

# Recovery Strategy for the Small White Lady's-slipper (*Cypripedium candidum*) in Canada

## Small White Lady's-slipper



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of Canada

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For copies of the recovery strategy, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)<sup>1</sup>.

**Cover Photo:** Anne Worley

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<sup>1</sup> <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

## PREFACE

The federal, provincial, and territorial government signatories under [the Accord for the Protection of Species at Risk \(1996\)](#)<sup>2</sup> agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years.

The Minister of the Environment is the competent minister for the recovery of the Small White Lady's-slipper and has prepared this strategy, as per section 37 of SARA. It has been prepared in cooperation with the Government of Manitoba and the Government of Ontario.

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. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Small White Lady's-slipper and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment Canada and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

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<sup>2</sup> <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

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## EXECUTIVE SUMMARY

The Small White Lady's-slipper belongs to the Orchid family and is characterized by a very small, white, slipper shaped flower. It is found predominately in moist prairie and savannah, and rich, calcareous wetland fens.

Small White Lady's-slipper is native to eastern North America. Less than 10% of its range is in Canada where there are 25 known extant populations; 18 in Manitoba and 7 in Ontario. Most populations are fragmented by agriculture or other development. The Small White Lady's-slipper was listed as endangered in Canada under the *Species at Risk Act* in 2003 because of its disjunct and limited distribution, its low genetic diversity, and the threat of habitat degradation and loss.

Major threats include encroachment by woody plants and thatch accumulation due in part to the suppression of periodic fires, alteration of hydrology, infrastructure and residential development, and resource competition with invasive species which together result in a decline in quality and amount of habitat. Inappropriately-timed mowing or haying, trampling and poaching are important threats that can cause harm to populations. Hybridization has traditionally been cited as a threat, although the severity of this threat has been a source of debate in the scientific community. Shoreline erosion is a threat at one site in Ontario. The Small White Lady's-slipper has specific needs which limit its ability to increase its populations under natural conditions. Germination of Small White Lady's-slipper is restricted to habitats that support specific species of soil fungi. It can take up to 16 years for a plant to flower. Seed production is dependent on specific pollinators.

Recovery of the Small White Lady's-slipper is determined to be technically and biologically feasible. The population and distribution objective is to maintain all 25 populations that were known to be extant in the past 16 years at their current areas of occupancy, plus any newly-discovered populations. Meeting the population and distribution objective will depend on the following broad strategies: communication, outreach and education; habitat protection, management, and stewardship; inventory and monitoring; and research.

Critical habitat is partially identified in the recovery strategy based on known locations and biophysical attributes required by Small White Lady's-slipper. Critical habitat is identified for 18 extant populations in Manitoba and one extant population in Ontario. In Manitoba, critical habitat is described as moderately to imperfectly drained, open native prairie; or prairie openings with occasional sparse shrub cover; or prairie openings between tree "bluffs". Slopes are flat to undulating with ridge and swale topography. In Ontario, critical habitat is described as rich calcareous fen habitat with a high water table, organic soils, and marl pools (calcium and magnesium deposits) for the one population where it is identified.

One or more Action Plan(s) will be posted on the Species at Risk Public Registry by 2017.

## RECOVERY FEASIBILITY SUMMARY

Under the *Species at Risk Act* (Section 40), the competent minister is required to determine whether the recovery of the listed species is technically and biologically feasible. The recovery of the Small White Lady's-slipper is considered biologically and technically feasible based on the following four criteria outlined in the SARA policies (Government of Canada 2009):

**1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.**

Yes. While reproduction of the Small White Lady's-slipper is somewhat limited by the presence of rare soil fungi and specific pollinators, individuals capable of sexual reproduction are available to sustain or improve population abundance.

**2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.**

Yes. Although the area of suitable habitat remaining is small, there is sufficient habitat to support the current populations. There is also unoccupied habitat adjacent to some populations that may be suitable for Small White Lady's-slipper.

**3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.**

Yes. The primary threats to Small White Lady's-slipper, including encroachment by woody plants and thatch accumulation due in part to the suppression of periodic fires, alteration of hydrology, housing and infrastructure development, hybridization, untimely haying, and trampling, can be mitigated through beneficial management practices, habitat protection, stewardship and increased awareness through education of its needs and threats.

