

COSEWIC
Assessment and Status Report

on the

Virginia Mallow
Sida hermaphrodita

in Canada



ENDANGERED
2010

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

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

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COSEWIC would like to acknowledge Melinda J. Thompson-Black for writing the status report on the Virginia Mallow, *Sida hermaphrodita*, in Canada, prepared under contract with Environment Canada, overseen and edited by Erich Haber, Co-chair, COSEWIC Vascular Plants Species Specialist Subcommittee.

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COSEWIC Assessment Summary

Assessment Summary – April 2010

Common name

Virginia Mallow

Scientific name

Sida hermaphrodita

Status

Endangered

Reason for designation

This globally rare showy perennial herb of the mallow family occurs in open riparian and wetland habitats where it reproduces by seed and asexually by spreading rhizomes. Only two small populations, separated by about 35 km, are known from southwestern Ontario where they are at risk from continued decline in habitat area and quality due to an aggressive invasive grass and quarry expansion.

Occurrence

Ontario

Status history

Designated Endangered in April 2010.



COSEWIC
Executive Summary

Virginia Mallow
Sida hermaphrodita

Species information

Virginia Mallow (*Sida hermaphrodita*) is a tall perennial herb of the mallow family. Plant height varies from 1-3 m. It has deeply lobed, toothed, maple-like leaves with the lobe tips dramatically elongated. The inflorescence produces clusters of white flowers from August to October (or first frost). Seeds are shed throughout the winter and germinate in early spring.

Distribution

The distributional range of Virginia Mallow is centred in the Appalachian Mountains and extends outward into both the Mississippi watershed and the Atlantic watershed. In Ontario, this species occurs in two areas, Niagara Region and Haldimand County, with one population in each. The species is extremely rare in the Great Lakes drainage region where it is at its northern limit.

Habitat

This species is a plant of open, moist, sunny to partly shaded riparian habitats. Soil samples for populations in the United States indicate that all soils where Virginia Mallow is found are relatively sandy with fairly low organic matter content. The pH is neutral to slightly acidic and there are usually soluble salts available to the plants. In Ontario, this species occurs in disturbed situations; however, the habitat is consistent with other presumed native occurrences elsewhere and the species is not commonly grown horticulturally in North America.

Biology

Virginia Mallow is a clonal perennial spreading by rhizomes. A large plant can produce several thousand seeds, most of which are viable. Flowering begins in early August and continues until a hard frost occurs. The suspected method of seed dispersal is by water.

Population sizes and trends

Two populations of this species are extant in Ontario. At least 2500 flowering stems have been documented. The actual number of individual plants is difficult to determine due to the species' spread by rhizomes.

Limiting factors and threats

Habitat destruction seems to be the most detrimental limiting factor for this species throughout its range, including Ontario. Undisturbed riparian woodlands with natural openings and stream terraces are exceptionally rare in Ontario and in the United States. The quality of the species' habitat continues to decline in Ontario. Specific threats include the spread of Common Reed, an aggressive exotic grass, quarry expansion, and pipeline maintenance activities.

Special significance of the species

Although this species is not grown or used extensively in North America, it is cultivated frequently in Poland and Russia for a number of purposes. The most important use of Virginia Mallow in these countries is as biomass for creating energy from a renewable source of fuel. Another identified use of this plant is in the paper and cellulose industry, because the content of cellulose, resins and wax in the stems of the plant is comparable with that found in spruce and pine. Virginia Mallow survives until the first frost and is therefore useful in apiculture. It contains substances similar to medical comfrey and could be used in the pharmaceutical industry. Virginia Mallow has been used for planting in chemically degraded terrain and garbage dumps. It can also be grown on slopes of eroding terrain.

There is no evidence that this species has any aboriginal traditional uses. This is likely due to the fact that the species is quite rare in North America and has a limited range.

Existing protection

Virginia Mallow is considered rare throughout most of its range in the USA with NatureServe assigning a vulnerable Global Conservation Rank. The species is listed as critically imperiled in Indiana, Maryland, and Virginia and possibly extirpated in Tennessee. In Canada, it is ranked both nationally and provincially as critically imperiled. Populations in Canada currently have no legal protection.

