

COSEWIC
Assessment and Status Report

on the

Pink Milkwort
Polygala incarnata

in Canada



ENDANGERED
2009

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 2009

Common name

Pink Milkwort

Scientific name

Polygala incarnata

Status

Endangered

Reason for designation

This annual herb is highly restricted geographically and is present in tallgrass prairie habitats in southwestern Ontario. There are likely four populations with a total of approximately 1800 plants, most of which are found in one population. Threats to all populations include encroachment by woody plants due to fire suppression and invasive species. Habitat conversion to agriculture, housing development, mowing, trampling, drainage and moisture alteration threaten three populations.

Occurrence

Ontario

Status history

Designated Endangered in April 1984. Status re-examined and confirmed Endangered in April 1998, May 2000, and November 2009.



COSEWIC Executive Summary

Pink Milkwort *Polygala incarnata*

Species information

Pink Milkwort (*Polygala incarnata*) is an annual herb of the milkwort family (Polygalaceae) with a single, smooth, greyish, slender, unbranched or sparingly branched stem and tiny narrow leaves. Mature plants are usually 20 - 40 cm tall. Rose purple, tubular flowers in a dense terminal head continue opening throughout the flowering season. The fruit is a green 2-celled capsule. The seeds are black, hairy, and about 2 mm long with a small two-lobed air-filled, sac-like appendage.

Distribution

Restricted to North America, Pink Milkwort occurs from Delaware to Florida in the east and from Wisconsin and Iowa, south to Texas in the west part of its range. It no longer occurs in Michigan and New York and has not been seen in New Jersey and Pennsylvania in over 20 years. In Canada, Pink Milkwort has been recorded only from Ontario, where it is known from Walpole Island First Nation (WIFN) and from the Ojibway Prairie Provincial Nature Reserve in Windsor. Historic literature reports are known from Leamington and from the Niagara Falls area.

The extent of occurrence in Canada is 52 km². This excludes unsuitable habitat between the populations at WIFN and the Windsor population. The index of area of occupancy is 8 km² based on the number of 1 km square grid units occupied, and 20 km² based on 2x2 km squares. Canadian populations occupy less than 1% of the total range of the species.

Habitat

In Canada, Pink Milkwort is found in open wet mesic to mesic prairies on sandy loam and sandy clay loam soils. It is almost always associated with Little Bluestem (*Schizachyrium scoparium*). Periodic fire is probably essential for maintaining open prairie conditions. A high water table in spring and summer drought may also contribute to maintaining an open prairie.

Biology

Pink Milkwort is an annual species that reproduces only sexually, by seeds that are produced in small numbers (two seeds per flower). Plants flower mainly from June to September or early October in Ontario. Flowers are bisexual and can be self-pollinated, although the rates of self-pollination and outcrossing are unknown.

Population sizes and trends

Because Pink Milkwort is an annual, numbers of individuals fluctuate from year to year. On WIFN there are an estimated 1800 plants documented at 3 populations but there may be four extant populations. The largest population is spread over 6 sites and contained about 1700 individuals in 2008. At a single population on Ojibway Prairie Provincial Nature Reserve, the number of plants counted year to year has fluctuated from 0 to 30 individuals.

Population trends are difficult to assess because of the lack of detailed census and long term monitoring. Some populations have been extirpated in the last 20 years and the extent and quality of habitat is still declining.

Limiting factors and threats

The major limiting factor for this species in Canada is the extent of tallgrass prairie habitat where it occurs. Lack of fire that maintains prairie habitat is allowing woody species to invade Pink Milkwort habitat.

At WIFN, major threats are loss of habitat by conversion to agriculture, housing and other land uses. Direct trampling, especially from ATV traffic, may also be a factor. Regular mowing has caused the loss of part of one sub-population at WIFN and likely killed plants at another population in 2008. Invasive species (e.g., Giant Reed, White Sweet Clover and Canada Thistle) threaten several Pink Milkwort sites and cause a decline in habitat quality.

Pink Milkwort may also be affected by changes in moisture regime as a result of dredging and ditching operations and natural changes in lake levels. High water levels during the late 1980s may have reduced populations at some sites.

At Ojibway Prairie Provincial Nature Reserve, Black Locust and other species are invading Pink Milkwort habitat and pose a serious threat.

Special significance of the species

The presence of the species in Ontario is of ecological significance because of the limited amount of suitable habitat and the extreme rarity or extirpation of the species in adjacent states. The only known medicinal use of the root is for respiratory ailments.

Existing protection

In Canada, Pink Milkwort is listed as Endangered under Schedule 1 of the *Species at Risk Act*, which applies to populations on federal land, including WIFN. Similarly in Ontario, the species is listed as Endangered with the plant and its habitat protected under the Ontario Endangered Species Act, 2007. At WIFN, sites with the largest number of plants are partially protected through land ownership and conservation leasing arrangements by the Walpole Island Heritage Centre; other sites are on private land and have little protection. The Ojibway Prairie Provincial Nature Reserve is protected and managed by Ontario Parks as a Provincial Nature Reserve.