**4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.**

Yes. Several recovery techniques have been shown to benefit Small White Lady's-slipper. Conservation Agreements are already in place and land has been purchased by conservation agencies in Manitoba and a local land trust in Ontario. Increasing landowner and land users' awareness of the species' requirements, beneficial management practices, habitat protection, stewardship, inventory and monitoring, and research should contribute to achieving the population and distribution objective within a reasonable timeframe by eliminating or reducing threats.

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## 1. COSEWIC\* SPECIES ASSESSMENT INFORMATION

**Date of Assessment:** May 2000

**Common Name (population):** Small White Lady's-slipper

**Scientific Name:** *Cypripedium candidum*

**COSEWIC Status:** Endangered

**Reason for Designation:** A species of wet prairies found in only two widely disjunct and restricted areas. Most populations have low genetic diversity and are subject to threats from habitat modification and loss. Hybridization with the more common Yellow Lady Slipper, competition from exotic species, and removal by orchid collectors are additional threats.

**Canadian Occurrence:** Manitoba, Ontario

**COSEWIC Status History:** Designated Endangered in April 1981. Status re-examined and confirmed in April 1999 and in May 2000.

\*COSEWIC = Committee on the Status of Endangered Wildlife in Canada

## 2. SPECIES STATUS INFORMATION

The conservation status of Small White Lady's-slipper (*Cypripedium candidum* Muhlenberg ex Willdenow) is given in Appendix A. Globally, and in the United States, it is considered Apparently Secure (G4 and N4, respectively). However, this species is not ranked higher than S3 (Vulnerable) in any of the states, with over half giving it a rank of S1 (Critically Imperilled) (Appendix A).

Less than 10% of the Small White Lady's-slipper's range occurs in Canada where it is nationally ranked as Imperilled (N2) (Appendix A). The species is found in two provinces: Ontario and Manitoba where it is respectively ranked as Critically Imperilled (S1) and Imperilled (S2) (Appendix A). There is one record of Small White Lady's-slipper occurring in Saskatchewan in the late 19<sup>th</sup> century (see Appendix B). No other Small White Lady's-slipper populations have been reported for Saskatchewan (J. Keith pers. comm. 2010). This species is listed as Endangered under Schedule 1 of the federal *Species at Risk Act*. It is listed as endangered under Manitoba's *Endangered Species Act*, and under Ontario's *Endangered Species Act, 2007*.

### 3. SPECIES INFORMATION

#### 3.1 Species Description

Small White Lady's-slipper (Family Orchidaceae) is a perennial orchid that grows to between 11 to 40 cm in height (Flora of North America Editorial Committee 2002). Plants grow in clumps of one to many stems, and spread by creeping rootstocks (Curtis 1943). Three or four lanceolate<sup>3</sup> leaves clasp each stem. One flower, rarely two, form at the tips of stems (Figure 1). Flowers consist of a small (less than 2.7 cm long), white, pouch-shaped "slipper" with purplish veins or spots. The surrounding twisted, greenish-yellow petals and sepals are also streaked or spotted with purple. Flowering usually occurs between mid-May and mid-June in Canada, but varies with weather. Fruit capsules reach approximately two to four cm long and contain thousands of tiny seeds (Brownell 1981).



Figure 1. Small White Lady's-slipper (Anne Worley).

Small White Lady's-slipper hybridizes with two varieties of Yellow Lady's-slipper; *Cypripedium parviflorum* Salisbury var. *makasin* (Farwell) Sheviak and *Cypripedium parviflorum* var. *pubescens* (Willedenow) O.W. Knight (Worley et al. 2009). Furthermore, hybrids have been shown to backcross with Small White and Yellow Lady's-slippers (Worley et al. 2009, C. Foster pers. obs.). Hybrids can be differentiated from pure Small White Lady's-slipper based on several characters such as an intermediate flower size, intermediate flower colour, and intermediate plant height to both parental species (Worley et al. 2009).

#### 3.2 Population and Distribution

Small White Lady's-slipper is native to eastern North America (Figure 2). Currently, there are 18 extant populations known in Manitoba and 7 in Ontario. Populations are separated by a minimum of 1 km between sites as per the most recent COSEWIC status report written in 1999 (COSEWIC 1999).

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<sup>3</sup> In the shape of a lance, the base of the leaf is wide and its apex is tapered, and the leaf's width is smaller than its length (Moss 1983).

