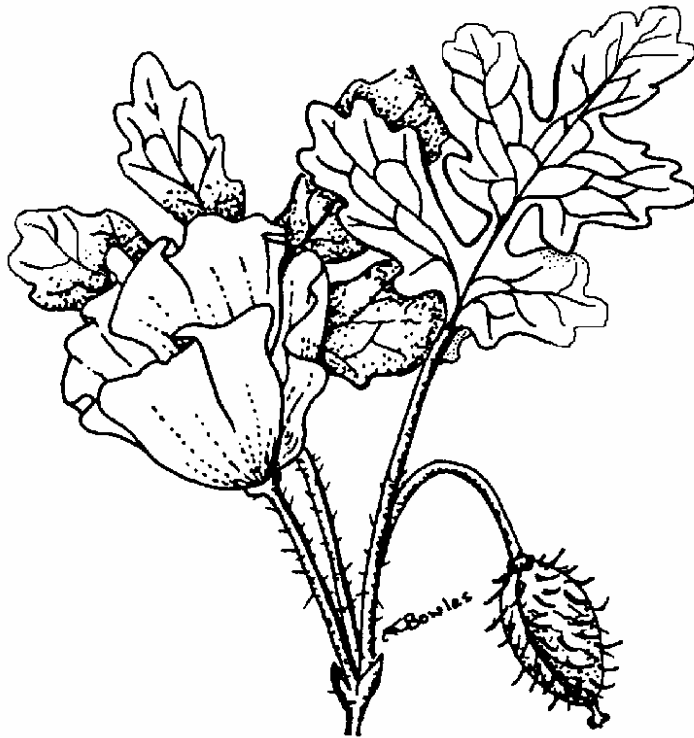


Recovery Strategy for the Wood-poppy (*Stylophorum diphyllum*) in Canada [Proposed]



Jane M. Bowles

June 2006

Recovery Strategy for the Wood-poppy (*Stylophorum diphyllum*) in Canada

Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In the spirit of cooperation of the Accord, the Government of Ontario has given permission to the Government of Canada to adopt the Recovery strategy for the Wood-poppy (*Stylophorum diphyllum*) in Canada under Section 44 of the *Species at Risk Act* (SARA). Details are provided in the addenda of this document.

Following this 60-day comment period starting in February 2007, and until the federal Minister of the Environment determines otherwise or the Ontario Ministry of Natural Resources formally amends this document, this recovery strategy will be the recovery strategy of the Minister of the Environment of Canada for this species.

RECOMMENDED CITATION

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Additional copies can be downloaded from the SARA Public Registry (www.sararegistry.gc.ca/)

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RESPONSIBLE JURISDICTIONS

Wood-poppy occurs in the province of Ontario, and the recovery strategy was developed by the province. The Canadian Wildlife Service - Ontario Region, on behalf of the competent minister (the Minister of the Environment), cooperated in the development of the recovery strategy.

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PREFACE

Wood-poppy is under the management jurisdiction of the Ontario provincial government.

The *Species at Risk Act* (SARA, Section 37) requires the competent Minister to prepare a recovery strategy for all listed extirpated, endangered or threatened species. SARA Section 44(1) allows the Minister to adopt an existing plan for the species if it meets the requirements under SARA for content and process (Sections 39-41).

Wood-poppy was listed as Endangered by COSEWIC in May 2000, and was added to Schedule 1 of SARA in June 2003. The Ontario Ministry of Natural Resources led the development of this recovery strategy for the species in cooperation with the Canadian Wildlife Service – Ontario Region, Environment Canada. All responsible jurisdictions reviewed and acknowledged receipt of the strategy.

EXECUTIVE SUMMARY

Wood-poppy is a long-lived, herbaceous, spring-flowering perennial. There are only three known populations of the species in Canada, comprising about: 24; 250; and, 150 mature plants each. The species is listed as N1, Endangered in Canada (COSEWIC, 2004), listed under Schedule 1 of the Species at Risk Act, ranked S1 in Ontario, listed as Endangered in Ontario and is ranked G5 globally. It was regulated as Endangered under Ontario's *Endangered Species Act* in 1994. The centre of its range is western Virginia, Kentucky and southern Illinois.

In 1997 a Wood-poppy Recovery team was formed in response to immediate threats to the Wood-poppy and its habitat. Seven years of recovery action have resulted in 1) the discovery of an additional site; 2) co-operation with private landowners of Wood-poppy sites; 3) establishment of two *ex-situ* populations of known maternal lines; 4) information about the breeding biology of Wood-poppy in Canada, including identification of seed predation and possible lack of germination sites as important factors limiting recruitment; 5) collection and preparation of material from Canadian and US populations for genetic studies; and 6) articles and newspaper columns to raise awareness about the species.

Critical habitat has been identified in this recovery strategy and includes the current area that the populations occupy plus the surrounding polygon of the same Ecological Land Classification (ELC) vegetation type. This identification will be refined following the completion of the Schedule of Studies.