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.

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SPECIES INFORMATION

Name and classification

Scientific Name: *Polygala incarnata* Linnaeus, Sp. Pl. 701. 1753.

Synonyms: *Galypola incarnata* (L.) Nieuwland

Common Names: Pink Milkwort, Procession Flower, Slender Milkwort

Family Name: Polygalaceae (Milkwort Family)

Major Plant Group: Eudicot flowering plant

Morphological description

Pink Milkwort is an annual herb with a single, smooth, glaucous, slender stem that is unbranched or sparingly branched. Mature plants are usually 20-40 cm tall. The leaves are few, alternate, linear, ascending and about 5-12 mm long, usually falling by flowering time. Rose purple, tubular flowers with flaring wings are clustered in a dense terminal raceme and continue opening from the base to the apex of the raceme through the flowering season from June to October (Figures 1, 2). The fruit is a green 2-celled capsule that usually falls from the plant intact after ripening, leaving a series of scars on the stem below the inflorescence (Figure 3). The seeds are dark brown to black, hairy, about 2 mm long and have a small two-lobed air-filled sac-like appendage (Figure 4).

Polygala incarnata is the only North American species of *Polygala* with the flower tube at least twice as long as the wings (Gleason and Cronquist, 1991). The brilliant pink to purple flowers are quite different from and a much more intense colour than the paler pink and white flowers of *P. sanguinea*, with which it sometimes grows.



Figure 1. Photograph of a branched plant of Pink Milkwort showing the flowering raceme, slender stem and minute leaves. Racemes are approximately 1 cm across. Photograph: Jane M. Bowles, WIFN, 2006.



Figure 2. Details of the flower head of Pink Milkwort. Photograph: Jane M. Bowles, WIFN, 2006.



Figure 3. Maturing raceme of Pink Milkwort showing the scars of detached fruit. Photograph: Jane M. Bowles.



Figure 4. Seed of Pink Milkwort. Length of seed approximately 2 mm. Photograph: Jane M. Bowles.

DISTRIBUTION

Global range

Restricted to North America, Pink Milkwort occurs from Delaware to Florida in the east and from Wisconsin and Iowa, south to Texas in the western part of its range (Figure 5). It is most abundant in the central plains and along the states of the southeastern seaboard. It is extirpated from Michigan and New York and there are only historic records from New Jersey and Pennsylvania (NatureServe, 2009).

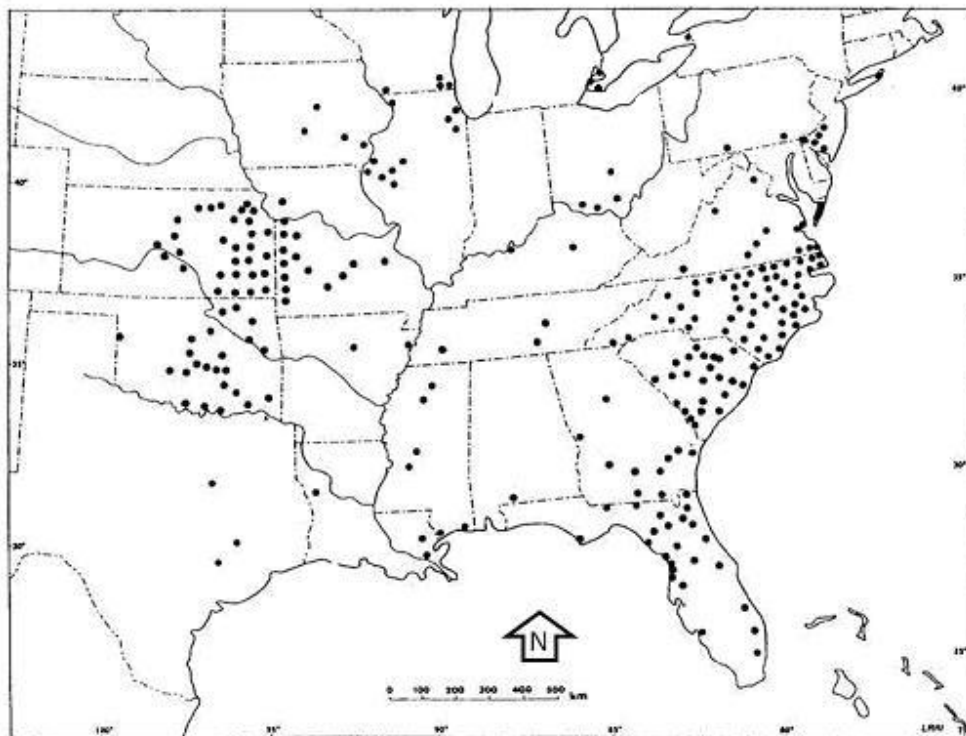


Figure 5. Historical distribution of Pink Milkwort in North America. Updated from Brownell (1984).