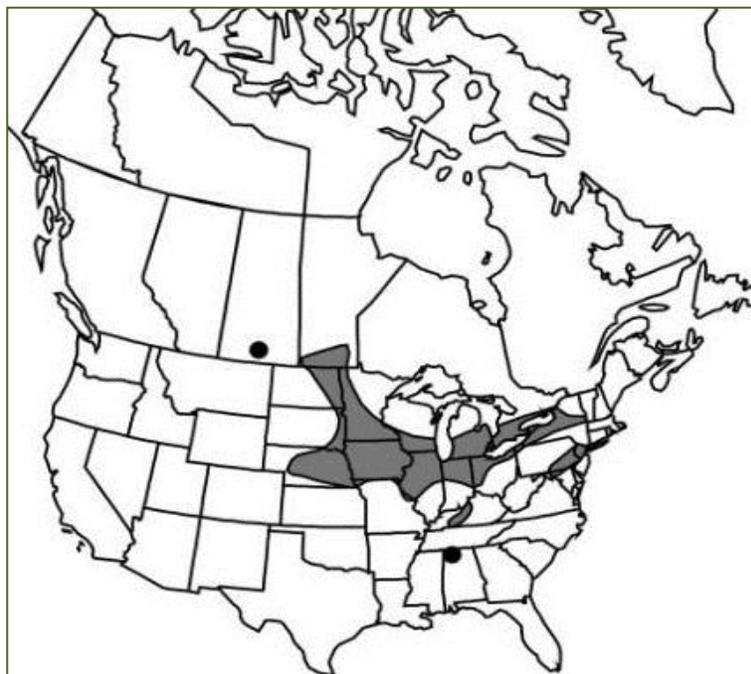


Figure 2 - Small White Lady's-slipper distribution (Flora of North America Editorial Committee 2002).

The current abundance of Canadian populations is unknown. Individual Small White Lady's-slipper plants spread by underground stems. Plants can be single-stemmed, or form clusters of various sizes and densities. Population abundance of Small White Lady's-slipper has been reported inconsistently as either number of individuals (e.g., number of clumps), or number of stems, and sometimes both. Abundance is also difficult to measure due to issues such as hybridization, time required to attain maturity, short flowering period, late spring frosts, and adult plant dormancy. The difficulty in estimating abundance is reflected in the COSEWIC criteria used to designate Small White Lady's-slipper as Endangered; the criterion Area of Occupancy<sup>4</sup> was used rather than Number of Mature Individuals (E. Haber pers. comm. 2010).

### ***Manitoba Populations***

Fifty to 90% of the Manitoba population is estimated to be within the Tall Grass Prairie Preserve (TGPP) located in the southeastern portion of this province. The total number of flowering and vegetative stems in the TGPP in 2010 was thought to exceed 55 000 (C. Borkowsky pers. comm. 2010). Outside of the TGPP the total number of flowering stems in Manitoba, recorded over the past several years, is estimated to be at least 4 000 (MB CDC 2010). The total area occupied in Manitoba is less than 170 ha. The estimated number of flowering stems and the area occupied by each extant population are given in Table 1. Locations of occurrences in Manitoba are shown in Figure 3. Six populations are extirpated in this province (see Appendix B) (COSEWIC 1999). Although trends are difficult to assess, there is sufficient monitoring data to provide evidence that several populations are likely decreasing in abundance.

<sup>4</sup> The smallest area that is necessary and occupied by the species, excluding unsuitable habitat (COSEWIC 2010).

**Table 1.** Summary of extant Small White Lady's-slipper populations in Manitoba (MB CDC 2010). Population estimates are reported as the number of **flowering stems** and are from either 2009 or 2010.

Population <sup>1</sup> (MB CDC EO #)	First Observation	Recent Population Estimate	Estimated Area Occupied (ha)
1. Kleefeld (7)	1980	139	0.2
2. Tall Grass Prairie Preserve (33)	1993	4 400 – 42 000 <sup>2</sup>	30.2
3. Franklin west (27)	1999	82	0.3
4. Franklin south (28)	1999	19	0.1
5. Franklin east (29)	1999	Unknown <sup>3</sup>	0.03
6. Emerson (44)	2001	50	0.8
7. Carman (43)	2008	Unknown <sup>3</sup>	0.1
8. Tolstoi (41)	2008	75	0.5
9. Woodlands (14)	1966	17	4.7
10 Lake Francis (8)	1983	10 to 15 <sup>3</sup>	0.5
11. St. Laurent (31)	1995	840	65.8
12. Woodlands Trail (30)	1999	20	0.2
13. St. Laurent northwest (39)	2005	247	1.0
14. South of Brandon (34)	1954	728 <sup>3</sup>	22.0
15. Brandon Hills (22)	1993	1000s <sup>2</sup>	18.7
16. Southeast of Brandon (32)	1997	202+ <sup>3</sup>	18.9
17. Southeast of Brandon Hills (40)	2007	132	0.6
18. Oak Lake (42)	2008	150	0.3