TECHNICAL SUMMARY

Sida hermaphrodita

Virginia Mallow

mauve de Virginie

Range of Occurrence in Canada: 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). Likely several years to the production of robust flowering plants, as seen in the field with several flowering stems, since flowering from seed, in cultivation, can occur in the first year but unknown in the wild.	Unknown but likely several years of age
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Overall increase since previous field survey but future decline inferred based on invasive plants and quarry operations.
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. No consistent thorough monitoring has been conducted.	Unknown
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown due to uncertainty of rate of impact of Common Reed
[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.	Unknown
Are the causes of the decline clearly reversible and understood and ceased?	Unknown if future potential declines due to spread of Common Reed or impacts of quarry operations can be reversed.
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	35 km ²
Index of area of occupancy (IAO) (Always report 2x2 grid value; other values may also be listed if they are clearly indicated (e.g., 1x1 grid, biological AO)). 5 km ² (1x1 km grid)	12 km ² (2x2 km grid)

Is the total population severely fragmented? Two populations widely disjunct and present in areas likely to be disturbed (quarry and pipeline corridor; spread of invasive grass) invokes uncertainty as to the viability of the populations in the long-term and may imply that severe fragmentation can be applied but >90% of total population is at one location.	No
Number of "locations*" Different threats documented at three of four subpopulations	4
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	No
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? There is uncertainty in regard to the persistence of the subpopulation at the quarry site and the impact of the spread of the invasive Common Reed grass at P1a.	Unknown
Is there an [observed, inferred, or projected] continuing decline in number of locations? There is uncertainty in regard to the persistence of the small Population 2	Unknown
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat? Inferred future decline in habitat quality at Population P1a based on the expansion of Common Reed and potential loss of plants in this wetland and at Population 2a from expanded quarry operations.	Yes
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations*?	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
Population 1	2300
Population 2	~210
Total [Stem counts have been used to represent "mature individuals" in this species that reproduces sexually but also asexually by spreading rhizomes.]	~2510 stems

Quantitative Analysis

Probability of extinction in the wild.	Unknown
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Threats (actual or imminent, to populations or habitats)

Inferred future impacts: spread of an aggressive invasive grass at Population 1, also quarry expansion and pipeline corridor maintenance at Population 2.

Rescue Effect (immigration from outside Canada)

Status of outside population(s)? Nationally vulnerable (N3); rare and localized throughout its US range but can be locally abundant; some riparian habitats for the species are impacted by invasive exotic species.	
Is immigration known or possible?	Unknown
Would immigrants be adapted to survive in Canada?	Possibly
Is there sufficient habitat for immigrants in Canada?	Yes
Is rescue from outside populations likely?	No

Current Status

COSEWIC: Endangered (April 2010)

Status and Reasons for Designation

Status: Endangered	Alpha-numeric code: B1ab(iii)+2ab(iii)
Reasons for designation: This globally rare showy perennial herb of the mallow family occurs in open riparian and wetland habitats where it reproduces by seed and asexually by spreading rhizomes. Only two small populations, separated by about 35 km, are known from southwestern Ontario where they are at risk from continued decline in habitat area and quality due to an aggressive invasive grass and quarry expansion.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. No overall decline in the number of mature individuals.
Criterion B (Small Distribution Range and Decline or Fluctuation): Meets Endangered B1ab(iii)+2ab(iii) based on EO and IAO below critical values and presence at <5 locations with inferred decline in habitat quality and area due to the spread of an invasive grass, quarry expansion, and pipeline maintenance activities.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. No continuing decline in mature individuals.
Criterion D (Very Small or Restricted Total Population): Not applicable. Although there are fewer than 5 locations and IAO is <20 km ² , threats would not likely make the species endangered or extinct in a very short period of time.
Criterion E (Quantitative Analysis): None available.



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 (2010)

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.

COSEWIC Status Report

on the

Virginia Mallow *Sida hermaphrodita*

in Canada

2010

TABLE OF CONTENTS

SPECIES INFORMATION.....	3
Name and classification.....	3
Morphological description.....	3
Population spatial structure and variability.....	4
Designatable units.....	4
DISTRIBUTION.....	5
Global range.....	5
Canadian range.....	6
HABITAT.....	7
Habitat requirements.....	7
Habitat trends.....	8
Habitat protection/ownership.....	9
BIOLOGY.....	9
Life cycle and reproduction.....	9
Dispersal.....	10
Adaptability.....	10
POPULATION SIZES AND TRENDS.....	10
Search effort.....	10
Abundance.....	11
Fluctuations and trends.....	12
Rescue effect.....	13
LIMITING FACTORS AND THREATS.....	13
Summary of specific threats to Ontario populations.....	13
SPECIAL SIGNIFICANCE OF THE SPECIES.....	14
EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS.....	15
ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED.....	15
Authorities consulted.....	15
INFORMATION SOURCES.....	16
BIOGRAPHICAL SUMMARY OF REPORT WRITER.....	18
COLLECTIONS EXAMINED.....	18

List of Figures

Figure 1. Photo of top portion of a flowering stem of <i>Sida hermaphrodita</i>	4
Figure 2. A generalized distribution map of <i>Sida hermaphrodita</i> in North America.	5
Figure 3. Site occurrences for <i>Sida hermaphrodita</i> in Ontario.....	6
Figure 4. Habitat of <i>Sida hermaphrodita</i> at Population 1a.....	8

List of Tables

Table 1. Population summary for <i>Sida hermaphrodita</i> in Ontario.....	13
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SPECIES INFORMATION