The goals of the Recovery Strategy are to ensure that extant populations of Wood-poppy are protected with no loss of numbers of mature individuals, to secure the habitat, and to restore populations at all known localities to numbers and demographic structures that are self sustaining. This will be achieved through improving degraded habitat, increasing landowner commitment through stewardship incentives, monitoring to determine viable population numbers and demographics, out-planting *ex situ* progeny at the smallest population, continuing studies on seed dispersal and survivorship, and assessment of genetic variability within and between populations.

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SPECIES INFORMATION

Date of Assessment: May 2000

Common Name: Wood-poppy

Scientific Name: *Stylophorum diphyllum*

COSEWIC Status: Endangered

Reason for Designation: Only a few hundred plants remain in two small colonies that are highly disjunct from main range of the species. The decline is due to agricultural expansion and impact of exotic species.¹

Canadian Occurrence: Ontario

COSEWIC Status History: Designated Endangered in April 1993. Status re-examined and confirmed in May 2000. Last assessment based on an existing status report with an addendum.

¹ Since completion of the Status Report (Bowles and Oldham, 1993) an additional population has been found.

1. BACKGROUND

1.1 Description

1.1.1 Description of the species

Stylophorum diphyllum is a perennial herbaceous species up to about 40 cm tall, with a stout rhizome. The leaves are pale beneath and mostly basal, with long stalks. They are deeply divided, almost to the mid-vein, into five to seven lobed and toothed segments. The flowering stalk has two or sometimes three leaves that are more-or-less opposite about half way up the stem. Stems, sepals, and sometimes leaves have few to many stout, multi-cellular hairs. Flowers are in few-flowered clusters at the end of the flowering stalk. Flowers have four petals that are 2-5 cm long and bright, rich yellow. The two sepals are hairy and slightly fleshy. The ovary is densely hairy, more or less elliptical in shape and narrowed to a long style that is persistent in the fruit. The fruit is a nodding, greyish-green, hairy, slightly fleshy, capsule that splits into three to four segments. All parts of the plant have a yellow to orange, bitter-tasting sap. A technical description of the species is given in Gleason and Cronquist (1963).

In spring, the large, bright yellow flowers of this species are distinctive. The leaves are strikingly similar to those of *Chelidonium majus* (celandine), a common Old World weed. In *Chelidonium* the leaves are all alternate in contrast to the basal and opposite or whorled leaves of *Stylophorum*. The flowers of *Chelidonium* are paler and much smaller, with narrow petals about 1cm long, and the sepals and fruit are hairless.

1.1.2 Populations and distributions

Wood-poppy is represented in Canada by only three known populations, near London, Ontario (Figure 1), where it is at the northern limit of its range. Although it is relatively common in scattered populations at the centre of its distribution in Virginia, Kentucky and southern Illinois, Wood-poppy has always been rare in Canada. All historic populations were from along the Thames River east of London. It was considered extirpated (Keddy, 1984) until it was rediscovered and reported in 1987 from a woodland along the Thames River in London. Since then 2 other populations have been found.

Wood-poppy is ranked S1 in Ontario (NHIC 2005), and all Ontario occurrences probably represent less than 1% of the species' global population (COSEWIC 2000).

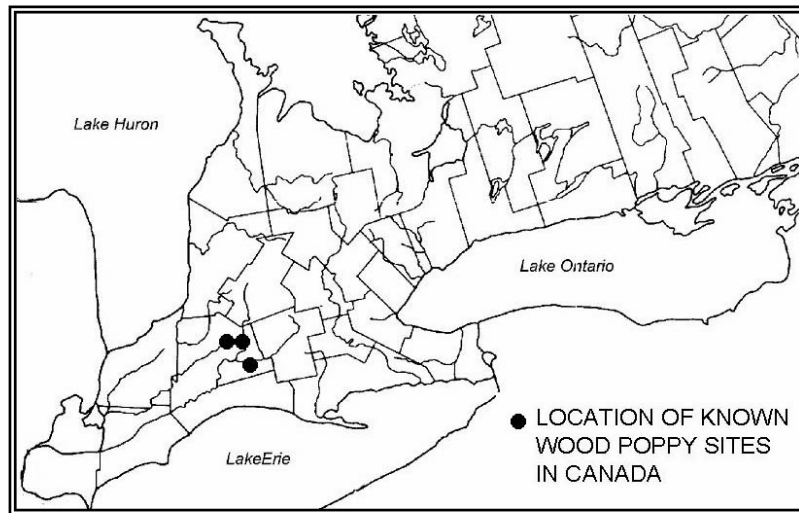


Figure 1: Map of southwestern Ontario showing location of Wood-poppy sites

The table below summarizes land ownership, population size and habitat notes for all three populations.

Popn.	Ownership	Number of plants	Date originally discovered	Description and notes
A	Conservation Authority	c. 24	1973	About 5-8 individuals in one clump on a wooded river valley slope, all of which have since died and been replaced by more dispersed recruitment. Twenty-four plants were counted in 2006.
B	Private	c.250	1987	Plants in one main patch with scattered outliers in a wooded ravine that was open pasture with clumps of trees in 1946. Contained about 800 individuals in 1993, but was subjected to logging and burial by fill later that year.
C	Private	c.150	1970's	At the edge of a commercial sugar bush next to a municipal drain. Rediscovered in 1998. Most plants in a patch with scattered outliers.