<sup>1</sup> Plants within 1km of each other are considered to be part of the same population, following COSEWIC's definition of a population (COSEWIC 1999) and NatureServe's definition of a plant Element Occurrence (EO) (NatureServe 2004). The MB CDC EO # refers to the number that the Manitoba Conservation Data Centre has assigned each population using NatureServe methods.

<sup>2</sup> Stem number estimated, not counted

<sup>3</sup> Partial stem count (entire population not counted)

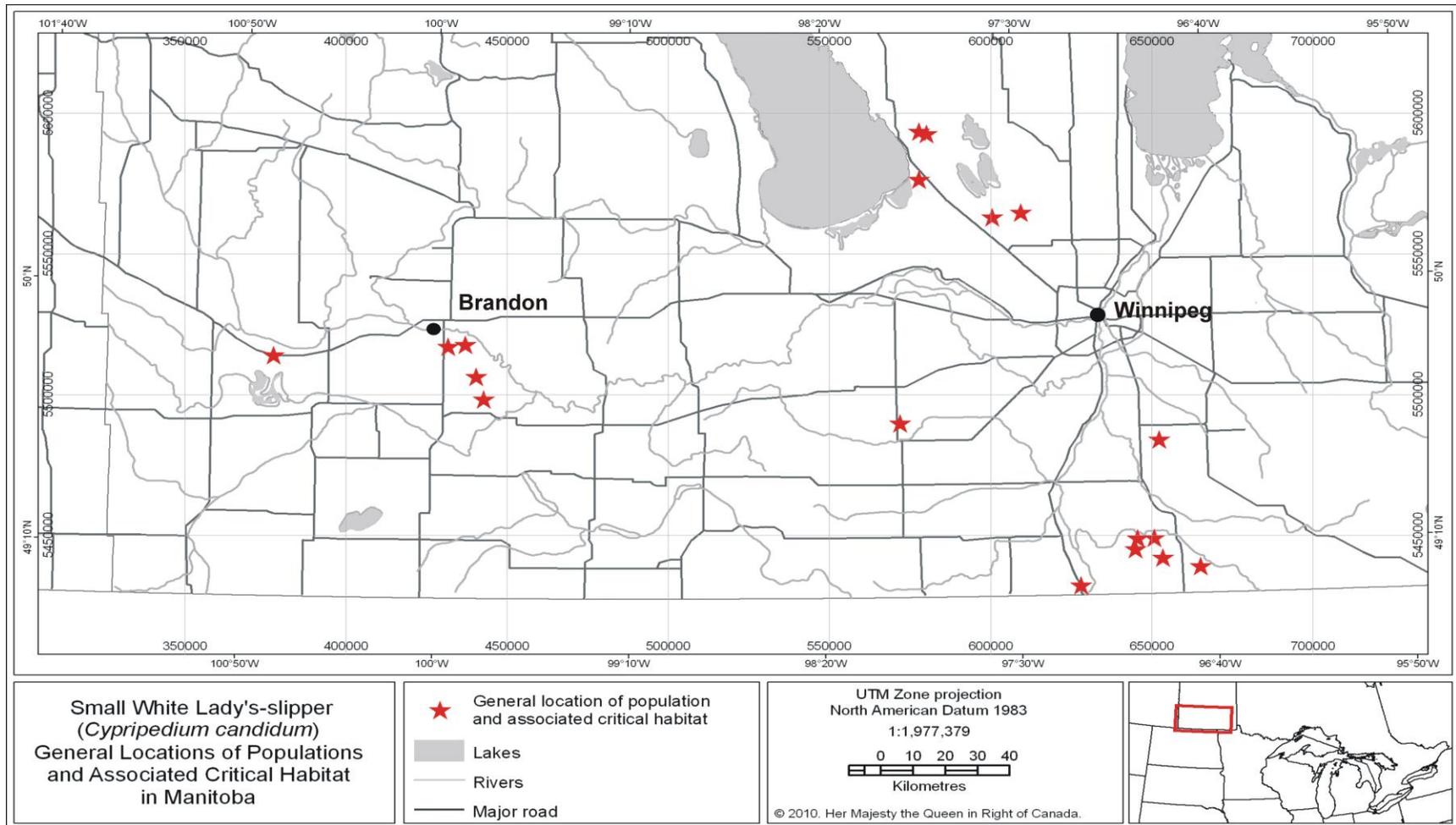


Figure 3. General locations of populations and critical habitat in Manitoba. Source of population locations: MB CDC 2010.

## Ontario Populations

In Ontario, five populations of Small White Lady's-slipper are possibly extirpated (see Appendix B) (COSEWIC 1999). Extant populations are known to occur in Hastings County and on Walpole Island First Nation (C. Jacobs, pers. comm. 2012), where more than 95% of the Ontario population is estimated to occur. The most recent flowering stem counts for Ontario populations are given in Table 2. The total area occupied by Small White Lady's-slipper in Ontario may be less than 150 ha (Environment Canada 2006). The Hastings County population appears to be decreasing likely due in part to Eastern White Cedar (*Thuja occidentalis*) encroachment, human trampling, and possibly to changes in hydrology (C. Brdar pers. comm. 2010). Data on populations found on Walpole Island First Nation are maintained by the Walpole Island First Nation Heritage Centre and recent data are currently unavailable to Environment Canada.

**Table 2.** Summary of extant Small White Lady's-slipper populations in Ontario (Solomon 2003; J. Gilbert pers. comm. 2010; COSEWIC 1999). Populations are difficult to quantify because of yearly variation in plant growth and flowering time as well as the use of different census techniques.

Population <sup>1</sup>	First Observation	Recent Population Estimate (year)	Estimated Area Occupied (Ha)
1. Hastings Co.	1979	248 (2003)	50
2. Walpole Island First Nation	unknown	11,600 clumps (2003)	Unknown <sup>2</sup>
3. Walpole Island First Nation	unknown	1,350 clumps (2003)	Unknown <sup>2</sup>
4. Walpole Island First Nation	unknown	1130 clumps (2003)	Unknown <sup>2</sup>
5. Walpole Island First Nation	unknown	192 clumps (2003)	Unknown <sup>2</sup>