Name and classification

Scientific name:	<i>Sida hermaphrodita</i> (L.) Rusby
Synonym:	<i>Sida napaea</i> Cav. <i>Napaea hermaphrodita</i> L
Common name:	Virginia Mallow; Virginia Fanpetals; River Mallow
Family:	Malvaceae (mallow family)
Major plant group:	Eudicot flowering plant

Ilitis (1963) explored in detail the reasons for the differing generic treatments the species has received. This species is sufficiently distinctive within the genus *Sida* to possibly merit its own monotypic genus (Fryxell, 1997). According to Fryxell (1997) the monotypic section *Pseudonapaea*, including only *Sida hermaphrodita*, has no close affinities with any other species in the genus, nor with *Napaea*, save in habit. *Sida hermaphrodita* has been retained in the genus primarily because no other suitable placement has been found (Fuertes *et al.* 2003).

Morphological description

Sida hermaphrodita is a tall perennial herb in the mallow family (Malvaceae), reaching a height of 1-3 m. The leaves grow alternately on the stem and resemble long, pointed maple-like leaves. They usually have 3 to 7 irregularly toothed lobes, with the middle lobe being the longest. Its stems are hairy when young but become smooth with age. The white flowers, which bloom from August to October, are arranged in stalked clusters that grow from the upper stem leaf axils. Each flower has 5 petals that are each about 8 mm long (Figure 1).

In spite of having distinctive flowers with both sexual organs in each, *Sida hermaphrodita* has been confused with Glade Mallow (*Napaea dioica*) where their ranges overlap in the United States. This has led to confusion and misinterpretation in nomenclature and distributions of both species. *Napaea dioica* does not occur in Canada and has male and female flowers on separate plants (Fryxell 1997). Overall, however, *Napaea dioica* is similar to *Sida hermaphrodita* in size, habit, leaf shape and general appearance.



Figure 1. Photo of top portion of a flowering stem of *Sida hermaphrodita* (Thompson-Black 2008).

Population spatial structure and variability

Spooner & Hall (1983) reported the chromosome count of *Sida hermaphrodita* ($2n = 28$) from a plant collected in Fairfax Co., Virginia (Spooner *et al.* 1985). A meiotic count ($n = 14$) came from a plant collected in Mason Co., West Virginia. Fryxell (1985) indicated that base numbers of $n = 7$ and 8 are common in *Sida* and useful in assessing relationships in this genus.

Designatable units

Because the species has a restricted range in Canada within a single ecological area as defined by COSEWIC (Great Lakes Plains), only one designatable unit is recognized for *Sida hermaphrodita*.

DISTRIBUTION

Global range

The global range for *Sida hermaphrodita* is centred in the Appalachian Mountains and extends outward into both the Mississippi watershed and the Atlantic watershed (Thomas 1979). *Sida hermaphrodita* is rare and localized throughout its range, primarily in disturbed habitat, with larger populations in portions of Ohio, Kentucky, and West Virginia (Figure 2). *Sida hermaphrodita* is considered indigenous to the Great Lakes drainage (Spooner *et al.* 1985) despite a tendency for populations to appear in disturbed areas. Reports from Michigan and Indiana are thought to be from cultivated sites; records for Massachusetts, New Jersey, and New York are considered escapes from cultivation (NatureServe 2009). Although cultivated in Poland and Russia, the species is native only in North America.