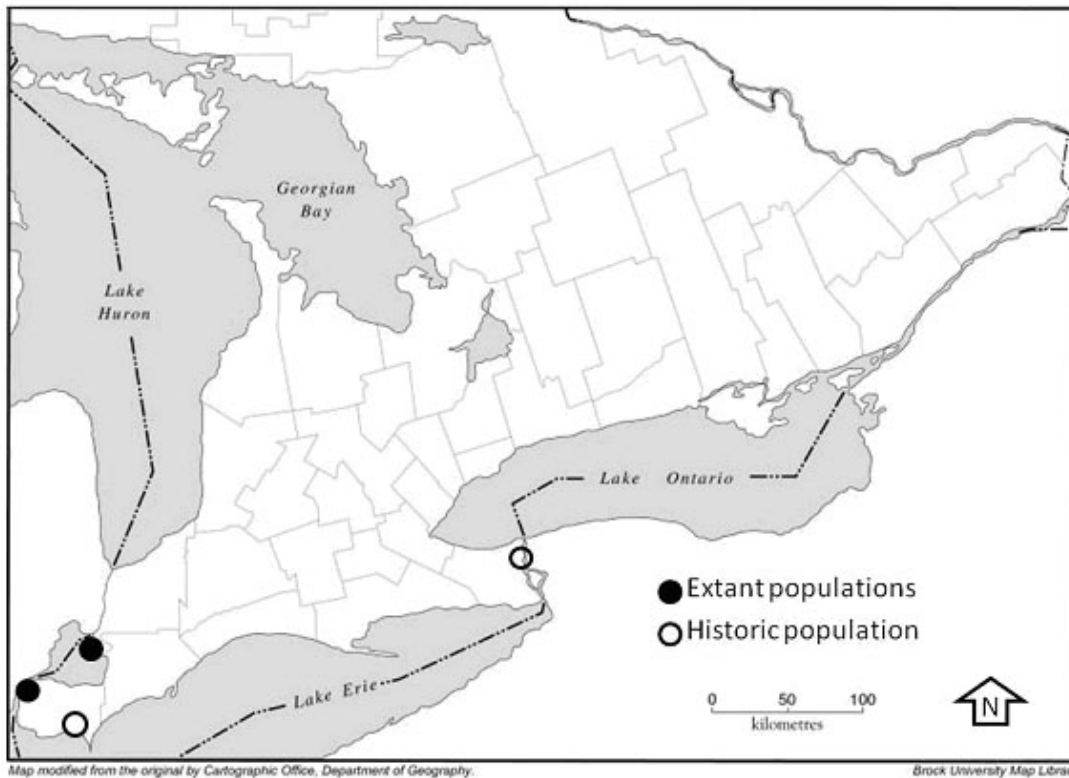


Figure 6. Map of southern Ontario showing location of Pink Milkwort populations in Ontario and Canada. The historic records at the southwest end of Lake Erie at Leamington and from the Niagara area are literature reports with no supporting specimens located. Basemap modified from: "St. Catharines sontbase." Brock University Map Library, St. Catharines, Ontario. Available: Brock University Map Library Controlled Access <http://www.brocku.ca/maplibrary/images/stcathv8.jpg>. (Accessed November 2, 2008.)

Canadian range

In Canada, Pink Milkwort has been recorded only from Ontario, where it is known from Walpole Island First Nation (WIFN) and from the Ojibway Prairie Provincial Nature Reserve in Windsor (Figure 6). There is a single historic record from rocky places along the Niagara River near Niagara Falls by David Douglas, a Scottish botanist visiting the falls in 1823. This and three other species recorded by Douglas have never since been found there, and Eckel (1991) was unconvinced they ever occurred there. Douglas was, however, a competent and highly respected botanist, and Pink Milkwort is quite distinctive. There is likely little reason to question its former occurrence in the area. It is here considered as an historical literature report with no supporting specimen located. John Macoun reported Pink Milkwort from a Windsor prairie in 1893 (Macoun, 1893). It was rediscovered by Allen Woodliffe in 1994 at Ojibway Provincial Nature Reserve (Woodliffe, pers. comm. 2004). Macoun (1893) also mentions the presence of Pink Milkwort at Leamington. No extant populations are known from this location.

The total extent of occurrence in Canada based on a convex polygon around all extant occurrences minus the intervening areas of unsuitable habitat (marsh and open water) is 52 km². The total number of one kilometre grid squares occupied by Pink Milkwort at WIFN is 7 and at Ojibway Prairie Provincial Nature Reserve is 1, for a total Index of Area of Occupancy of 8 km². The number of 2x2 km squares occupied is 4 at WIFN and 1 at Ojibway for a total of 20 km². The Canadian populations occupy less than 1% of the global range of the species. The populations are not considered severely fragmented because one population has >95% of all plants and comprises most of the actual area of habitat for the species.

Population spatial structure and variability

No information has been published on the genetics of this species.

Designatable units

The species comprises a single designatable unit because no infraspecific taxa are recognized and the species occurs within a restricted geographical area within a single COSEWIC Ecological Area (Great Lakes Plains).