6. Walpole island First Nation	unknown	1 clump (2003)	Unknown <sup>2</sup>
7. Walpole Island First Nation	unknown	38 clumps (2003)	Unknown <sup>2</sup>

<sup>1</sup> Plants within 1km of each other are considered to be part of the same population, following COSEWIC's definition of a population (COSEWIC 1999) and NatureServe's definition of a plant Element Occurrence (NatureServe 2004).

<sup>2</sup> In 2003, Small White Lady's-slipper was estimated to occupy about 92 ha of land in total at Walpole Island First Nation (Pers. comm. to R.Poulin 2006)

### 3.3 Needs of the Small White Lady's-slipper

In Canada, Small White Lady's-slipper grows in fragmented, moist, calcareous, native prairie or savannah, and rich calcareous wetlands, known as fens. For long term persistence, Small White Lady's-slipper requires disturbance events, such as periodic fires, prescribed burns and/or compatible grazing in order to persist. In the absence of such disturbance, Small White Lady's-slipper can be out-competed by woody vegetation encroachment or negatively affected by litter accumulation and excessive grass cover (Curtis 1946; Falb and Leopold 1993).

In Manitoba, Small White Lady's-slipper typically occupies native prairie openings with sparse shrub cover, or native prairie openings between tree "bluffs". The terrain is flat to undulating. In ridge and swale topography it tends to prefer ridge slopes. When it occurs on slopes the aspect is often south or west facing, less commonly east or north facing. Soils that support Small White Lady's-slipper are typically moderately to imperfectly drained, strongly to moderately calcareous, sandy loam to loam over glacial till. Seepage areas and hummocks have been observed at some Manitoba sites and may be indicative of fen-like habitat that is dependent on availability of flowing surface or ground water. Some of the only remaining suitable native prairie habitat exists along old road sides surrounded by agriculture. In sloped ditches, Small White Lady's-slipper generally prefers shoulders near fence lines but may occasionally be found in less favored areas such as the bottom of ditches or slopes adjacent to the road (MB CDC 2010). About 80% of Manitoba's populations have some portion of the population occurring along roadsides. Eight of Manitoba's 18 populations are restricted to remnant prairie only along roadsides (MB CDC 2010).