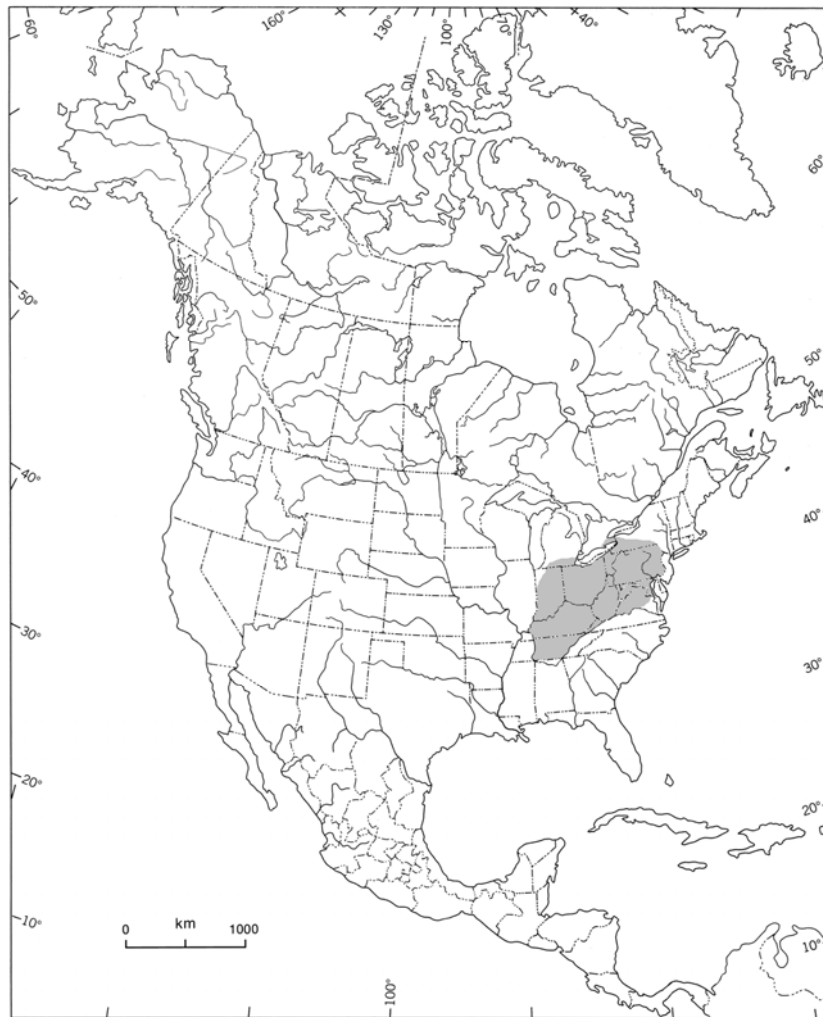


Figure 2. A generalized distribution map of *Sida hermaphrodita* in North America.

Canadian range

In Ontario, this species occurs in two regions, Haldimand County and the Niagara Region about 35 km apart (Figure 3). The species was first reported for Canada from Haldimand County based on a 1951 collection by Miller (Scoggan 1978). A second population in the Niagara Region was first documented in 1998 and reported in the files of the Natural Heritage Information Centre, Peterborough (Oldham, pers. comm. 2009). A single plant was observed at this population on July 10, 1998 as well as on June 3, 1999. The Canadian populations are considered to be native according to the General Status of Species in Canada (<http://www.wildspecies.ca/home.cfm?lang=e>) and as recognized by the Natural Heritage Information Centre (NHIC), Peterborough, Ontario (Oldham and Brinker 2009). Although Ontario populations are in disturbed sites, the species occurs in similar habitats across its core range in the United States. *Sida hermaphrodita* is extremely rare in the Great Lakes drainage where it is at its northern range limit. The index of area of occupancy for the species in Canada is 5 km² when based on a 1x1 km grid and 12 km² when based on a 2x2 km grid. The actual area of habitat occupied by this species is <1 km². The extent of occurrence is 35 km².