1.2 Description of the species' needs

1.2.1 Ecological role, biological needs and limiting factors

Stylophorum diphyllum is typically a plant of rich deciduous forests, forested ravines and slopes, woodland streams, ravine bottoms and the base of bluffs. Soils generally are somewhat calcareous. Although wild populations tend to be found under closed canopy forest, garden plants of *Stylophorum diphyllum* can do well in partial shade or full sun. The

Ontario populations of *Stylophorum diphyllum* represent the northern limit of its natural range. It appears to be adversely affected in years of cold winters and late springs.

Seeds have an oil-rich elaiosome² and are dispersed by ants. Ants are attracted to the elaiosome and carry off the seed, but may remove the elaiosome and discard the seed, which then germinates (Gates, 1943, Nordhagen, 1959). The species of ants involved are unknown. Seeds have a deep dormancy, but germination rates are high following cold stratification. There is a high rate of seed predation by mice in Ontario populations.

Seedling establishment is most successful on open or slightly disturbed micro-sites with bare soil. Plants are capable of flowering in their first year, but usually do not flower in the wild until their second or third year. Plants have indeterminate flowering that can continue until the fall, but the great majority of flowers are produced over a short period in spring. Seed set is more successful on early flowers. The flowers appear to be constructed for insect pollination, but visits by insects are not commonly observed. Plants are capable of self-pollination. Once established, plants can survive at least 10 and possibly 20 years or more. Most adult mortality appears to be due to crown rot. Late spring frosts can kill plants that have not hardened-off because they have been buried by a snow bank.

Small populations are vulnerable to stochastic events that may cause local extinction, and may suffer inbreeding depression. One population of Wood-poppy (A) had only a few mature plants, in one small clump. Although the clump appeared to be about the same size in 1993 that it was in 1973 (Dufton personal communication), several plants have died over the last four or five years. Since 2004 some new plants have established beyond the main clump. The largest population (B) lost about 600 plants (80% of the population) in 1993, as a result of fill placement and logging, but now the number of mature individuals appears to be more or less stable. The third population (C) has not been monitored long enough to determine trends. There is little evidence to date that Wood-poppy in Canada is suffering from inbreeding depression. Plants out-cross and self-pollinate easily and produce viable and healthy progeny.

Recruitment at Population A has been observed in only one year in 10 years of observation. Seeds at this site are almost all predated by mice (unpublished data). Seeds collected and planted at the site failed to germinate, although seeds planted under cultivation have germinated and the progeny thrived. Predation and unknown factors limiting germination appear to be major limiting factors at this site. No seed removal by ants has been detected at Population A. It is possible that a suitable ant fauna is missing.

At other sites recruitment of seedlings is sporadic and varies year to year. Some recruitment does occur, but so far there has not been enough demographic monitoring to determine if it is sufficient to allow the populations to increase. Spread to nearby sites is generally very low, even though the habitat appears suitable.

² Elaiosome: structure on surface of some seeds that contains an oily substance that aids in seed dispersal by attracting certain organisms such as ants

Stylophorum diphyllum in Canada is represented by three small populations, separated by several kilometers and at the periphery of the range. The nearest US populations are several hundred kilometers away, in southwest Michigan. It is unlikely that genetic exchange between the Canadian populations occurs. Seed dispersal is primarily by ants and is not generally long-distance. The three sites are too far apart for there to be any possibility of natural rescue effect or re-establishment after a local extinction event.

1.2.2 Habitat needs

Existing populations of Wood-poppy in Canada are all in mid-aged forest communities dominated by Sugar Maple. Other associated canopy trees include Bitternut Hickory, American Beech, American Elm, White Ash, Hackberry and Basswood. Canopy cover ranges from about 65 to 90%. The most common shrub layer species at Wood-poppy sites include Sugar Maple, Choke Cherry, Alternate-leaved Dogwood, White Ash, Basswood, Wild Red Raspberry, Staghorn Sumac and American Beech. Shrub cover ranges from more than 75% to less than 5% at different parts of the habitat. All sites have a rich assemblage of woodland ground flora, but it is not identical across sites.

Nearest neighbours to Wood-poppy plants are most commonly other Wood Poppies. At Population A the most common associated ground layer species are Garlic Mustard and Jack-in-the-Pulpit. At Population B and C common associates include Wild Ginger, Virginia Waterleaf, Zig-zag Goldenrod, Blue Cohosh, Wild Geranium and Jack-in-the-Pulpit. Soils at all sites are mesic glacial deposits that range from sandy loam to clay loam. Germination sites are often on bare soil that has been disturbed for example by animal activity, falling debris or slumping. Performance following human disturbances (fill, drainage activities) in and adjacent to the habitat demonstrates that plants can colonize disturbed and/or weedy sites. The species does not normally occupy the entire habitat that is apparently suitable adjacent to where it grows. Limits to Wood-poppy spread are not understood and it is unknown why the species occupies the sites it does and not apparently similar sites in the same area. Under cultivation it grows well in sun or shade and can be quite weedy.