In Ontario, Small White Lady's-slipper occurs in calcareous fen habitat, as well as moist prairies and savannahs (Bowles 2005; Imrie et al. 2005). In Ontario, fens are characterized by high water tables, organic soils, and marl pools (calcium and magnesium deposits), and savannahs are described as areas of mostly grass vegetation with scattered, open-grown trees.

In addition to the above, Small White Lady's-slipper has two habitat needs required for sexual reproduction. Like all species in the genus *Cypripedium*, germination of Small White Lady's-slipper is fully dependent on the presence of specific soil fungi for nutrition during the reproductive period. Many of the species belonging to the group of fungi commonly associated with *Cypripedium*, are currently considered rare and included on European Red Lists<sup>5</sup>, although they may be more common than believed (Shefferson et al. 2005). Small White Lady's-slipper also requires specific pollinators. Since Small White Lady's-slipper flowers lack edible rewards, the presence of pollinators is dependent on nectar/pollen produced by other plants with similar flowering periods. Thus, a lack of diversity of flowering plant species in Small White Lady's-

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<sup>5</sup> The European Red List identifies those species that are threatened with extinction at the European level – so that appropriate conservation action can be taken to improve their status. The European Red List is compiled by IUCN's Species Programme, Species Survival Commission and Regional Office for Pan-Europe.

slipper habitat could limit pollination success (Catling and Knerer 1980; Bernhardt and Edens-Meier 2010).

Adequate light is a primary limiting factor determining Small White Lady's-slipper distribution, growth and abundance. Small White Lady's-slipper requires full to filtered light for growth and flower development (Falb and Leopold 1993). It does not tolerate shade but shows a tendency to prefer edges of shrubs and woods at some sites in both Manitoba and Ontario (Imrie et al. 2005; C. Foster pers. obs). Moisture availability, as it relates to groundwater levels, is also a primary limiting factor (Imrie et al. 2005). Small White Lady's-slipper requires a constant supply of moisture (Brownell 1981), as is typical of fens, ridge and swale topography, and drainage ditches. In addition to limiting factors related to habitat, Small White Lady's-slipper may be limited by its late age of maturity. It can take up to 12 to 16 years for a Small White Lady's-slipper to produce its first flower (Curtis 1943, 1954).

## 4. THREATS

### 4.1 Threat Assessment

Table 3. Threat Assessment Table for Small White Lady's-slipper

Threat	Level of Concern <sup>1</sup>	Extent	Occurrence	Frequency	Severity <sup>2</sup>	Causal Certainty <sup>3</sup>
<b>Habitat Loss and Degradation</b>						
<b>Encroachment by woody plants and thatch accumulation</b>	High	Widespread	Current	Continuous	High	High
<b>Alteration of hydrology</b>	High	Widespread	Historic/ Anticipated	Recurrent	High	High
<b>Infrastructure and residential development</b>	High	Localized	Historic/ Anticipated	Recurrent	Medium	High
<b>Shoreline Erosion</b>	Medium	Localized	Current	Recurrent	Medium	Low
<b>Pesticide/ herbicide applications in or near occupied habitat</b>	Low	Unknown	Unknown	Unknown	Low	Low
<b>Conversion to incompatible agriculture</b>	Low	Widespread	Historic/ Unknown	One-time	High	High
<b>Gravel extraction</b>	Low	Localized	Anticipated	Unknown	Low	Low
<b>Exotic, Invasive, or Introduced Species</b>						
<b>Resource competition</b>	High	Widespread	Current	Seasonal	Medium	High

Threat	Level of Concern <sup>1</sup>	Extent	Occurrence	Frequency	Severity <sup>2</sup>	Causal Certainty <sup>3</sup>
<b>Natural Processes</b>						
<b>Hybridization</b>	Medium	Widespread	Current	Continuous	Medium	Low
<b>Frost</b>	Low	Widespread	Historic/ Anticipated	Seasonal (Spring)	Low	High
<b>Incompatible grazing</b>	Low	Localized	Historic/ Current	Recurrent	Low	High
<b>Disturbance or Harm to Populations</b>						
<b>Inappropriately-timed haying/mowing</b>	High	Widespread	Current	Seasonal	Medium	Medium
<b>Poaching</b>	High	Widespread	Historic/ Anticipated	Recurrent	Medium	High
<b>Trampling</b>	High	Widespread	Historic/ Anticipated	Recurrent	Medium	High
<b>Direct application of herbicides</b>	Low	Localized	Historic/ Anticipated	Seasonal	Low	Medium

