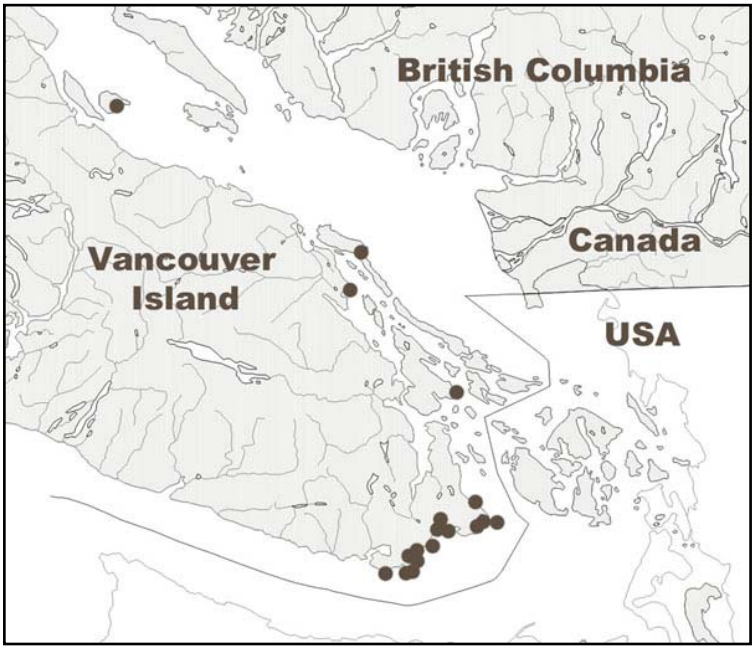

Figure 4. Distribution of Macoun's meadowfoam (*Limnanthes macounii*) in British Columbia, Canada.

The core of Macoun's meadowfoam distribution is between East Sooke Park in Sooke and Gordon Head in Victoria, 33 km apart. There is a 30 km gap between Gordon Head and Saltspring Island populations and 40 to 46 km gap between Saltspring Island and Yellow Point/Gabriola Island populations, respectively. The northernmost locality is that on Hornby Island and that locality is 80 km from the closest known locality, i.e., the one on Gabriola Island. It is difficult to calculate the extent of occurrence in this linear type of distribution. The extent of occurrence is about 40 km² (coastal strip about 200 km long and about 0.2 km wide).

Because of the lack of any active dispersal mechanism of meadowfoam nutlets, many subpopulations are smaller than 1 m²; largest subpopulations can reach up to 200 m². The total area of occupancy is very small, probably not more than one or two hectares (0.01-0.02 km²).

HABITAT

Habitat requirements

General characteristics

Macoun's meadowfoam occurs in open places or light open forest, usually close to the shore of the Pacific Ocean. All localities are characterized by being wet or submerged in winter and completely dry in summer. Depressions in shallow soil lining

bedrock (a form of vernal pools) and intermittent seepage streams along fractures in bedrock are typical spots where the water regime is suitable for its growth.

Most populations grow close to the sea level with elevation from 5 to 35 m above the sea level. Several localities, however, are as high as 195 m a.s.l.

Climate

A maritime climate with mild and wet winters is essential for the existence of Macoun's meadowfoam. The regional macroclimate is Mediterranean, temperate rainy with dry warm summers (Csb in Koppen's classification). The area in which meadowfoam occurs is in the rain shadow of the Olympic Mountains, Sooke Hills and Vancouver Island Mountains, and has the lowest amount of precipitation of all Vancouver Island. Most of the precipitation is in the winter months; there is a sharp decline during the spring and drought in summer. The growing period of Macoun's meadowfoam spans from late September or October to May and relatively mild temperatures and high rates of precipitation in this period are essential for the plant's survival. Dry summers are important for the "rest period" of the seeds.

The proximity of most of the localities to the ocean shore suggests microclimates milder than those more inland. The ground temperatures are higher in winter than inland, and the sites are generally moister. These two factors are again important to the growing period of Macoun's meadowfoam. The most adverse influences on the development and growth of Macoun's meadowfoam are low temperatures in winter and unusually dry periods in early spring. Low temperatures in the fall can impede germination, and winter frosts can kill the plants. According to our observations, however, temperatures slightly below freezing (about -2 C or -3 C) do not harm the plants but can suppress the growth of other plant species competing with Macoun’s meadowfoam for space. There is usually no water deficit in the growing period of Macoun's meadowfoam. Unexpected dry weather in the fall months can harm those seedlings that germinated too early after the first heavy rains, but in order for the seeds to germinate, so much water must have accumulated in meadowfoam localities that there is almost no danger of a later water deficit.

With regard to light requirements, Macoun's meadowfoam can be considered to be shade intolerant. It usually occurs in open places. When it grows in shade (among tall grasses in open light forests), the plants are thin and elongated and usually produce fewer nutlets.