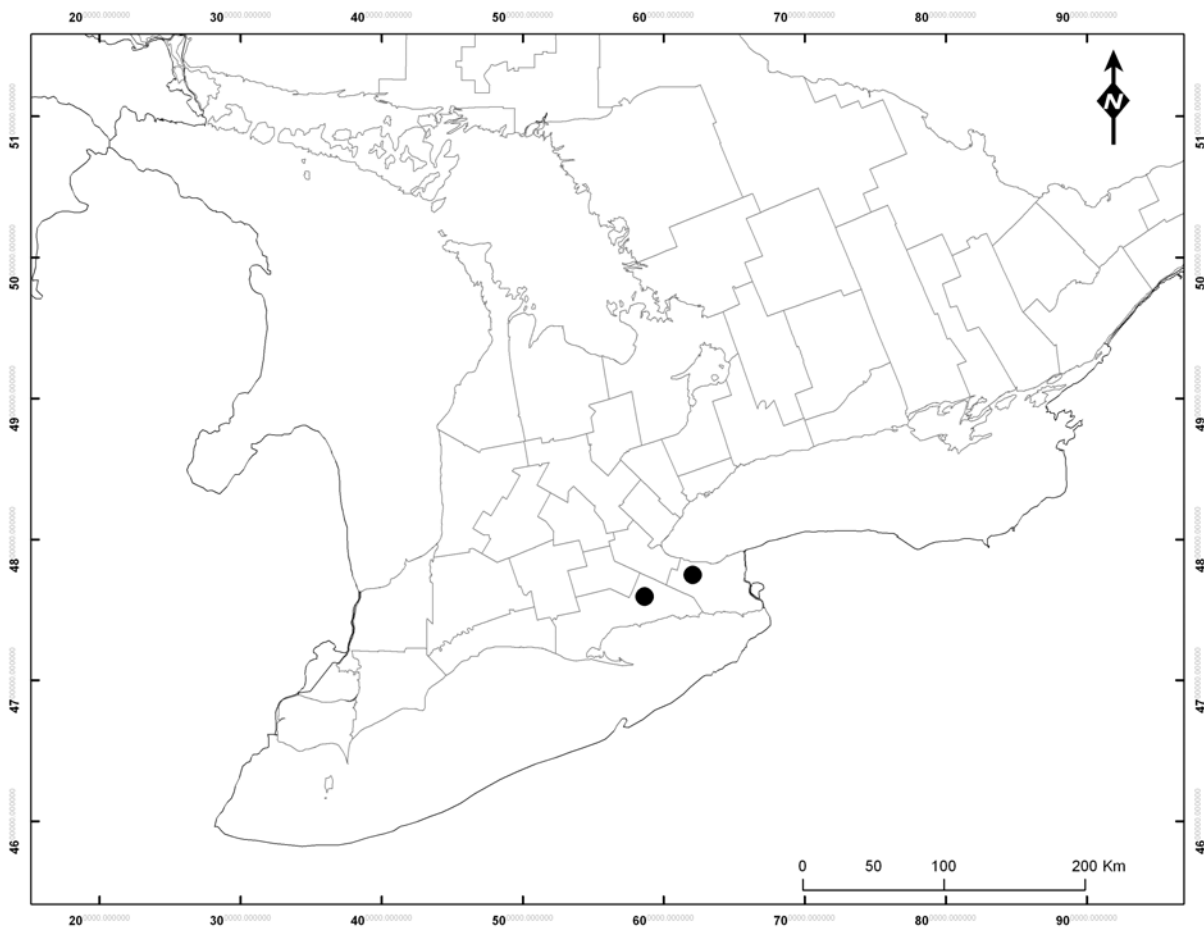


Figure 3. Site occurrences for *Sida hermaphrodita* in Ontario.

HABITAT

Habitat requirements

Sida hermaphrodita is a perennial herb of open, moist sunny to partly shaded riparian habitats (Spooner *et al.* 1985). Populations have been found on floodplains that probably receive some inundation almost annually, or on talus, colluvial deposits (Thomas 1979). At all sites assessed by Thomas (1979) in the United States, the substrate was loose, which allows for good aeration. Near populations in the United States, soils are relatively sandy with fairly low organic matter content. The pH is neutral to slightly acidic and there are usually soluble salts available (Thomas 1979). Clearly the species occurs over a range of soil types but these do not appear to limit the distribution of the species (Spooner *et al.* 1985). This species occurs in both natural and disturbed habitats. Given that the species also grows in disturbed habitats but is relatively rare across its range, its absence in many other suitably disturbed habitats, which tend to be quite common, is unclear but may simply reflect the species' native occurrence in such habitats and its lack of spread to other sites. In Ontario, one population of this species occurs in a particularly disturbed situation, however, both habitats in which the species is found in Ontario are similar to other sites elsewhere in the species' range (Oldham 1999).

Part of the habitat for population one (P1) consists of riparian vegetation dominated by Black Walnut (*Juglans nigra*), Red-osier Dogwood (*Cornus stolonifera*), and Staghorn Sumac (*Rhus typhina*). Most of the plants in P1 are located in a marsh (Figure 4) dominated by Cattail (*Typha latifolia*) and Common Reed (*Phragmites australis*). The habitat for population two (P2), subpopulation P2a is along a rarely used access road to an area that is undergoing quarry expansion. The habitat for subpopulation P2b consists of a gas pipeline corridor with open meadow habitat dominated by Teasel (*Dipsacus fullonum*), Queen Anne's Lace (*Daucus carota*), Grey Dogwood (*Cornus racemosa*), Staghorn Sumac and goldenrod (*Solidago* spp.). The nearby area also supports an alvar community (Thompson 2001). Population P1 occurs in a relatively natural-looking habitat; however, the presence of a reservoir and occurrence along a roadside indicates that disturbance has occurred within the area. Population P2 is located in a clearly more disturbed habitat. However, throughout the species' range, it occurs in both riparian habitats and disturbed sites.



Figure 4. Habitat of *Sida hermaphrodita* at Population 1a (photo by M. Thompson-Black 2008).

Habitat trends

No information was found on habitat trends in the Niagara Region and Haldimand County. However, it has been estimated, in general, that about 70% of wetlands in southern Ontario have been lost through agricultural expansion (Twolan-Strutt 1995). Additional information on wetland change has been published for major wetlands in the extreme southwestern portion of southern Ontario, such as the wetlands at Point Pelee Marsh. Here, a loss of 71% has occurred between 1880-1975, and the Lake St. Clair marshes were reduced by 39% in area of marsh and 90% in the overall wetland areas (Rubec *et al.*1988).

Specific alteration of *S. hermaphrodita* habitat is only known for Population #1, subpopulation 1a. A dam that flooded the area was removed about 2004 and silt was removed at the dam site near where *S. hermaphrodita* was documented in 2001 by Thompson-Black (Norminton, pers. comm. 2010). The removal of the dam was undertaken to create a varied landscape of ponds, wetlands and woodlands and to improve water quality of the cold-water stream flowing through the former reservoir (Baine, 2005). The subsequent change from reservoir to wetland is depicted in Figure 4. When documented near the dam in 2001, *S. hermaphrodita* was primarily in a riparian habitat next to the reservoir; by 2008 this had reverted to form a marsh. An improvement in habitat quality for *S. hermaphrodita* is likely reflected in the expansion in number and size of clumps since removal of the dam.