1.3 Threats

The main threats to Wood-poppy populations in Canada have been identified as follows, and are listed in decreasing order of importance:

1.3.1 Small Population and poor recruitment

The small isolated populations and poor recruitment rates described above may be limiting the recovery potential of the species and make it more vulnerable to human threats such as recreation, forest management and encroachment from adjacent land use.

1.3.2 Erosion and Fill

Part of the ravine at Population B was destroyed by filling in 1993. Additional fill with topsoil and road-building adjacent to the site caused erosion of the ravine in 1997. At least 5 mature plants have been lost to erosion since then. Most plants are in less disturbed locations at the site. A municipal drain runs adjacent to Population C. Some outlying plants grow in the soil heaps along the drain. Further drainage operations, would impact these plants.

1.3.3 Change in adjacent Land Use

Population B is located right at the edge of an Environmentally Sensitive Area within the City of London and has already been affected by activities on and adjacent to the site (see *Erosion and Fill*). Current land use adjacent to the site includes agriculture and an industrial plant. Although the site is outside the current 30-year growth boundary of the City of London Official Plan, new development is taking place on neighboring lots. It is likely that land adjacent to Population B will be zoned for development in the future. Although The City of London Official Plan and the Provincial Policy Statement provide protection of the site itself, adjacent development would probably increase recreation pressure, and raise the level of disturbance to Population B.

1.3.4 Recreation pressure and trespassing

Increasing numbers of mountain bikers trespass on the property at two Wood-poppy sites. At Population A, in a site managed by a Conservation Authority, a combination of signage and moving the trail further from the Wood-poppy population appears to have been effective in reducing the threats. On the privately owned site at Population B new trails have been formed and marked without the knowledge or consent of the landowner. The trespassing is very aggressive, including damaged and removed signs, opening closed trails and cutting fences. Public awareness of the presence of Wood-poppy in London is quite widespread and the location of Population B is quite well known. It is not known how many people have visited the site, or how frequent those visits have been, but the landowners have complained about the numbers of trespassers. Because the slopes on which the Wood-poppy grows are so steep, they are very vulnerable to damage by trampling.

1.3.5 Forest Management

Logging degraded the habitat of Population B in 1993. The habitat is regenerating, but some edge trees are still dying. Shading by understory growth may become a problem. Population C is in a sugar bush. Management (logging, trails, trampling) could impact the population, but it has apparently survived next to a sugar bush operation for at least 30 years. The threat at this site does not seem to be imminent.

1.3.6 Invasive species

Garlic Mustard (*Alliaria petiolata*) is a direct competitor of Wood-poppy at all sites, but especially at Population A. Garlic Mustard plants immediately adjacent to Wood Poppies are removed each year. Disturbance from pulling Garlic Mustard here may have created germination sites for Wood-poppy seedlings. Japanese Knotweed (*Polygonum cuspidatum*) at Population B has been treated to prevent its becoming a problem, but it is not yet eradicated. Herb Robert (*Geranium robertianum*) is also of concern at Population B because large numbers of seedlings have been noted under and around mature Wood-poppy plants. Such plants could be in competition with Wood-poppy seedlings.

1.3.7 Wildflower gardening

Stylophorum diphyllum is prized by wildflower gardeners and is available for sale as a garden plant. It can be a prolific, almost weedy, garden plant in southern Ontario, growing well in rich soil in shade or partial sun. The origin of most garden stock is unknown and is almost certainly not Canadian. Garden plants have little value for conservation purposes. Extensive cultivation of species of very rare plants is likely to be detrimental to conservation efforts. Individuals from garden stock may escape into the wild. Adventive plants not only make assessment of natural populations impossible or very difficult, but they may genetically contaminate local stock and may also disrupt the natural community dynamics of the sites where they establish.

1.3.8 Climate

Stylophorum diphyllum is at the northern limit of its range in Canada and may be temperature limited. Populations have flourished in the last decade when temperatures have been amongst the warmest on record. It has been observed that late frosts kill unhardened plants and cool springs adversely affect flowering. The species may do well under global warming, but other effects of climate change, such as drought and unpredictable conditions may be detrimental.

1.4 Critical Habitat

1.4.1 Proposed identification of the critical habitat of Wood-poppy

Critical habitat for Wood-poppy is being identified in the Recovery Strategy for all three extant populations, to the extent possible, with further delineation to be completed at the Action plan stage, following the completion of the Schedule of Studies. Critical habitat includes the current area that the populations occupy plus the surrounding polygon of the same Ecological Land Classification (ELC) vegetation type (Lee et al., 1993). Occasional outliers found away from the main populations indicate that the plants are capable of spreading into adjacent areas within the same polygon. Critical habitat at Populations B and C should also include adjacent disturbed areas (fill and soil piles) into which there is occasional recruitment. At Population B where plants grow very close to the edge of the woodland, critical habitat may include portions of the adjacent agricultural land required to protect the habitat from the impending development.

Critical Habitat applies to the three extant populations and may be updated periodically, as new information becomes available.