Physiographic and topographic characteristics

Localities of Macoun’s meadowfoam are situated on rocky shores. Bedrock depressions, such as glacial grooves, collect water. Fractures in rocks collect seepage water running to the shore and provide another possible location for the plant. The bedrock is predominantly volcanic, with the exception of the Yellow Point area, Gabriola Island and Hornby Island, where it is sandstone. The bedrock substrate must be

impermeable so that vernal pools and seepy places retaining water can develop. The surface is generally not covered by glacial till; but if it is (e.g., **[3]** or **[18])**, the till layer is very thin (less than 15 cm).

Edaphic factors

Populations of Macoun's meadowfoam grow on shallow soils that range from being a few cm to about 30 cm thick. These soils are classified as Orthic Humic Regosols (Canada Soil Survey Committee 1978), or as Protoranker or Mull Ranker in Kubiena's classification (Kubiena 1953). The soils are rich in humus, which gives them their distinctive black colour. Most of the localities are rich in nutrients, especially nitrogen and phosphorus. Meadowfoam can tolerate high amounts of nutrients, as is shown by several populations occurring around rocks where sea birds gather and deposit layers of guano (**[7.1]** or **[14]**). Preliminary tests show that soils are quite acidic (pH <5.5) and rich in nutrients (Coger 1985).

The main edaphic factor is the abundance of moisture during the winter (the water table is either at the soil surface or about 5 cm above the surface). The soil remains fresh and moist until the end of April when it starts to dry out. It is bone dry during the summer.

Biological characteristics

According to Krajina's biogeoclimatic classification (Krajina 1965), the area in which Macoun's meadowfoam occurs belongs to the drier subzone of the Coastal Douglas fir zone. The climax vegetation of this area are dry Douglas fir forests in which Douglas fir (Pseudotsuga menziesii) may be accompanied with arbutus (Arbutus menziesii) and Garry oak (Quercus garryana), with mahonia (Mahonia nervosa), western fescue (Festuca occidentalis), and Eurhynchium oreganum in the undergrowth. Open Garry oak (Quercus garryana) stands are characteristic of the driest part of the Douglas fir zone.

Macoun's meadowfoam grows in the following vegetation formations (photographs are on file with COSEWIC):

1. Vernal pools - open depressions with a large number of annual plants (**[5.4]**, **[21.1]**, **[23.1]**, **[24.1]**, **[24.3]**, **[29.6]**, etc.).
2. Ephemeral seepage streams on open slopes (**[10.5]**, **[13.1]**, **[21.2]**, **[22.4]**, **[26.2]**, **[28.4]**, etc.).
3. Seagull roosting places - wet depressions and the end of seepage streams in places where sea birds gather and feed, areas extremely rich in nutrients (**[7.1]**, **[14.1]**, and **[16.1]**).
4. Open light forests - depressions and seepy places in open light mixed forests of Douglas fir, Garry oak, arbutus, Rocky Mountain juniper (*Juniperus scopulorum*), or lodgepole pine (*Pinus contorta*) (**[5.9]**, **[6.1]**, **[11.1]**, and **[29.1]**).

Populations of Macoun’s meadowfoam are more viable in shallow soils than in deeper ones. In shallower soils (up to about 4 cm), the species does not encounter the

competition of introduced perennial grasses, namely bentgrass (*Agrostis* spp.), orchard grass (*Dactylis glomerata*), rye grass (*Lolium perenne*), and velvet grass (*Holcus lanatus*) or some shrubs, such as Scotch broom (*Cytisus scoparius*) or Himalayan blackberry (*Rubus armeniacus*).

Habitat trends

Suitable habitats for Macoun's meadowfoam are disappearing. Natural vegetation of Garry oak savanna that once occurred on southern part of Vancouver Island has diminished. Lea (2002) estimated only about 5% of the original area of Garry oak ecosystems still exists in more or less natural state. In the Victoria area, the majority of open Garry oak forests and open grasslands on shallow soil were developed for housing and many suitable natural habitats disappeared. With this development pressure, many historical habitats of native plants associated with Garry oak disappeared (e.g., open spaces at "Cloverdale", Royal Oak, Oak Bay, and Saanich Peninsula).

Before the introduction of European fodder plants, the open habitats of southern Vancouver Island had only a few native perennial grasses: California wild oat grass (*Danthonia californica*), blue wild rye (*Elymus glaucus),* Roemer's fescue (*Festuca roemeri*)*,* and prairie Koeler's grass (*Koeleria micrantha*), or perennial graminoids (such as *Carex tumulicola*). None of these perennial graminoids represents a real competition to Macoun's meadowfoam, because they have different ecological requirements than Macoun's meadowfoam and seldom occurred together with it.

Even the remaining Garry oak vegetation has been significantly altered. Introduced plants now represent almost 50% of all vascular plant species and often are the main dominants of the herb layer. Introduced perennial grasses now dominate herb layer of vegetation associated with Garry oak. Scotch broom (*Cytisus scoparius*), with its nitrogen-fixing abilities, changed the structure and composition of areas that remained undeveloped in the Garry oak ecosystems.