HABITAT

Habitat requirements

Pink Milkwort is generally found in open, mesic to dry mesic sand prairie sites. Brownell (1984, 1998) reported it was always closely associated with Little Bluestem (*Schizachyrium scoparium*).

In Canada, Pink Milkwort is found on open wet mesic to mesic prairies. At WIFN, soils are sandy loams and sandy clay loams with moderate to imperfect drainage, an Ah horizon (incorporation of organic material into the mineral soil) of about 22-24 cm and mottles at about 20-25 cm (Bowles, pers. obs. 2008). Mottles are an indication of the depth at which the soil is intermittently saturated. Mottles at 20-25 cm indicate a moist regime in sandy loams (Ontario Institute of Pedology, 1985).

Periodic fire is probably essential for maintaining open prairie conditions. A high water table in spring and summer drought may contribute to maintaining open prairie.

The most abundant associated species at WIFN are Little Bluestem, Tall Nut-rush (*Scleria triglomerata*), Bastard Toadflax (*Comandra umbellata*), Culver's Root (*Veronicastrum virginicum*), Pussytoes (*Antennaria neglecta*), Dense Blazing-star (*Liatrix spicata*), various sedges (*Carex* spp.), Witch Grass (*Panicum virgatum*), Golden Alexanders (*Zizia aurea*), Virginia Mountain Mint (*Pycnanthemum virginianum*) and Sky Blue Aster (*Symphotrichum oolentangiense*) (Walpole Island Heritage Centre, 2003 unpublished data; Bake, 2007). Total plant cover around Pink Milkwort plants averaged about 20%, including about 12% forbs and about 6% graminoids. Mean vegetation height was about 42 cm with a range 23-80 cm.

Habitat trends

Most of the extant prairies at WIFN are in good to excellent condition. Many areas have never been ploughed and regular burns occur (Bowles, 2005). In Ontario, where rainfall is abundant, without fire to suppress tree growth, prairies can quickly change to savannah and savannah to woodland. This is particularly true on WIFN where the water table is relatively high (Woodliffe and Allen, 1998; Woodliffe, 2002). Some prairies may have expanded since the First Nations started maintaining a permanent settlement on the islands in the early 1800s, but many areas have been lost to agriculture, development and encroachment by woody species. In the 25 years between 1972 and 1998, air photos suggest that prairie at WIFN was reduced by 36% from about 730 ha to about 470 ha (Crow *et al*, 2003). Some of this resulted from conversion to agriculture and housing, but most was due to encroachment by forest and woodland in the absence of regular fires.

Losses of Pink Milkwort habitat in the period since 1998 also include continuing conversion to agriculture, development and encroachment by woody species. The frequency of fires on WIFN prairies has decreased as housing increases, and mowing has affected at least two populations. One site was mowed for the first time in 2008.

At Ojibway Prairie Provincial Nature Reserve, the last prescribed burn was in 2003 and the habitat is being invaded by fire sensitive species (Pratt, pers. comm. 2008; Woodliffe, pers. comm. 2008). A burn was planned for the spring of 2009. However, an accidental fire burned through about 34 ha of the Reserve just prior to the planned burn (Pratt, pers. comm. 2009). The fire may have missed the Pink Milkwort site. A burn is planned for 2010 (Pratt, pers. comm. 2009).

Habitat protection/ownership

The Ojibway Prairie Provincial Nature Reserve is managed by Ontario Parks and protected under the provincial *Parks Act*. It is managed with an approved Park Management Plan as well as a Resource Management Plan.

At WIFN, most Pink Milkwort sites are on private lands held under Certificates of Possession (under the *Indian Act*). The habitat for part of one population (WIFN 1) is leased for conservation purposes, and another area is protected as a nature reserve. Two populations (WIFN 2 and WIFN 3) are on Band-owned land. One of these (WIFN 3) is next to a garbage dump. All sites for Pink Milkwort at WIFN are in or adjacent to areas that have been recognized by the Band Council as Significant Natural Heritage Sites. This status provides recognition, but no formal protection. The draft Walpole Island Ecosystem Recovery Strategy (Bowles, 2005) identifies general threats and actions to protect habitat on WIFN.

BIOLOGY

Life cycle and reproduction

Pink Milkwort is an annual species that reproduces only sexually, by seeds that are produced in small numbers (two per flower). In Ontario, large plants with multiple inflorescences may produce up to 200 seeds, but most plants produce fewer than 80 (Bake, 2007, Bake and Bowles, unpublished data).

Plants flower mainly from June to September in Ontario, although occasional late flowering individuals may be found into early October. Peak flowering likely occurs during August. Flowers are bisexual and can be self-pollinated, although the rates of self-pollination and outcrossing are unknown. A small number of plants bagged to isolate them from pollen from other individuals in 2006 set a few seeds (Bake, 2007). This supports the hypothesis of Gillet (1968) who believed the whole family of Polygalaceae is capable of self-pollination if no cross-pollination occurs.