Habitat protection/ownership

This species is currently not legally protected in Canada or Ontario. Population P1 is located within a Conservation Area, and is somewhat protected from development. Population P2 is on a private quarry site.

BIOLOGY

Spooner *et al.* (1985) contains the most detailed information on the ecology and biology of *Sida hermaphrodita*. More data are available from studies about cultivation in Russia and Poland, but much of this literature has not been translated into English. When cultivated, plants can flower and reproduce in their first year (Spooner *et al.* 1985). The species is also clonal, making it difficult to determine the actual number of distinct individuals.

Life cycle and reproduction

Sida hermaphrodita is a perennial. According to Spooner *et al.* (1985), in the United States, shoots emerge from the soil in April and early May from buds at the base of the previous year's stems and from the ends of numerous radiating rhizomes. Many large populations appear to be clonal. Flowering begins in early August and continues until a hard frost occurs. Seeds are dispersed throughout the winter, and germinate in early spring. The age of first flowering for plants is not currently known for *Sida hermaphrodita* in its natural habitat, but individuals grown in a garden are capable of reproducing the same year the seeds germinate (Spooner *et al.* 1985). A large plant of *Sida hermaphrodita* is capable of producing several thousand seeds, most of which are viable and have the potential to germinate. Seedling recruitment has been observed at two sites in Ohio where several hundred seedlings were reported (Spooner *et al.* 1985).

Exact generation time is unknown but cultivated plants can live up to 15 years (Krzaczek *et al.* 2006). Because plants grown from seed under cultivation may flower in their first year, it may be reasonable to conclude that, in nature, most robust flowering plants with several stems would be at least two or more years of age. The rhizomatous nature of the species and vigorous growth and increase in number of stems within a given growing season make it difficult to judge natural generation time.

Thomas (1980) found low germination percentages ($x = 6.6\%$) for *Sida hermaphrodita* seeds collected from natural populations in Maryland, Pennsylvania, and Virginia. This led Thomas (1980) to suggest that low germination may be responsible for the rarity of this species. Thomas did not scarify seeds. In germination tests, Spooner *et al.* (1985) using scarified seeds, 81 to 99% of seeds collected from the 10 populations of *S. hermaphrodita* in Maryland and Ohio germinated.

Russian research on *Sida hermaphrodita* has not been cited in the western literature. Seed anatomy (Savchenko and Dmitrashko 1973) and seed germination

(Dmitrashko 1970, 1972) have been studied to increase germination percentage. These studies indicate that without pre-treatment, 10 to 15% of freshly gathered seeds germinate. After 6 to 8 months of storage in a laboratory, germination percentage was 60%, but after 13 years of storage it fell below 10%. Germination percentages are increased to various degrees by different treatments, including scarification, soaking in hot water, sulfuric acid, and irradiation with cobalt-60. Thus, the rarity of *S. hermaphrodita* does not appear to be attributable to low seed viability or to low germination potential (Spooner *et al.*, 1985).

Shoots of *Sida hermaphrodita* emerge from the soil in April and early May from buds at the base of the previous year's stems and from the ends of numerous rhizomes (Spooner *et al.* 1985). Rhizome sections that are approximately 25 cm long (with a minimum diameter of 1 cm) with large, visible buds (> 1 mm) can be used to generate new plants. New shoots appear from these rhizome sections in as little as 9 days (Kujawski *et al.*, 1997).

Dispersal

Since *Sida hermaphrodita* is found in riparian and wetland habitats. Its method of seed dispersal is likely by water.

Adaptability

The species occurs in both natural wetland sites as well as in disturbed habitats, and on different soil types. The use of the plants for soil remediation of chemically degraded terrain (see Special Significance of the Species) further indicates a range of adaptability to varying substrate conditions.

POPULATION SIZES AND TRENDS

Search effort

Ontario's Carolinian Zone, including Niagara Region and Haldimand County, is among the most intensively botanized parts of the province. The Niagara Region has a long history of botanical exploration dating to the 1800s. *Sida hermaphrodita* is a distinctive plant and is unlikely to be overlooked. Its occurrence in open disturbed wetland sites, however, may mean that its habitat is less frequently visited by botanists (Oldham, pers. comm. 2009).

An intensive two-year inventory was conducted as part of the Halimand-Norfolk natural areas inventory (Gartshore *et al.* 1987). The Niagara Peninsula Conservation Authority also completed a three-year inventory of natural areas within its watershed (Oldham, pers. comm. 2009). This included botanical inventories in dozens of natural areas.

Abundance

Although it is difficult to determine the number of individuals due to the clonal nature of the species, stem counts have been used to estimate abundance. This follows COSEWIC guidelines for determining “mature individuals” for species that reproduce both sexually and asexually through spreading rhizomes. In such cases, stem counts are generally used for assessment purposes. Population data were compiled by Thompson-Black based on field surveys in 2001 and 2008.