Perennial grasses such as sweet vernal grass (*Anthoxanthum odoratum*), orchard grass (*Dactylis glomerata*), bent grass (*Agrostis capillaris,* and *A. stolonifera*), velvet grass (*Holcus lanatus*), perennial rye grass (*Lolium perenne)* and Kentucky blue grass (*Poa pratensis*) has changed the herb layer. The annual introduced grasses also play a significant role in sites with Macoun's meadowfoam. These are: bristly dog's tail grass (*Cynosurus echinatus),* early silver-hair grass (*Aira praecox*), common silver-hair grass (*Aira caryophyllea*), brome six-weeks grass (*Vulpia bromoides*), rat-tail six-weeks grass (*V. myuros*), soft brome (*Bromus hordeaceus*), and bald brome (*Bromus racemosus*). These annual grasses are not direct spatial competitors as are the perennial grasses, but they significantly contribute to the build-up of soil and filling in of wet depressions.

Habitat protection/ownership

Macoun's meadowfoam occurs in areas that have a full range of the ownership holdings as summarized in Table 1.

Table 1. Ownership status and number of subpopulations in various ownership types.	
Ecological Reserve	3
National Historical Site	3
Provincial Park	7
CRD - Regional Park	3
Municipal Park	8
DND	27
Federal	2
First Nation Reserve	17
Golf Club	4
Private	25
Total	**99**

An Ecological Reserve to protect Macoun's meadowfoam was established on Trial Island. Provincial, Regional and Municipal Parks provide a certain degree of protection, but in general, protection of rare plants is not the main objective of these parks. Populations or subpopulations on private land, Indian Reserves and at the golf course are not protected with the exception of one protective covenant.

BIOLOGY

Macoun's meadowfoam is a winter annual. It germinates after the first heavy rains from late September to November (with some additional germination through the winter), blooms from late March to early May, and produces nutlets by the beginning of June.

Like many other annual species, Macoun's meadowfoam seeds have strong dormancy. In a rough experiment conducted by the writers about 50 seeds were planted; only three germinated the first year. It has been found in other species of the genus *Limnanthes* that seed germination is triggered by the drop in the air temperature (Toy & Willingham 1967); this could be the case in Macoun's meadowfoam as well.

Macoun's meadowfoam is among many annual species that germinate in the early fall after the first heavy rains. This early germination gives it a certain advantage, since it can produce most of its biomass in the time when it is not overgrown by other species. December and January is also the best time to look for the plant; its cotyledons are conspicuous and leaves are not overgrown with other vegetation.

Winter survival depends on the weather and the plant's location. In the severe winter of 1987/88, those plants that were submerged in water of vernal pools mostly died, whereas those that were above the waterline, partly survived. In an average winter, certain populations can be reduced to about 60% of the original number, others would come through without any losses. Winters warmer than average give a certain advantage to introduced perennial grasses that in turn results in the decrease of Macoun's meadowfoam populations. In the relatively mild winter of 2002/2003,

perennial grasses did not start to grow early; they may have suffered due to the droughts in a series of extremely dry summers over the last several years.

Macoun's meadowfoam flowers from the end of March to the beginning of May. The species is most probably self-pollinated or has autogamous flowers and it can produce fruit without any cross-pollination.

Up to four nutlets can be formed in each flower. Nutlets are relatively large and in fact they are largest from the cohort of all our native annuals. The plant is most probably barochoric, i.e., nutlets fall off and do not have any dispersal agents. In April, young nutlets are yellow-green and quite conspicuous.

POPULATION SIZES AND TRENDS

Search effort

Since the completion of the1988 COSEWIC status report, the writers made 150 field trips that involved revisiting old known subpopulations of Macoun's meadowfoam and search for new ones. During the winter 2002/2003 all the Macoun's meadowfoam sites (with the exception of one or two) were visited again and the size of each subpopulation was either counted or estimated.

The exact locality of the population from which Macoun's type specimen was collected ("Victoria, ditches") is not known. The efforts to find Macoun's meadowfoam at Dallas Road & Victoria Breakwater (reported by C.F. Newcombe in 1920's) and at West Burnside Road (Macoun's 1875 record) failed.

Since the 1988 COSEWIC report, seven new sites (populations) have been discovered: Church Point **[4]**, Williams Head **[6]**, Saxe Point **[18]**, Government House **[19]**, Arbutus Grove **[25]**, Gabriola Island **[31]**, and Hornby Island **[32]**. New finds of Macoun's meadowfoam on Gabriola Island and Hornby Island extended the known distribution of Macoun's meadowfoam about 100 km in a northwestern direction. With the exception of these populations listed above, most new populations and sub-populations were found in the vicinity of previously known populations. A large proportion of newly discovered sub-populations came from the military areas as a result of a more intensive search conducted there since the 1988 report. The majority of new sub-populations were found on DND property with the largest number found at any one site being at the Rocky Point DND property.

Abundance

Based on the latest fieldwork, Macoun's meadowfoam is known globally from 28 extant populations (= locations). About a third of these populations consist of two or more sub-populations each; a total of 84 extant sub-populations (out of a total of 99 documented) are presently known (see Appendix).

The original 1988 status report listed 52 “populations” many of which should be treated as mere sub-populations. Applying the present concept of populations (based on a separation of about 1 km), the original 1988 COSEWIC report would have consisted of 24 populations. Four populations known in 1988 have been destroyed and seven new populations have been found (based on increased search effort) and one was restored.