1.4.2 Examples of activities that are likely to result in destruction of the critical habitat

Examples of activities that are likely to result in the destruction of the critical habitat of wood-poppy include, but are not limited to:

Recreation pressure: Increase in trail creation and use or increased access likely would be detrimental to Wood-poppy and its habitat.

Development: Development adjacent to the Wood-poppy sites would degrade the adjacent natural woodlands and lead to loss of habitat.

Fill, erosion and drainage: Additional filling of the ravine would further damage Wood-poppy habitat. Erosion of existing fill continues and further attempts at fill could damage more habitat. Road repair or widening adjacent to the ravine could pose further problems. Drainage operations adjacent to Population C could harm some plants.

Forest management: Heavy logging that opened the canopy or caused damage to the steep-sided ravines would be detrimental. Any logging would alter the habitat, but changes need not necessarily be detrimental to Woody Poppy populations. Expansion of sugar bush operations at Population C could harm the Wood Poppies if trees were felled onto the population or the plants were trampled or soil was compacted.

1.4.3 Existing and recommended approaches to habitat protection

Population A is in a Conservation Area and is managed as a natural area. A trail that was close to the Wood-poppy population has been moved. The site is monitored so that needs for vegetation management can be recognized and assessed. Garlic Mustard is pulled annually from the immediate vicinity of the Wood-poppy plants. Shrubs may be thinned if it appears that Wood-poppy plants are being affected by increasing cover.

Population B is privately owned. The main part of the Wood-poppy population has some protection as a Candidate Environmentally Significant Area (ESA) under the City of London Official Plan, but the Wood-poppy population extends to the boundary of the Candidate ESA. A Comprehensive Community Plan, currently underway, is required to determine the boundary of the ESA and protect the site from future development. Recreational use is still a current and potential threat. Development of adjacent lands, currently under active agriculture, is a future threat. The Recovery Team has assisted the landowner in attempts to control trespassing on the property where it threatens the Wood-poppy population. The landowner has been informed about options for protection and stewardship of the ESA and adjacent lands. A proposal to consider acquisition of portions of the land has been submitted to the Thames Talbot Land Trust that already owns another section of the ESA.

Population C is privately owned and lies between an active sugar bush and a municipal drain. The landowners are aware of the Wood-poppy on site, allow access for monitoring by members of the Recovery Team and have agreed to inform the recovery team if any change in land use is proposed. It may be useful to inform these landowners about options such as easements for the long-term protection of the woodland. Maintenance or alteration of the municipal drain would likely be detrimental to some Wood-poppy plants that grow on soil piles beside the drain.

1.4.4 Schedule of Studies

Description of Research Activity	Start Date	Recommended Completion Date
Detailed mapping of Wood-poppy populations onto airphotos using GPS where feasible.	2006	2008
Delineate and describe the nature and extent of the ELC polygons where the plants occur	2006	2008
Conduct habitat mapping	2006	2008

1.5 Actions already completed and underway

Wood-poppy recovery activities were started in 1997 with the formation of a Recovery Team and preparation of a Draft Recovery Plan (Bowles, 1997). Recovery actions completed or ongoing include the following:

- a) Search for additional Wood-poppy sites. One additional site that was known from the 1970's, but not reported in the literature or supported by collections was rediscovered. The number of mature individuals known increased to about 400 in three sites.
- b) Landowner contact and landowner involvement with the Recovery Team.
- c) Mapping of significant habitat by MNR for application of the Conservation Land Tax Incentive Program (CLTIP) and the Provincial Policy Statement (PPS) at two of the three sites.
- d) Regular monitoring of the existing populations. Increased knowledge of survival, recruitment and fecundity for population viability analysis.
- e) Habitat protection and management at the two sites where control of public access, trail closure, signage, invasive plant control are needed. Some trail closures have been successful, but a systemic problem of trespassing exists at one site. Invasive species control and control of public access will continue.
- f) Establishment of *ex-situ* populations of Wood-poppy at the Environmental Sciences Field Station at University of Western Ontario and the Royal Botanical Gardens. About 200 mature plants of 21 maternal lines survive at the two locations. Populations will be maintained for study. Additional small *ex situ* populations are established at Thorndale and South Walsingham, Ontario from seed collected in 1993.
- g) Germination and seed dispersal experiments have been done. These have helped determine causes of low recruitment rates. Seed:ovule ratio is moderate, fecundity is high, germination rates are high, but seed survival in the wild is poor. Many seeds (up to 100%) are predated after release from the capsule (Bowles, unpublished data). Dispersal

by ants does not appear to be taking place at the site with the smallest population, Population A (Bowles, unpublished data).

- h) Seed storage experiments have been done for Canadian populations. Stored seeds (2-3 years) failed to germinate (personal observation). Long-term viability of stored seeds may be poor. Viability of seeds in the main part of the range is unknown.
- i) Fifty seeds from Population A were planted in the fall of 2004, but failed to germinate. Additional seeds will be planted in the fall of 2005, for germination in the spring of 2006. Juvenile and young mature plants, if seeds germinate, will be planted into the wild in fall 2006.
- j) Material for genetic analysis has been collected from Canadian and US populations of Wood-poppy. Search for primers for genetic analysis is underway. The MNR forensic lab at Trent University is undertaking the work, but lack of funds precludes hiring a full time technician.
- k) Articles about Wood-poppy and the recovery actions have been published in naturalist magazines and regional media to raise awareness.