Population 1

In 1985, this population was documented to occupy about 50 m² with several smaller clumps scattered nearby (Gartshore *et al.* 1987).

Subpopulation P1a

This site was visited on July 25, 2001. Three clumps of *Sida hermaphrodita* were recorded. Two of the clumps are well-established and consisted of 40 stems each. The third clump was in a more shaded site and consisted of 3 stems. All clumps were adjacent to the outflow of a reservoir.

The site was visited again on September 27, 2008. Four additional clumps were documented. Of the previously documented clumps, one remained stable at 40 stems, one was reduced from 3 to 1 stem, and the final clump had increased to more than 500 stems. The clump that increased was in open habitat. The newly discovered clumps were also quite large. Stem counts for clump 4 were 64 stems, clump 5 consisted of 400 stems, and clumps 6 and 7 contained at least 300 stems each. In addition, a number of scattered stems occurred throughout the wetland, totalling approximately 100 stems. The total number of stems in this subpopulation has thus increased to approximately 1700.

Subpopulation P1b

Thompson-Black rediscovered a population further south along the nearby road where it was first reported by T. Farrell in 2001. In 2008, she also found three clumps adjacent to the road. One was quite large and consisted of approximately 400 stems. Two more clumps were located within 10 m of the large clump and had approximately 100 stems each.

The total size for Population 1 is estimated to be at least 2300 stems.

All clumps were easily identified due to their stature and density, but it is possible that there are additional small subpopulations and individual plants located in the large wetland.

Population 2

Subpopulation P2a

On July 25, 2001, *Sida hermaphrodita* occupied a 2X2 m area on the south side of an old access road. At the time of the survey, the site appeared to be idle. Other rare species and habitats occur in the adjacent area. The presence of a rare (S1) community type (Black Maple-Chinquapin Oak) in the immediate vicinity lends importance to protection of the site (Thompson 2001).

The site was revisited on September 27, 2008. The population still occupied the same 2X2 m area with the population consisting of 80 stems. There were no additional clumps and no evidence of the spread of the species at this site.

Subpopulation P2b

On July 25, 2001, there were 5 clumps of *Sida hermaphrodita* located along the south side of the gas pipeline. Plants were distributed along a stretch < 0.5 km long. No stem counts were made.

The site was revisited on September 27, 2008. Five clumps were present along the pipeline. Clump 1 contained 25 stems, the second consisted of 5 stems, clump 3 was also small and consisted of 10 stems, clump 4 consisted of 35 stems and clump 5 was the largest, with 55 stems. The total number of stems documented for this subpopulation was 130. There was no increase in the number of clumps and the population appeared to be stable.

The total estimate for the number of stems in Population 2 is 210. No additional clumps or subpopulations were located in the area.

Fluctuations and trends

Population counts for this species in Ontario have not been performed consistently or frequently since this species was first documented. Total population size has increased from an estimate of close to 200 stems in 2001, to close to 2500 stems in 2008 (Table 1). One of the populations (P2) remained stable with no visible increase or decrease in the number of stems in either subpopulation. This is likely due to the fact that the subpopulations are located in marginal habitat. There was no substantial change in the quality or availability of that habitat and it is likely that some other factors prevent the species from colonizing nearby areas. In contrast, population (P1) located in a riparian/wetland habitat has increased greatly. This increase is likely due to the increase in size and quality of the adjacent wetland subsequent to the removal of a dam. This allowed the population to expand into the newly created habitat following the drainage of the former reservoir.

Table 1. Population summary for *Sida hermaphrodita* in Ontario.

POPULATION	YEAR 2001	YEAR 2008
P1a	83 stems	1700
P1b	undocumented	600
P2a	~89 stems*	80
P2b	5 clumps	130
Total	Incomplete data	~2500 stems

* Stems were not counted but it was indicated that *Sida hermaphrodita* occupied an area of 2x2 m.

Rescue effect

This species is intrinsically rare across its range in the United States despite a seemingly wide range of suitable habitats. The nearest populations are likely in northwestern Ohio (Williams County), more than 400 km from the two Ontario populations (see USDA PLANTS Database (<http://plants.usda.gov/java/profile?symbol=SIHE3>) for Ohio county records. Natural rescue over this distance is highly unlikely.

LIMITING FACTORS AND THREATS

Thomas (1979) suggested that soils limit the distribution of *Sida hermaphrodita*. Spooner *et al.* (1985), however, concluded that *Sida hermaphrodita* will grow on a variety of soil types ranging from silt loam, sandy clay loam and clay loam. Range in pH and organic matter content do not seem to affect the species.

Thomas (1980) also suggested that failure to germinate may affect the species but Spooner *et al.* (1985) achieved high rates of germination using scarification. Kujawski *et al.* (1997) obtained higher rates of germination using a hot water soak method. A large plant of *Sida hermaphrodita* is capable of producing several thousand seeds, many of which are viable (Spooner *et al.* 1985). It is unlikely that the rarity of *Sida hermaphrodita* can be attributed to low germination rates or low seed viability, unless germination requirements are not being met for the species.