The majority of all plants are concentrated in twelve large populations that all together host over one half of all plants documented in Canada. The majority of “large” populations have less than 2000 individuals. Only about 8 populations have more than 2000 plants (subpopulations **5.12**, **5.4**, **7.1**, **14.1**, **18.1**, **24.1**, **24.3**, **29.3**). It is estimated that there are presently a total of about 10,000 plants in Canada.

Fluctuations and trends

Annual plants vary widely from season to season and absolute numbers of plants in each population change from year to year. In the 1988 COSEWIC report, three size classes were distinguished to characterize population size:

Small: 1-50 plants; Medium: > 50 - 200 plants; Large: > 200 plants

The writers’ experiences monitoring Macoun’s meadowfoam populations since 1987 has shown that these categories reflected the size of populations reasonably well. Variation of plant numbers from year to year usually remain within the size limits of the respective categories (i.e., small, medium and large), in spite of the fluctuation from one generation to another in absolute numbers, typical for annual plants.

Of the 52 occurrences that were reported in the 1988 COSEWIC report (as “populations”), 29% (15) disappeared, 27% (14) declined, 19% (10) remained about the same and 23% (12) increased. The majority of subpopulations that disappeared were small and most of them were outcompeted by introduced perennial grasses.

Rescue effect

There is no possible rescue effect from populations outside Canada since the species is an endemic.

LIMITING FACTORS AND THREATS

There are ecological parameters that are essential to successful growth of Macoun's meadowfoam:

1) availability of open soil, and

2) sufficient moisture during its growing season, i.e., from October to March.

Since the 1988 COSEWIC report, 16 subpopulations have been lost representing about one third of subpopulations listed in the original report. The causes of extirpation give a very good picture about threats to the plant.

There are three categories of threats:

1) human activity

2) competition of introduced plant species

3) animal pests

1) Human activity

Human activities resulted directly in the disappearance of several populations. A sundeck was built over a depression with Macoun's meadowfoam **[27]**, a site was subdivided and built over **[15]**. One of the largest subpopulations known at the time of writing the1988 COSEWIC report **[3.2]** was almost eliminated and reduced to less than 50 plants when the remnants of a two-story building were burned in a depression that hosted this population. Recently, a sub-population on Gordon Head with a protective covenant **[26.4]** was eliminated when the wet depression was filled with gravel. The site was restored in November 2003 and is being monitored. All subpopulations on private land west of the Devonian Park [11.2 – 11.5] were lost when the area was built over.

Besides the direct destruction of the sites with Macoun's meadowfoam, modification of water regime (such as interruption of a seepage on which the plant depends) results in decline of meadowfoam on a site.

Human activity, on the other hand, is beneficial at quite a few sites in the Greater Victoria area where Macoun's meadowfoam grows in heavily trampled areas **[18]** and **[24]**. In this case, trampling keeps the areas with Macoun's meadowfoam open, and helps to control the competition of introduced plants. In winter, wet areas are avoided by park visitors and populations of Macoun's meadowfoam are not disturbed. In summer, however, these areas are heavily used and common lawn grasses (e.g., *Lolium perenne*, *Agrostis capillaris*) and other grasses (e.g., *Dactylis glomerata*, *Anthoxanthum odoratum*, *Cynosurus echinatus*) are suppressed.

Trampling also seems to be beneficial to the sub-populations in Ruckle Provincial Park **[28]** and at the Yellow Point Lodge site **[30]**. This may change, however, if trampling will benefit those competitors that are adapted to it. *Poa bulbosa* and *Trifolium subterraneum* have spread into meadowfoam habitats in the Victoria area in the last two decades and Ruckle Provincial Park meadowfoam populations are threatened by introduction of *Soliva sessilis* brought in by human traffic.

2) Competition with introduced plant species

Introduced plants represent one of the major threats to Macoun's meadowfoam. The major dominants of Garry oak plant communities and open areas associated with them are European introductions. The major components of meadowfoam sites are introduced species (Tables of associated species are on file with COSEWIC).

Two introduced shrubs, *Cytisus scoparius* and *Ulex europaeus* have major impact on coastal vegetation and may overshadow wetter areas with Macoun's meadowfoam. *Cytisus scoparius* (30%) is present in almost one third or releves; *Ulex europaeus* (3.3%), on the other hand, is restricted to the DND areas of Rocky Point and Gonzales Point.

Ivy (*Hedera helix*) contributed to the decline and disappearance of two sub-populations in Glencoe Cove **[26.1]** and **[26.3]**.

Competition with introduced tufted grasses and human activities were the main causes of disappearance of Macoun's meadowfoam from populations that have been lost. All the populations that were lost due to the competition of introduced plants were originally small, i.e., they did not have more than 50 plants. At the same time, the sixteen populations that showed the decreasing trend and that are now listed as "small" may vanish within next ten or fifteen years.

Introduced grasses pose direct competition to Macoun's meadowfoam and the area of open soil decreases in wet depressions and seepages. At the same time, tufted grasses produce biomass that accumulates in the depressions and make them drier and less suitable for the growth of Macoun's meadowfoam and other native annual species.