Germination rates for Pink Milkwort are unknown. Attempts to germinate stratified seeds at the University of Western Ontario were unsuccessful (Bake, 2007). Soil seed banks are likely present.

Herbivory

The flowering head of Pink Milkwort is occasionally removed by herbivores. Some plants that lose their terminal inflorescence will produce a branch, with its own terminal inflorescence, at the next undamaged node down the stem.

In 2006, the background rate of herbivory in Ontario (based on missing terminal inflorescence) was about 9%. This number could be an underestimate because plants without inflorescences are difficult to detect, so this number is based mainly on plants that had recovered from previous browsing and had produced inflorescences on side branches. Plants that were tagged for a phenology study were browsed at a rate of about 35 of 40 plants (Bake 2007, Bake and Bowles, in preparation). Because tagging was terminated after the high rate of browse was detected, it is not clear whether this rate represents normal levels of browse that are not otherwise detected, or whether smell from handling the plants or the visual clues of the tags themselves attracted browsers.

The only insects found on Pink Milkwort at WIFN likely to cause damage (Bowles pers. obs. 2007) were adults and juveniles of *Merocoris distinctus*, a common species of true bug (Hemiptera) in the family Coreidae (Leaf-footed Bugs).

Dispersal

The function of the small sac attached to the seeds is not known. It may be an eleiosome attractive to ants, or may aid dispersal in some other way. Seeds left on small trays protected by a wire cage from predators such as birds and mice, but accessible to ants, were removed just as often as seeds left in the open. Ants have been observed removing and carrying seeds (Bake, 2007; Bowles, pers. obs.). Additional observations by Bake of ants taking the seeds with the sac intact in preference to those from which it had been removed lends support to the suggestion that it is an eleiosome to which the ants are attracted. Brownell (1984, 1998) also suggested wind dispersal, but no justification is given. The air sacs may provide some buoyancy; however, ripe fruits (capsules) of Pink Milkwort detach from the plant very easily, and usually fall intact with the two seeds still inside (Bowles, pers. obs. 2006). Given the low height of the plant, usually well below the height of surrounding vegetation (Bake, 2007), a ground surface usually covered by leaf litter, and the relatively heavy fruit with no obvious structures for catching the wind, wind dispersal over large distances seems unlikely. Fruit has been observed being knocked off plants during heavy summer rain showers (Bowles, pers. obs. 2006). It is possible that splashing and floating on temporarily flooded ground surfaces may help short distance dispersal. The distribution of the populations and sub-populations suggest that long distance dispersal is extremely rare.

Interspecific interactions

In greenhouse experiments, Klironmos (2002) found that *Polygala incarnata* plants grew less well in soil with a previous history of the same species, compared with soil in which other species had previously grown. He suggested that negative feedback from the accumulation of soil pathogens may be responsible for the limited distribution and rarity of susceptible plants such as Pink Milkwort.

POPULATION SIZES AND TRENDS

Search effort

The prairies at WIFN (Woodliffe and Allen, 1996) and Ojibway Prairie Provincial Nature Reserve have been well surveyed, and the historic and present populations of Pink Milkwort are probably known. On the other hand the plant is slender and difficult to see, particularly when there are no flowers or the vegetation is taller than about 0.5 m, so some plants and even some populations may have been missed. Given the specialized habitat of Pink Milkwort, its patchy distribution, and the scarcity of quality prairie remnants in Ontario, it is unlikely that there are any large undiscovered populations elsewhere.

The WIFN populations have been monitored since 2003. Censuses have consisted of walking back and forth across the site at known locations and recording the GPS waypoint location of plants including the number of individuals at each GPS waypoint and the approximate area they occupy. Most of these censuses have been carried out by staff and seasonal staff of the Walpole Island Heritage Centre (WIHC), J.M. Bowles under contract to WIHC, members of the Michigan Botanical Club on field outings to WIFN, and other guests. Records of exact search hours have not been kept, but have involved over 20 people on 17 dates between 2003 and 2006. All known sites were censused in 2006. During 2008 most of the effort was spent verifying that plants were present at known sites and searching historic sites presumed extirpated by Brownell (1998). Searches in 2008 were made on 6 dates between 25 August 2008 and 16 September 2008, mainly by J.M. Bowles and Clint Jacobs (WIHC).

At Ojibway Prairie Provincial Nature Reserve, a census was carried out in 2008 by Paul Pratt, Shane Butnan and Kyle Coatsworth on 9 August 2008 for a total of 135 person minutes.