Wetland habitat destruction has been the most detrimental limiting factor for this species throughout its range. Undisturbed riparian woodlands with natural openings and stream terraces are rare in southwestern Ontario and in the United States. However, the species is adapted to a variety of natural and disturbed habitats.

Summary of specific threats to Ontario populations

Based on the following threats or absence at one subpopulation, four locations, as defined by threats, are recognized.

Population 1 (Conservation Area Site)

Subpopulation 1a

Common Reed, an aggressive invasive grass, could potentially spread throughout the wetland habitat and negatively impact *S. hermaphrodita*. Concern over the presence of this invasive and the need to include it in the management plan for the site was expressed at a meeting of the Conservation Committee for the site in November 2008 (Tonellato, pers. comm. 2010). Mowing was also observed in September 2008 right up to the base of several plants.

Subpopulation 1b

No obvious threats were evident along the roadside where these plants occur.

Population 2 (Quarry Site)

Subpopulation 2a

In September 2008, clearing and topsoil removal had occurred within 5 m of the 2x2 m patch of *S. hermaphrodita* in order to prepare the site for aggregate extraction.

Subpopulation 2b

Normal maintenance of the gas pipeline may be harmful to the plants at the site.

SPECIAL SIGNIFICANCE OF THE SPECIES

Although this species is not grown extensively in North America, it is cultivated frequently in Poland and Russia for a number of uses. The most important use of *Sida hermaphrodita* in these countries is as a biofuel (Borkowska 2003).

This plant is also used in the paper and cellulose industry, because the content of cellulose, resins and wax in the stems of the plant is comparable with that found in spruce and pine. Based on comparative analysis of content, stems of *Sida hermaphrodita* could be potentially used to produce fibrous pulp (Borkowska and Styk 1995).

This species survives until the first frost thereby providing bees with a late source of nectar and is therefore useful in apiculture. During flowering, *Sida hermaphrodita* can produce up to 120 kg/ha of late yield honey (Borkowska and Styk, 2006; Wroblewska and Kolasa, 1986). The species also contains substances similar to medical comfrey and could be used in the pharmaceutical industry.

Sida hermaphrodita has been planted in chemically degraded terrains, including garbage dumps. Borkowska and Wardzinska (2003) found that cultivation of *Sida hermaphrodita* for three years in sewage sludge caused positive changes in the structure of the sewage sludge, as it is proficient in the uptake of cobalt, iron and nickel. *Sida hermaphrodita* can be grown on slopes of eroding terrain as a stabilizer. The durability of plantations, ease of cultivation and large adaptation capabilities to various climates and soil conditions show the potential possibilities of use of this species (Borkowska and Styk 2006).

There is no evidence that it has been used for any Aboriginal traditional uses, likely because the species is quite rare in North America.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

The majority of *Sida hermaphrodita* populations in the United States have no formal protection, despite recognition of the rarity of the species both nationally and globally. NatureServe (2009) ranks this species as critically imperiled in Indiana, Maryland and Virginia and possibly extirpated in Tennessee. It is designated as Endangered in Indiana (Indiana DNR 2007) and is also listed as Endangered in Maryland (Maryland DNR 2007).

Sida hermaphrodita is considered rare throughout most of its range and has been assigned a Global Conservation Rank of vulnerable (G3), and a rank of critically imperiled at both the national level (N1) and at the provincial level (S1) in Ontario (NatureServe 2009). It is also recognized as “May be at Risk” under the General Status of Species in Canada (<http://www.wildspecies.ca/home.cfm?lang=e>).

No organized recovery efforts have been attempted for this species to date. Propagation studies have been done at the National Plant Materials Center (NMPC) in Beltsville, Maryland (Kujawski *et al.* 1997). The species can be propagated indoors (Gartshore 2001).

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Authorities consulted

- Staff at the Natural Heritage Information Centre, Peterborough, ON
- COSEWIC Secretariat for information on sources of Aboriginal Traditional Knowledge, Canadian Wildlife Service

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Melinda Thompson-Black has completed a Master's thesis on Bird's-foot Violet (*Viola pedata* L.), examining optimal microhabitat characteristics in Ontario tallgrass prairie remnants. In addition to completing her M.Sc., she has been involved in numerous Species at Risk projects with the Ontario Ministry of Natural Resources as a Species at Risk Biologist. Over the past 6 years, she has authored or co-authored 11 reports related to species management and recovery in Ontario and Canada for 7 different plant species. She sits on several Recovery Teams, and has extensive experience liaising with rare species in Ontario. Melinda has previously authored a status report for COSSARO (2001) for *Sida hermaphrodita*.

COLLECTIONS EXAMINED

No collections were examined or deposited for this species.