Competition of introduced species was responsible for the loss of 7 (out of 18) sub-populations. Competition also played a very significant role in the decline of populations. Almost all populations that declined since the 1988 report declined because of the competition of introduced species.

Introduced perennial grasses are the most serious threat to Macoun's meadowfoam populations. In the following tabulation they are listed in decreasing constancy (numbers are percentages of the species' occurrence in 89 sampled sites):

Holcus lanatus	55.1%
Agrostis capillaris & gigantea	49.4
Dactylis glomerata	41.6
Lolium perenne	32.6
Anthoxanthum odoratum	29.2
Agrostis stolonifera	18.0
Cynosurus cristatus	5.6
Poa bulbosa	4.5
Poa pratensis ?	4.5

Grasses that form either large tussocks (*Dactylis glomerata*) or dense swards (namely *Agrostis capillaris, A. gigantea* and *Lolium perenne*) have the greatest negative impact on Macoun's meadowfoam populations. *Dactylis glomerata* and *Agrostis* spp. are distributed through the general area where Macoun's meadowfoam occurs. Dense stands of *Holcus lanatus* and *Anthoxanthum odoratum* contribute to the build up of organic matter. *Lolium perenne* is a problem in urban areas. *Poa bulbosa* has started to spread through the urban areas around Victoria about five to ten years ago and its population in the meadowfoam site has become denser in the last few years. Whereas *Lolium perenne* is usually suppressed in meadowfoam sites that are trampled by people in the municipal parks, *Poa bulbosa* can tolerate trampling or even increase in trampled areas and it is a potential threat to the sites in municipal parks.

Annual grasses are extremely common in the meadowfoam sites. *Vulpia bromoides, Vulpia myuros, Cynosurus echinatus* and *Bromus hordeaceus* are ubiquitous in almost all sites. Their vegetation peak is when Macoun's meadowfoam is already in fruit and they don't represent any spatial competition to this plant. *Aira praecox* and *Aira caryophyllea* are also common, but because of their small size, they do not pose a problem.

Aira praecox	74.2%
Cynosurus echinatus	32.6
Bromus hordeaceus	18.0
Aira caryophyllea	2.2
Vulpia bromoides	2.2
Vulpia myuros	1.1

In addition to these annual introduced grasses, some other introduced grasses, such as *Bromus racemosus*, are abundant at some localities, but because they start to germinate later, they are not listed in the releves and because of this phenological shift, they do not represent a direct competition to Macoun's meadowfoam.

All the introduced grasses, however, contribute to the build-up of organic matter in the soil and filling up vernal pools. This, besides the direct competition, contributes to demise of Macoun's meadowfoam populations, since the vernal pools get drier and less suitable for Macoun's meadowfoam growth.

Several populations of Macoun's meadowfoam are in parks, in areas that are trampled by visitors. Cattle Point, Uplands Park and Saxe Point - are good examples. At such sites, Macoun's meadowfoam flourishes because the grass competition is reduced in the area frequented by people. During the growing season for Macoun's meadowfoam, these areas are usually wet and avoided by people. Similarly, the only two known sub-populations at bird roosting sites **[7.1]** and **[14.1]** are enhanced by birds that graze the perennial grasses and disturb the soil surface.

The following introduced herbs are common in meadowfoam sites during its growing period.

Geranium molle	67.4
Stellaria media	61.8
Plantago lanceolata	55.1
Hypochaeris radicata	51.7
Geranium pusillum	32.6
Leontodon taraxacoides	30.3
Erodium cicutaria	18.0
Taraxacum officinale	3.4
Ranunculus repens	1.1

Exotic species with rosettes of basal leaves (such as *Plantago lanceolata, Hypochaeris radicata, Bellis perennis*, *Leontodon taraxacoides* and *Erodium cicutaria*) are, together with introduced tufted grasses, major competition to Macoun's meadowfoam.

Two, relatively new introductions are Burrowing clover (*Trifolium subterraneum*) and Lawn burrweed (*Soliva sessilis*):

Trifolium subterraneum	9.0
Soliva sessilis	2.2

Burrowing clover (*Trifolium subterraneum*) was introduced to British Columbia about forty years ago and the first records came from the Becher Bay area (Ceska 1975). Today it is a common plant in the DND properties on Rocky Point and intrudes in several populations of Macoun's meadowfoam. In the Victoria area, Burrowing clover has become a weed in the city lawns; it is present at several Macoun's meadowfoam localities (e.g., **[3]** and **[20]**.)

Lawn burrweed (*Soliva sessilis*) is at present known only from the Ruckle Park on Saltspring Island, where it was first collected by Frank Lomer in 1996 (Lomer 1997). In several subpopulations in Ruckle Park **[28]** it occurs in mixed populations with Macoun's meadowfoam.

Both *Trifolium subterraneum* and *Soliva sessilis* have similar ecology and phenology as Macoun's meadowfoam. They are all winter annuals that germinate in winter and they have similar water requirements, growing in wet depressions. Both these species grow in drier conditions than Macoun's meadowfoam and they don't represent a great threat on wet sites. On the other hand, they both represent a competition to Macoun's meadowfoam in sites that are drier than optimal for its growth. In drier sites, they can outcompete Macoun's meadowfoam and reduce its populations.