Abundance

Pink Milkwort at WIFN occurs in three populations based on a distance of at least one kilometre between separate populations. The largest of these populations (WIFN 1) contains 1600 to 2250 plants in any year. It comprises 7 sub-populations. Six of these are spread over 6 loosely interconnected prairie patches (separated by a swale, agricultural land, housing lots and roads) in an area of about 1.5 km². The other sub-population is on another island, separated by a channel about 30 m wide. This sub-population was thought to be extirpated (Brownell, 1998), but was rediscovered in 2008 by J.M. Bowles and Clint Jacobs. The two other populations are more compact. Population WIFN 2 is spread over about 1.4 ha of a prairie patch. This area was censused in 2003 (67 plants) and 2006 (89 plants). WIFN 3 is a remnant stand of individuals remaining after most of the population was converted to agriculture in 1985. A single individual was found in 2003 and nine plants in about 2 m² in 2006. In July 2008, the site was mowed and no plants or stumps or regenerating plants, were found. The area was checked twice, about 6 and 8 weeks after mowing. Population WIFN 4 has not been seen since 1996.

A population census of Pink Milkwort at Ojibway Prairie Provincial Nature Reserve in 2008 yielded 9 plants (Pratt, pers. comm. 2008).

Fluctuations and trends

Since Pink Milkwort is an annual, it is likely that populations fluctuate from year to year as a result of stochastic events such as weather, pollinator availability, moisture levels and recent fire history.

Because of the short period of regular monitoring and inconsistencies in census (observer bias, search effort, etc.) it is difficult to document real fluctuations and trends. Apparent increase in plant numbers between the previous and current status reports (Table 1) is more likely due to increased search effort and more rigorous counting methods than to a real increase in numbers.

Table 1. Summary of historic and current records and population estimates for Pink Milkwort in Canada.

Population	Original record	Brownell 1984	Brownell 1998	Most recent record
Ojibway Prairie Provincial Nature Reserve	Macoun (1893)	Presumed extirpated	28 plants (Brownell, 1997)	9 plants (Pratt, 2008)
Leamington	Macoun (1893)			Historical literature report
Niagara	Douglas (1823)	Presumed extirpated	Presumed extirpated	Douglas (1823). Historical literature report
WIFN Population 1	Dodge (1894)	Brownell and Catling (1980): No population estimates given	Listed as 3 populations: "hundreds of plants throughout"; approximately 100 before 1986; 0 in 1997 Presumed extirpated	6 sub-populations over 1.5 km ² area 42 plants (2008) 1824 plants (2003); 577 plants (2006); extant (2008) 263 plants (2003); 943 (2006); extant (2008) 107 plants (2003); 144 plants (2006); extant (2008) 18 plants (2008) 13 plants (2008) (WIHC database)
WIFN Population 2	Soper and Shields (1950)?	Brown <i>et al.</i> (1982)	Woodliffe and Allen (1966)	69 plants (2003); 87 plants (2006) Not checked in 2008 (WIHC database)
WIFN Population 3	Soper and Shields (1950)?	Not mentioned	100 plants in 1977 (Brown) Presumed extirpated in 1985 (Woodliffe and Allen (1996)	1 plant (2003) 9 plants (2006) Mowed in 2008 and no plants found (WIHC database)

Population	Original record	Brownell 1984	Brownell 1998	Most recent record
WIFN Population 4	1947-1948? Various collectors Canne-Hiliker (1988)	Not mentioned	14 plants Based on Woodliffe and Allen (1996)	Not found since 1996. Possibly extirpated
Total in Canada		No estimate	c 400 at WIFN (Woodliffe, 1997) c 30 plans at Ojibway Prairie Provincial Nature Reserve	c 1800 plants at WIFN c 10 plants at Ojibway Prairie Provincial Nature Reserve

Some known sites for Pink Milkwort on WIFN have been lost since 1990 (see Table 1), mainly due to conversion to agriculture (WIFN 4 and most of population WIFN 3) and building lots (part of WIFN 1), but the rate of wholesale loss of habitat since then has been reduced. Nevertheless, mown areas have increased to the detriment of Pink Milkwort populations, and some houses have been built. Other disturbances and declines in habitat quality due to ATV use and invasive species are ongoing. The number and longevity of seeds in the seed bank are unknown.

Rescue effect

There is no likelihood of natural reintroduction of plants from the US if Pink Milkwort were extirpated from Canada. The species is already extirpated from Michigan and the nearest populations are over 200 km away in southern Ohio, where it is rare (S2) and listed as Threatened.

LIMITING FACTORS AND THREATS

The major limiting factor for this species in Canada is the decline of the specialized tallgrass prairie habitat where it occurs. Tallgrass prairie is critically imperiled in Canada (Bakowsky, 1995) and fire is extremely important in maintaining the open prairie required by this species. The importance of other species such as pollinators, ants as dispersal agents, and mycorrhizal fungi are not known, but Klironmos (2002) suggests a negative feedback with soil biota.

Anthropogenic factors are important at WIFN in reducing the amount of natural prairie habitat by conversion to agriculture and housing and other land uses. The rate of conversion of prairie to agriculture has been reduced on WIFN because of an active campaign by the WIHC to lease the land for conservation, but the threat remains, especially on private land. Most of the largest sites for Pink Milkwort at WIFN are already protected under land ownership and leasing by the WIHC, but there is a critical housing shortage at WIFN and houses are continually built in tallgrass prairie habitat. Direct trampling, especially from ATV traffic may also be a factor, at least one stand of Pink Milkwort was on an ATV trail in 2008. Regular mowing has caused the loss of part of one sub-population at WIFN and negatively affected plants at another population in 2008. An area of prairie near the garbage dump was mowed in June 2008. No plants of Pink Milkwort at WIFN 3 were found in 2008. The precise location was either covered by some dumping or mowed.