2. RECOVERY

2.1 Rationale for Recovery Feasibility

Ecological and technical feasibility of species recovery

Wood-poppy has always been rare in Canada, so widespread reintroductions within the range of the species in Ontario are an inappropriate approach to recovery, even though apparently suitable habitat exists within the previous range.

Based on limited data regarding the success of *ex-situ* populations, it is likely that Wood-poppy recovery will be successful. Experimentation is needed to find out how to create and manage optimal germination sites. Mature plants are easy to produce under cultivation and transplant success has been moderate to good in the limited trials to date.

Demographic monitoring has not yet been sufficient to determine if populations are viable over long periods. Individual plants are long lived and reproduce annually. The limiting factors appear to be seed predation and lack of germination sites. Larger numbers of seeds produced by more plants would increase the probability of some seeds surviving.

There is little evidence of inbreeding depression even at the site with the smallest population. Seed:ovule ratio was the same as for all three extant Canadian populations and although germination rates were slightly lower, the difference was not significant. Seedlings and adult plants *ex situ* are as vigorous as plants from the three extant Canadian populations.

Based on the above information, recovery is deemed feasible and will require continued site protection (low effort), some habitat restoration through invasive species control and creation

of germination sites (moderate effort) and will include experimental translocation at one site (high effort).

Anticipated Conflicts or Challenges

The most likely challenge to Wood-poppy protection is change of ownership or land use at the privately owned sites. Population C is in a sugar bush owned and operated by a large local producer. It is unlikely to be affected unless there is a change in management or ownership of the operation. Population B is within the City of London. Although the site is currently zoned Agricultural and it is not within a designated growth area, it is almost certain that adjacent lands will be developed in the future. Even though the critical habitat may be protected, impacts from surrounding land use will be unavoidable as the site is close to the edge of the existing woodland and already heavily used for recreation. Current landowners of all three sites are members of the Recovery Team.

2.2 Recovery Goal, objectives and corresponding approaches

2.2.1 Recovery Goal

The goals are to ensure that extant natural populations of Wood-poppy are protected with no loss of numbers of mature individuals, to secure the habitat, and to restore populations at all known localities to numbers and demographic structures that are self sustaining.

2.2.2 Recovery Objectives (2006-2011)

- 1) Stabilize or increase population sizes of mature plants at all known sites.
- 2) Increase recruitment rates at all known sites.
- 3) Increase population size at Population A to at least 50 mature individuals by out-planting progeny from that site raised ex situ.
- 4) Improve and protect habitat by controlling public access to Wood-poppy sites.
- 5) Improve degraded habitat by managing invasive plant species.
- 6) Determine the genetic variability within and among populations to determine relatedness and degree of outbreeding.
- 7) Maintain landowner support and commitment to protecting Wood-poppy habitat and explore stewardship incentives.
- 8) Secure Wood-poppy habitat in the City of London through policy, easements and agreements.
- 9) Increase awareness and support for the objectives of the Recovery Strategy.

2.2.3 Approaches Recommended to Meet Recovery Objectives

Priority	Obj. No.	Broad Approach/Strategy	Threats Addressed	General Steps	Outcomes or Deliverables
1	2, 3	<ul style="list-style-type: none"> Study seed and seedling survivorship. Create germination sites to enhance germination rates. 	<ul style="list-style-type: none"> Poor recruitment Seed predation Lack of seed dispersal 	<ul style="list-style-type: none"> Study of germination sites and germination requirements. Additional experiments on seed predation and dispersal. Grow seedlings <i>ex situ</i> and out plant progeny. Determine viability and storage time for seeds. Monitor seedling survivorship Continue experiments in creating germination sites. 	<ul style="list-style-type: none"> Better understanding of seed viability, survivorship and germination requirements to guide management options. Higher recruitment levels at all populations. Published paper on Wood-poppy seed ecology.
1	3	<ul style="list-style-type: none"> Out plantings of <i>ex situ</i> material. 	<ul style="list-style-type: none"> Poor recruitment 	<ul style="list-style-type: none"> Collect seeds and grow material for out planting. 	<ul style="list-style-type: none"> At least 50 mature plants at Population A.
1	4	<ul style="list-style-type: none"> Signage and trail closure to control access. Prepare and distribute information to recreationalists. 	<ul style="list-style-type: none"> Recreation pressure 	<ul style="list-style-type: none"> Signage. Trail closures. Prepare material on fragile sites and Species at Risk for distribution to off-road cyclists Prepare materials about landowner rights and trespassing issues. 	<ul style="list-style-type: none"> Reduced trespassing and recreation Population B. Articles and promotional material about trespassing issues in recreation literature.
1	5	<ul style="list-style-type: none"> Invasive species control as necessary. 	<ul style="list-style-type: none"> Invasive species 	<ul style="list-style-type: none"> Monitor invasive species populations. Continued removal of Garlic Mustard. Control of Japanese Knotweed. 	<ul style="list-style-type: none"> Response as needed to invasive species problems. Reduced impact of invasive species Japanese Knotweed removal at Population B.
1	8	<ul style="list-style-type: none"> Landowner contact, monitoring and enforcement. 	<ul style="list-style-type: none"> Erosion and fill 	<ul style="list-style-type: none"> Monitor activities on Wood-poppy site and adjacent land. 	<ul style="list-style-type: none"> Quick response to new problems. Enforcement when infractions occur.
1	7,8	<ul style="list-style-type: none"> Encourage landowners and land trusts to explore stewardship options and conservation incentives. Communicate with city planners to protect critical habitat. 	<ul style="list-style-type: none"> Land use conflicts 	<ul style="list-style-type: none"> Increase landowner awareness. Explore the best options for securing the Wood-poppy site and a buffer at Population B before detailed land use planning occurs. 	<ul style="list-style-type: none"> Land at Population B secured from land use conflicts