SPECIAL SIGNIFICANCE OF THE SPECIES

Macoun's meadowfoam is a Canadian endemic restricted to the southern part of Vancouver Island and several adjacent islands. It is the only native representative of

the genus *Limnanthes* in Canada. Other species of *Limnanthes* have horticultural and agricultural uses, this, the most northerly species may be useful in providing genetic material in breeding programs (Knapp & Crane, 1999).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Based on the 1988 status report, COSEWIC designated this species as RARE giving the following reason: “A Canadian endemic with a restricted range and numerous populations readily persisting in or near urban areas”. The species was interpreted as a species of “No Special Concerns” in the provincial assessment (Douglas et al. 1998) or later as “Vulnerable” (Douglas et. al. 2002). The British Columbia Conservation Data Centre listed this species as BLUE-listed, although in past versions of the list, the rating of Macoun’s meadowfoam varied from RED-listed to not listed.

Macoun’s meadowfoam is protected on the Trial Islands Ecological Reserve [ER # 117]. None of the plants on this island occur on federal lands.

TECHNICAL SUMMARY

Limnanthes macounii
Macoun's meadowfoam ***Limnanthe de Macoun***
Range of Occurrence in Canada: British Columbia

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* **200 km coastline x 0.2 km**	40 km²
• *Specify trend in EO*	stable (recent finds likely representing previously unknown localities)
• *Are there extreme fluctuations in EO?*	no
• *Area of occupancy (AO) (km²)* **total of individual patch (sub-population) areas**	< 0.02 km²
• *Specify trend in AO*	fluctuates but likely overall decline based on impact of expanding populations of exotic plants
• *Are there extreme fluctuations in AO?*	no
• *Number of known or inferred current locations*	28
• *Specify trend in #* **[note that for plants location or site = population]** Slight increase in overall number (24 to 28) due to increased search effort but likely best considered as a decline when considering that out of 52 original sub-populations 29% (15) disappeared, including 4 whole populations (although these were not major sites)	likely best considered as a decline in number of localities-sub-populations
• *Are there extreme fluctuations in number of locations?*	no
• *Specify trend in area, extent or quality of habitat*	decline in habitat quality
Population Information	
• *Generation time (average age of parents in the population)*	several months (winter annual)
• *Number of mature individuals*	about 20,000
• *Total population trend:* **(based on the 52 sub-populations documented in original report in 1988)**	likely a decline: 29% lost 27% declined 19% stable 23% increased
• *% decline over the last/next 10 years or 3 generations.*	decline of 8 to 12 % in absolute numbers in the past 10 years (net loss of about 800 to 1,200 individuals)
• *Are there extreme fluctuations in number of mature individuals?*	uncertain if extreme fluctuations but considerable yearly variation occurs

• *Is the total population severely fragmented?*	extreme fragmentation (smaller populations occupy areas les than 1 m² and there would be seemingly no genetic exchange among them since the plants are self-pollinated and lack dispersal mechanism)
Specify trend in number of populations	declining
• *Are there extreme fluctuations in number of populations?*	no
• List populations with number of mature individuals in each: see Appendix	
Threats (actual or imminent threats to populations or habitats)	
Loss of habitat due to: property developments on a number of sites and competition with introduced exotic plants, especially annual grasses	
Rescue Effect (immigration from an outside source)	
• *Status of outside population(s)?* **USA: none**	
• *Is immigration known or possible?*	no (endemic)
• *Would immigrants be adapted to survive in Canada?*	N/A
• *Is there sufficient habitat for immigrants in Canada?*	N/A
• ***Is rescue from outside populations likely?***	**N/A**
Quantitative Analysis	N/A
Previous Status Previous COSEWIC assessment : Special Concern	

Status and Reasons for Designation

Status: Threatened	**Alpha-numeric code:** Met criteria for Endangered, B1ab(iii)+2ab(iii), but designated Threatened, B1ab(iii)+2ab(iii); D2, because the species does not seem to be at imminent risk of extirpation.

Reasons for Designation: A Canadian endemic highly restricted within a narrow coastal fringe of seasonally wet microhabitats where it is at risk from continued competition with a wide range of exotic plants. Its presence in a highly urbanized area results in habitat disruption and population losses.

Applicability of Criteria

Criterion A (Declining Total Population): Not met (rough estimate of decline in last 10 years is perhaps only 8-12%)

Criterion B (Small Distribution, and Decline or Fluctuation): Meets Endangered B1ab (iii) + 2ab (iii), based on the small extent of occurrence and occupancy, the highly fragmented nature of the populations and the considerable impact on habitat quality due to human activities and invasive plants; populations are considered highly fragmented since they occur as small patches within seasonally wet depressions and appear to be primarily self-pollinated with no specialized means of dispersal likely resulting in limited genetic exchange. Fragmentation may also have been promoted by habitat disruption in this highly populated region. Meets Endangered but recommended as Threatened since the species does not seem to be at imminent risk of extirpation with perhaps only an 8-12% estimated loss in about 15 years.