Invasive species are invading several Pink Milkwort sites and causing a decline in habitat quality at WIFN. These include Giant Reed (*Phragmites australis*) and White Sweet Clover (*Melilotus alba*). Canada Thistle (*Cirsium arvense*) is abundant and increasing at one site.

Trampling, mainly by ATVs, is increasing.

Although all recent sites for Pink Milkwort at WIFN have been burned since 2006, the site at Ojibway Prairie Provincial Nature Reserve has not. Lack of fire is allowing populations of fire intolerant species to move in to Pink Milkwort habitat. Black Locust (*Robinia pseudoacacia*), a fire-tolerant invasive is also moving in here (Bowles, pers. obs.; Woodliffe, pers. comm. 2008) and may pose a serious threat if it is not controlled. A fire is planned for 2010 at the Ojibway Prairie Provincial Nature Reserve (Pratt, pers. comm. 2009).

Lack of fire and encroachment by woody species may be the cause of extirpation of one population at WIFN since 1990. However, late season (fall) fires would presumably be damaging to this and a number of other late-flowering species.

Pink Milkwort may also be affected by changes in moisture regime as a result of dredging and ditching operations and natural changes in lake levels. High water levels during the late 1980s may have reduced populations at some sites.

SPECIAL SIGNIFICANCE OF THE SPECIES

The presence of the species in Ontario is of ecological significance because of the limited amount of suitable habitat and the extreme rarity or extirpation of the species in adjacent states.

There are no recorded traditional Aboriginal uses for Pink Milkwort listed in Moerman (1998), although several other species in the genus are used for various medicinal purposes. A Texas-based website “A Weeds Worth” (<http://www.zombiejuice.com>) reports that the root is used medicinally for respiratory ailments and is currently even sold in some pharmacies. It is similarly listed in Smyth (1903).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Pink Milkwort has a Global Status of G5 (secure) and a US Status of NNR (not ranked), because although it is undetermined or rare in states in the northern part of its range, the total range is large (NatureServe, 2009). In Canada, it has an N-rank of N1 (critically imperiled) and was assessed by COSEWIC as Endangered in May 2000. This species is listed as Endangered under Schedule 1 of the *Species at Risk Act*, which applies to populations on federal land, including WIFN, but not Ojibway Prairie Provincial Nature Reserve. In Ontario, it has an S-rank of S1 (critically imperiled) and is listed as Endangered under the *Endangered Species Act, 2007*, and the species and its habitat are protected. It is listed as Endangered in Illinois, Indiana, New Jersey, Pennsylvania and Wisconsin, and as Threatened in Iowa and Ohio. S-ranks for all the US states where it occurs are given in Table 2.

Table 2. S-rank status for Pink Milkwort in the United States.

S-rank	State
SX (extirpated)	Michigan, New York
SH (historical)	New Jersey, Pennsylvania
S1 (critically imperiled)	Delaware, Illinois, Indiana, Wisconsin
S2 (imperiled)	Iowa, Maryland (S2S3), Ohio
S4 (secure)	Kentucky (S4?), Virginia
SNR (not ranked)	Alabama, Arkansas, District of Columbia, Florida, Georgia, Kansas, Louisiana, Mississippi, Missouri, Nebraska, Oklahoma, South Carolina, Tennessee, Texas

TECHNICAL SUMMARY

Polygala incarnata

Pink Milkwort

Polygala incarnat

Range of occurrence in Canada (province/territory/ocean): Ontario

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines (2008) is being used)	<1 yr
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals? The species fluctuates.	N/A
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations] The species fluctuates.	N/A
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. The species fluctuates.	N/A
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations]. The species fluctuates.	N/A
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future. The species fluctuates.	N/A
Are the causes of the decline clearly reversible and understood and ceased?	No
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	52 km ²
Index of area of occupancy (IAO) (Always report 2x2 grid values; other values may also be listed if they are clearly indicated (e.g., 1x1 grid, biological AO)).	8 km ² based on 1x1 km grid; 20 km ² based on 2x2 km grid
Is the total population severely fragmented? Over 95% of the total population occurs in the largest population, which also comprises most of the habitat occupied by the species.	No
Number of "locations" (as per definition, in relation to threat)	4 likely but with plants only seen at 3 in 2008
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	No (stable)
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	No
Is there an [observed, inferred, or projected] continuing decline in number of populations?	No (stable or declining)
Is there an [observed, inferred, or projected] continuing decline in number of locations?	No (stable or declining)
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Decline in quality
Are there extreme fluctuations in number of populations?	No

Are there extreme fluctuations in number of locations (as per definition, in terms of threat)?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each population)