Priority	Obj. No.	Broad Approach/Strategy	Threats Addressed	General Steps	Outcomes or Deliverables
2	1	<ul style="list-style-type: none"> • Increase the number of known sites 	<ul style="list-style-type: none"> • Small population size 	<ul style="list-style-type: none"> • Search for additional sites. 	<ul style="list-style-type: none"> • New areas searched for additional populations • More known sites if plants are found.
2	1,2	<ul style="list-style-type: none"> • Study the possible effects of small population size. 	<ul style="list-style-type: none"> • Small population size 	<ul style="list-style-type: none"> • Demographic monitoring to provide data for Population Viability Analysis. 	<ul style="list-style-type: none"> • Preliminary Population Viability Analysis models created
2	6	<ul style="list-style-type: none"> • Examine within and among population genetic variability. • Examine relationships with US populations. 	<ul style="list-style-type: none"> • Genetic isolation 	<ul style="list-style-type: none"> • Develop DNA markers. • Sequence stored material from Canadian populations. • Determine genetic variability of Canadian populations. Determine relationships with US populations. • Identify genetic management units. Determine intrinsic life history attributes. 	<ul style="list-style-type: none"> • Understanding of genetic variability within and between Wood-poppy populations. • Genetic management units identified.
2	7	<ul style="list-style-type: none"> • Landowner involvement and communication to direct and monitor forest management. 	<ul style="list-style-type: none"> • Forest management 	<ul style="list-style-type: none"> • Monitor activities at all sites. • Assist landowners to prepare management plans 	<ul style="list-style-type: none"> • Management plans created and implemented for each Wood-poppy site.
3	1	<ul style="list-style-type: none"> • Monitor and document the effects of extreme climate events e.g. drought, late frosts. 	<ul style="list-style-type: none"> • Climate 	<ul style="list-style-type: none"> • Monitor effects of weather events on Wood-poppy performance. 	<ul style="list-style-type: none"> • Role of climatic factors better understood.
3	9	<ul style="list-style-type: none"> • Develop educational materials and contacts with gardening groups, nurseries and seed suppliers. • Discourage wildflower gardeners from making introductions into new sites. • Discourage use of material that does not originate from Canada. 	<ul style="list-style-type: none"> • Wildflower gardening 	<ul style="list-style-type: none"> • Create and distribute information materials (pamphlets, newsletter articles) to increase awareness. • Contact with gardening groups, nurseries and seed suppliers. 	<ul style="list-style-type: none"> • Information available to wildflower gardeners, nurseries and seed suppliers about problems with restoration and gardening with endangered species. • Increased awareness about using material of local provenance.

2.2.4 Effects on non-target species

Wood-poppy is a forest herb that grows in a mixed ground layer under a deciduous canopy. Invasive species (Garlic Mustard and Japanese Knotweed) are potential threats to survival of the habitat. Both species are being deliberately targeted for removal.

Experimental out-planting of Wood-poppy plants at Population A may include removal or disturbance of some native plants during the preparation of the planting sites. Effects will be very local as Wood Poppies will be spot-planted into the existing habitat. All potential planting sites will receive a three-season inventory prior to final selection to ensure no rare or sensitive species will be affected. No other species at risk are likely to be impacted by recovery actions for Wood-poppy.

2.2.5 Performance measures

Performance measures for the success of recovery action will include:

1. Census of mature individuals at all three sites show increasing numbers.
2. Out-planted plants survive and produce second generation progeny.
3. A reduced requirement for trail management and patrol at Population B indicates reduced, or less aggressive, trespassing.
4. Reduced requirement for management for Japanese Knotweed at Population B.
5. Demographic monitoring and Population Viability Analysis indicate population stability or growth at all three sites.
6. Microsatellite analysis establishes degree of genetic variability and outcrossing within and among Canadian populations and relationship to US populations.
7. Landowner participation results in stewardship agreements or similar protection of Wood-poppy sites. Municipal Official Plans and policies provide better protection for Wood-poppy habitat.