Criterion C (Small Total Population Size and Decline): Not met (Population size is too large).

Criterion D (Very Small Population or Restricted Distribution): Threatened D2 based on a very small area of occupancy <20km^2 and at on-going risks due to presence in a highly urbanized region and from the spread of invasive plants.

Criterion E (Quantitative Analysis): Not applicable

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INFORMATION SOURCES

Buxton, E. & R. Ornduff. 1999. Noteworthy collections - California: *Limnanthes macounii* Trel. (Limnanthaceae). *Madroño* 45(1998): 184. [Note: Ms. Buxton's collection is in fact a different, yet undescribed species.]

Canada Soil Survey Committee, Subcommittee on Soil Classification. 1978. *The Canadian system of soil classification.* Can. Dept. Agric., Publication 1646. Ottawa, Ont. 164 p.

Ceska, A. 1975. Additions to the adventive flora of Vancouver Island, British Columbia. Can. *Field-Nat*. 89: 451-453.

Ceska, A. & O. Ceska. 1988.*Status report on the Macoun's meadowfoam (*Limnanthes macounii *Trel.).* Report for the Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ont. [unpublished ms.]

Ceska, A. & O. Ceska. 1999. Limnanthes macounii – the end of endemic species. *BEN* 225. http://www.ou.edu/cas/botany-micro/ben/ben225.html [accessed March 2003] [Note: Ms. Buxton's collection from California is in fact a different, yet undescribed species – Ms. Buxton – pers. comm. January 2004]

Coger, K. 1985. In search of elusive meadow-foam. High School Science Project. [ms]

Douglas, G.W., G.B Straley, & D. Meidinger. 1998. *Rare native vascular plants of British Columbia*. BC Conservation Data Centre, Victoria, BC. 423 p.

Douglas, G.W., D. Meidinger, & J.L. Penny. 2002. *Rare vascular plants of British Columbia*. 2nd edition. Province of British Columbia, Victoria, BC. 358 p.

Knapp, S.J. & J.M. Crane. 1999. Breeding Advances and Germplasm Resources in Meadowfoam: A Novel Very Long Chain Oilseed. Pp. 225-233 in Janick, J. (ed.), *Perspectives on new crops and new uses*. ASHS Press, Alexandria, VA. http://www.hort.purdue.edu/newcrop/proceedings1999/pdf/v4-225.pdf

Krajina, V.J. 1965. Biogeoclimatic zones in British Columbia. Ecol. Western N. Amer. 1: 1-17.

Kubiëna, W.L. 1953. *The soils of Europe*. Thomas Murby and Co., London. 317 p.

Lea, Ted. 2002. *Historical Garry Oak Ecosystems of Greater Victoria and Saanich*

Peninsula. 1:20,000 Map. Terrestrial Information Branch, B.C. Ministry of Sustainable Resource Management. Victoria, B.C. http://www.goert.ca/reference/oak_map.htm [accessed March 2003]

Lomer, F. 1997. Six new introduced species in British Columbia. *BEN* 163. http://www.ou.edu/cas/botany-micro/ben/ben163.html [accessed March 2003]

Mason, C.T., Jr. 1952. A systematic study of the genus *Limnanthes* R.Br. Univ. Calif. Publ. Bot. 25: 455-512; pl. 43-46.

Toy, S.J. & B.C. Willingham. 1967. Some studies on secondary dormancy on *Limnanthes* seed. *Econ. Bot*. 21:363-366.

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Oldriska Ceska, prom.biol. (Charles, Prague), mycologist, botanist, phytochemist and botanical illustrator. Author and co-author of over fifty scientific papers in chemistry of natural compounds, floristics, and taxonomy of aquatic macrophytes.

COLLECTIONS EXAMINED

Specimens records examined in the Royal British Columbia Museum are on file with COSEWIC. George W. Douglas examined specimens at the Canadian Museum of Nature, Ottawa, and at the Central Experimental Farm, Ottawa; Olivia Lea provided the information from the University of British Columbia.

Appendix: List of known (extant and lost) populations of Macoun's meadowfoam.