Population	N Mature Individuals
WIFN Population 1 [6 sub-populations; all extant in 2008; see table 1 for survey history]	ca. 1700
WIFN Population 2	87 [in 2006]
WIFN Population 3 [area mowed in 2008 with no plants found]	0
Ojibway Prairie Provincial Nature Reserve	9 [2008]
Total	ca. 1800

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	None available
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Threats (actual or imminent, to populations or habitats)

Habitat conversion to agriculture, housing development, mowing, trampling, drainage and moisture alteration, lack of fire causing encroachment by woody species, invasive species.
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Rescue Effect (immigration from an outside source)

Status of outside population(s)? USA: Extirpated from adjacent states – Michigan and New York, very rare (S2) in Ohio, SH in Pennsylvania. Nationally Not Ranked in the US, most populations are in the southeastern US.	
Is immigration known or possible?	Unknown and unlikely
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Possibly, but good quality habitat is scarce and declining.
Is rescue from outside populations likely?	No

Current Status

COSEWIC: Endangered (November 2009)

Status and Reasons for Designation

Status: Endangered	Alpha-numeric code: B1ab(iii)+2ab(iii)
Reasons for designation: This annual herb is highly restricted geographically and is present in tallgrass prairie habitats in southwestern Ontario. There are likely four populations with a total of approximately 1800 plants, most of which are found in one population. Threats to all populations include encroachment by woody plants due to fire suppression and invasive species. Habitat conversion to agriculture, housing development, mowing, trampling, drainage and moisture alteration threaten three populations.	

Applicability of Criteria

<p>Criterion A (Decline in Total Number of Mature Individuals): Not applicable. The populations fluctuate and have seed banks; there is no evidence of population decline.</p>
<p>Criterion B (Small Distribution Range and Decline or Fluctuation): Meets Endangered B1ab(iii)+2ab(iii) with the EO and IAO being well within criterion limits and likely only four locations are extant with only three with plants counted in 2008; continuing decline in habitat quality is evident at all sites. Extreme fluctuation has not been recorded for this annual, but large fluctuations have been documented at some sites.</p>
<p>Criterion C (Small and Declining Number of Mature Individuals): Not applicable. With fluctuating population sizes and inadequate long-term monitoring, a continuing decline in mature individuals cannot be demonstrated.</p>
<p>Criterion D (Very Small Population or Restricted Distribution): May meet Threatened D2 with only 4 populations and IAO of 20 km² but uncertain if threats are severe enough to cause loss of populations within a very short period of time.</p>
<p>Criterion E (Quantitative Analysis): None available.</p>

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Authorities consulted

Dean Jacobs, Director, Walpole Island Heritage Centre, Walpole Island First Nation.
Clint Jacobs, Natural Heritage Coordinator, Walpole Island Heritage Centre, Walpole Island First Nation.
Michael J. Oldham, Botanist, Natural Heritage Information Centre, Ministry of Natural Resources, Peterborough, Ontario.

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Jane M. Bowles received her Ph.D. from the University of Western Ontario in 1980. She has over 25 years of experience as a freelance ecologist in southern Ontario, doing

life science inventories, pursuing research in conservation ecology and working with species at risk. She has worked with the WIHC on their species at risk and habitat stewardship programs since 2003. She has been a member of the Vascular Plant Specialist Sub-Committee of COSEWIC since 2002 and a member of COSSARO since 2006. She sits on the Recovery Teams for Wood-poppy, Lake Huron Dune Grasslands/Pitcher's thistle, Tallgrass, Carolinian Woodlands and WIFN. She is an Adjunct Professor at the University of Western Ontario where she has also been Curator of the Herbarium and Director of the Sherwood Fox Arboretum since 2005.

Clinton R. Jacobs is Anishinaabe from Walpole Island First Nation – Bkejwanong Territory and has been Natural Heritage Coordinator for Walpole Island Heritage Centre since 1998. He is part of the Walpole Island Heritage Centre's Natural Heritage Program that coordinates numerous initiatives relating to the conservation of Walpole Island First Nation's natural heritage. The Natural Heritage Program aims to connect the Walpole Island community to its unique natural heritage through enhanced appreciation, knowledge and respect by focusing on biodiversity, education, cultural connections, communications, outreach and sustainability. The Natural Heritage Program is also heavily involved in Species at Risk and Habitat Stewardship. Clinton manages species at risk monitoring, habitat management, outreach and education programs on the Walpole Island First Nation as well as the land securement program. He advises and supervises research activities on WIFN in collaboration with various universities. He is familiar with all populations of plant species at risk on Walpole Island and supervises field crews who conduct monitoring and census. He is well recognized in the community and has ongoing regular contact and communication with landholders. He has reviewed and commented on numerous single species recovery strategies. He sits on the Walpole Island Ecosystem Recovery Team and his involvement was integral to the development of the Walpole Island Ecosystem Recovery Strategy.

COLLECTIONS EXAMINED

No herbarium collections of *Polygala incarnata* were examined during the preparation of this report.