2.3 Knowledge Gaps

Survey Requirements: Repeated surveys to look for additional populations will continue in suitable habitat within the species known range in Ontario and around extirpated sites. Historic information on species location is very vague and general. Two additional sites have been found since the species was reported in 1987 after it was believed extirpated. The annual window of opportunity is limited to the flowering season (about 2 weeks in May), when the plants are easily visible. These surveys will continue. Old air photos (1945) will be used to screen sites that have had continuous woodland cover for at least the last 100 years.

Biological/Ecological Research Requirements: More demographic monitoring is needed to establish rates of recruitment so that Population Viability Analysis can be done. Although studies are under way, we know little about the genetic variability within and among populations. Until this is understood recovery efforts at each population will be limited to local material.

Clarification of Threats Research Requirements: Seed survival and germination seem to be the most important limiting factors in long term Wood-poppy survival. Although some information as to causes is available, more study is needed about seed dispersal, seed predation and germination requirements. Nothing is known about Wood-poppy seed banks or the long-term survival of seeds in the soil or in storage. Because mature Wood-poppy plants are long-lived (at least 10 years and possibly 20 or more years) and recruitment rates are low, long-term viability of the population is difficult to determine. All studies on Wood-poppy in Canada have been conducted in the last 10 years, when the weather was warmer than normal. Flowering rates appear to be reduced in cold springs. New growth that does not harden off because snow banks cover the plants can be killed by late frosts (personal observation).

2.4 Recommended Scale for Recovery

The Wood-poppy Recovery Project was initiated as a direct response to immediate threats to one of the populations. No other threatened or endangered species are known from these sites. Seven years of effort have gone into habitat protection, habitat restoration and research on the species. Much more is now known about its ecology. To date Wood-poppy recovery has been a “low-budget” operation with substantial in-kind contribution from members of the Recovery Team. Experiences during the process, such as landowner involvement, can certainly be applied to other situations. Biological information such as demographic monitoring can be used as models for other taxa with similar life histories. Genetic studies will provide information about genetic variability of plant populations at the edge of the species range.

2.5 Statement of When One or More Action Plans in Relation to the Recovery Strategy Will Be Completed

The Wood-poppy Recovery Team is a small group that formed in 1996. The Draft Recovery Plan (Bowles, 1997) has formed the basis for seven years of recovery activities performed by the Recovery Team. Ongoing activities include monitoring, invasive species control and management of *ex situ* populations.

An Action Plan for implementing activities to meet recovery objectives will be completed in late 2008 depending on priorities and constraints of the lead and participating organizations.

An Action Plan for collecting of seed, growing plants and out planting of *ex situ* material to increase the number of plants at Population A will be completed in June 2008 depending on priorities and constraints of the lead and participating organizations.

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ADDENDA

Jurisdictional responses



**Acknowledgement of Receipt of the
Recovery Strategy for Wood-poppy in Canada (June 2006) (Proposed)
by the Ontario Ministry of Natural Resources
on behalf of the Province of Ontario**

This draft National Recovery Strategy for Wood-poppy has been prepared in cooperation with the members of the Wood-poppy Recovery Team, Canadian Wildlife Service (CWS) and the Ontario Ministry of Natural Resources (OMNR). It represents advice to the OMNR on the recovery goals, approaches and objectives that are recommended to protect and recover the species. It does not necessarily represent the views of all individual members of the recovery team, or the official positions of the organizations with which the individual team members may be associated. The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives. Implementation of the plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations

Received by: Cameron Mack
Director, Fish and Wildlife Branch
Natural Resource Management Division
Ontario Ministry of Natural Resources
On behalf of the Province of Ontario

Date: July 2006

Species at risk – act today so they have tomorrow

DECLARATION FROM ENVIRONMENT CANADA

This recovery strategy has been prepared in cooperation with the jurisdictions responsible for the Wood-poppy. Environment Canada has reviewed and accepts this document as its recovery strategy for the Wood-poppy, as required under the *Species at Risk Act*. This recovery strategy also constitutes advice to other jurisdictions and organizations that may be involved in recovering the species.

The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives.

This recovery strategy will be the basis for one or more action plans that will provide details on specific recovery measures to be taken to support conservation and recovery of the species. The Minister of the Environment will report on progress within five years.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada or any other jurisdiction alone. In the spirit of the Accord for the Protection of Species at Risk, the Minister of the Environment invites all responsible jurisdictions and Canadians to join Environment Canada in supporting and implementing this strategy for the benefit of the Wood-poppy and Canadian society as a whole.

STRATEGIC ENVIRONMENT ASSESSMENT

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below.

This recovery strategy will clearly benefit the environment by promoting the recovery of Wood-poppy. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. Although experimental outplanting may result in some loss of adjacent native flora, the impacts are anticipated to be very localised and minimal. The SEA concluded that this strategy will clearly benefit the environment and will not result in any significant adverse effects.

RESIDENCE

SARA defines residence as: *a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating* [Subsection 2(1)].

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry:

www.sararegistry.gc.ca/plans/residence_e.cfm.