POPULATION	2004 #	SUB	2003 size	1987 #	1987 size	TREND	STATUS
CAPTAIN POINT	**1**	**1.1**	small	1	medium	declined	CRD Park
CREYKE POINT	**2**	**2.1**	large	2	medium	increased	CRD Park
BECHER BAY IR # 2	**3**	**3.1**	none	3	small	lost	IR
		3.2	small	4	large	declined	IR
		3.3	small	x	x	x	IR
		3.4	small	x	x	x	IR
		3.5	small	5	small	stable	IR
		3.6	medium	x	x	x	IR
		3.7	small	x	x	x	IR
		3.8	small	x	x	x	IR
		3.9	none	6	small	lost	IR
CHURCH POINT	**4**	**4.1**	medium	x	x	x	IR
ROCKY POINT DND EAST	**5**	**5.1**	large	7	medium	increased	DND
		5.2	small	x	x	x	DND
		5.3	large	x	x	x	DND
		5.4	large	8	large	stable	DND
		5.5	large	x	x	x	DND
		5.6	medium	x	x	x	DND
		5.7	small	x	x	x	DND
		5.8	large	x	x	x	DND
		5.9	small	9	medium	declined	DND
		5.10	large	x	x	x	DND
		5.11	small	x	x	x	DND
		5.12	large	10	medium	increased	DND
		5.13	small	11	medium	declined	DND
		5.14	medium	x	x	x	DND
		5.15	medium	x	x	x	DND
		5.16	medium	x	x	x	DND
WILLIAMS HEAD	**6**	**6.1**	medium	x	x	x	federal
MARY HILL	**7**	**7.1**	large	12	small	increased	DND
		7.2	none	13	small	lost	DND
		7.3	none	14	small	lost	DND
		7.4	medium	x	x	x	DND
		7.5	small	15	small	declined	DND
		7.6	small	x	x	x	DND
		7.7	small	x	x	x	DND
PEDDER BAY	**8**	**8.1**	none	16	small	lost	private
PEARSON COLLEGE RD.	**9**	**9.1**	small	17	small	declined	private
MONTREUL HILL	**10**	**10.1**	small	23	small	declined	private
		10.2	small	x	x	x	private
		10.3	small	24	medium	declined	private
		10.4	medium	25	small	increased	private
		10.5	medium	26	large	declined	private
		10.6	medium	x	x	x	private

POPULATION	2004 #	SUB	2003 size	1987 #	1987 size	TREND	STATUS
DEVONIAN PARK AREA	**11**	**11.1**	small	18	small	restored	CRD Park
		11.2	none	19	small	lost	private
		11.3	small	20	small	declined	private
		11.4	none	21	small	lost	private
		11.5	none	22	small	lost	private
ALBERT HEAD	**12**	**12.1**	small	x	x	x	DND
		12.2	small	x	x	x	DND
		12.3	large	27	large	stable	DND
FORT RODD HILL	**13**	**13.1**	medium	28	small	increased	Nation.Park
YEW POINT	**14**	**14.1**	large	29	small	increased	Nation.Park
FORMER HORTH PROPERTY	**15**	**15.1**	none	30	medium	lost	private
INSKIP ISLAND	**16**	**16.1**	large	31	medium	increased	DND
SONGHEES IR	**17**	**17.1**	none	32	small	lost	IR
SAXE POINT	**18**	**18.1**	large	x	x	x	Munic.Park
GOVERNMENT HOUSE	**19**	**19.1**	small	x	x	x	federal
HARLING POINT	**20**	**20.1**	large	33	medium	increased	Nation.Park
TRIAL ISLAND	**21**	**21.1**	large	34	large	stable	ER
		21.2	medium	35	medium	stable	ER
		21.3	small	x	x	x	ER
GONZALES POINT	**22**	**22.1**	large	36	medium	increased	golf club
		22.2	large	x	x	x	golf club
		22.3	small	x	x	x	golf club
		22.4	large	x	x	x	golf club
CHATHAM ISLAND	**23**	**23.1**	large	37	small	increased	IR
		23.2	small	x	x	x	IR
CATTLE POINT - UPLANDS	**24**	**24.1**	large	38	large	stable	Munic.Park
		24.2	medium	x	x	x	Munic.Park
		24.3	large	39	medium	increased	Munic.Park
		24.4	small	40	small	declined	Munic.Park
ARBUTUS COVE	**25**	**25.1**	small	x	x	x	private
GLENCOE COVE	**26**	**26.1**	none	41	small	lost	Munic.Park
		26.2	small	42	medium	declined	Munic.Park
		26.3	none	43	small	lost	Munic.Park
		26.4	none	44	large	lost	private
SATSPRING IS. - KING ROAD	**27**	**27.1**	none	45	small	lost	private
RUCKLE PARK	**28**	**28.1**	medium	46	medium	stable	Prov.Park
		28.2	small	x	x	x	Prov.Park
		28.3	large	x	x	x	Prov.Park
		28.4	large	x	x	x	Prov.Park
		28.5	small	x	x	x	Prov.Park
		28.6	large	x	x	x	Prov.Park
CHEMAINUS IR - RICE FARM	**29**	**29.1**	small	47	large	declined	IR
		29.2	small	x	x	x	IR
		29.3	large	48	large	stable	IR
		29.4	small	49	medium	declined	IR

POPULATION	2004 #	SUB	2003 size	1987 #	1987 size	TREND	STATUS
		29.5	none	50	small	lost	private
		29.6	medium	51	medium	stable	private
YELLOW POINT	**30**	**30.1**	large	52	large	stable	private
		30.2	medium	x	x	x	private
		30.3	medium	x	x	x	private
		30.4	medium	x	x	x	private
		30.5	large	x	x	x	private
GABRIOLA ISLAND	**31**	**31.1**	medium	x	x	x	Prov.Park
HORNBY ISLAND	**32**	**32.1**	medium	x	x	x	private
		32.2	small	x	x	x	private

Note: x indicates populations and subpopulations with no data for the given column. COSEWIC Report.
Small: 1-50 plants; Medium: 51 - 200 plants; Large: > 200 plants