<sup>1</sup> *Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the recovery of the species, consistent with the population and distribution objectives. This criterion considers the assessment of all the information in the table.*

<sup>2</sup> *Severity: reflects the population-level effect (High: very large population-level effect, Medium, Low, Unknown).*

<sup>3</sup> *Causal certainty: reflects the degree of evidence that is known for the threat (High: available evidence strongly links the threat to stresses on population viability; Medium: there is a correlation between the threat and population viability e.g., expert opinion; Low: the threat is assumed or plausible).*

## 4.2 Description of Threats

Threats are listed in order of decreasing level of concern. Threats ranked as “low level of concern” in Table 3 are not described in this section.

### ***Encroachment by Woody Vegetation and Thatch Accumulation***

In the absence of pre-settlement fire and compatible grazing regimes, encroachment by woody species and accumulation of thatch has reduced the quality of remaining habitat for all Small White Lady's-slipper populations in Canada. Encroachment and thatch build-up can result in competition for limited resources, such as sunlight, and can limit availability of suitable sites for establishment. Moisture levels and surface temperatures can be affected by the presence of thatch (Sletvold et al. 2010), potentially affecting germination and dormancy.

For the most part, the use of prescribed burns has adequately addressed this threat at the Manitoba TGPP. However, one site at the preserve, which has not burned since 2001, has been associated with thatch accumulation and a decrease in stem counts since 2004 (C. Borkowsky pers. comm. 2010). The use of twice-over rotational grazing has also been shown to reduce the accumulation of thatch at the Manitoba TGPP (Hernandez and Blouin 2001). Nevertheless, more research is needed to determine the specifications of grazing practices that are compatible with

the species and would effectively address this threat (see Table 4). At some sites in Manitoba, shrub encroachment and thatch build-up have been steadily increasing despite attempts at periodic mowing and shrub removal (C. Foster pers. obs.).

In Ontario, succession of Eastern White Cedar in fen habitat may be affecting the Hastings County population. It is not known what historically maintained the open fen habitat or why cedar growth appears to be increasing (C. Brdar pers. comm. 2011). The decline of the Norfolk County population in Ontario has also been attributed to shrub encroachment. Brownell (1984) examined aerial photographs from 1945 which showed that the area occupied by the orchid and its hybrids in Norfolk County was treeless at that time. By 1984, some of the open areas occupied by the orchid and its hybrids had changed to Poison Sumac (*Toxicodendron vernix*) thicket, or succeeded to mixed forest and old field (Brownell 1984). In addition, see Alteration of Hydrology and Resource Competition sections below for a description of the effects of the woody, invasive wetland plant, European Common Reed (*Phragmites australis* ssp. *australis*).

### ***Alteration of Hydrology***

Alteration of hydrology is a concern at all sites since Small White Lady's-slipper is dependent on appropriate moisture regimes. Furthermore, changes in moisture availability can also have a compounding affect by influencing encroachment by woody species and invasive species such as European Common Reed . Drainage for agriculture, and to a lesser extent other purposes such as mosquito reduction, has already reduced the amount of suitable habitat available to support Small White Lady's-slipper. Potential hydrological changes within the watershed are cited as a threat to the Hastings County population, Ontario (Solomon 2003). Water level changes resulting from stream channelization may also be partially responsible for encroachment of woody vegetation into Small White Lady's-slipper habitat at the Norfolk County Ontario population (COSEWIC 1999). There is potential for ditch maintenance activities, such as dredging, to alter hydrology at roadside locations.

Alteration of hydrology can also result from natural processes. Ontario's Walpole Island First Nation populations are affected by natural water level fluctuations of the Great Lakes (J. Bowles pers. comm. 2006). At the Manitoba TGPP, a beaver dam has expanded a wetland into a Small White Lady's-slipper site, where counts have dropped substantially since the late 1990s (C. Borkowsky pers. comm. 2010).

### ***Infrastructure and Residential Development***

Although development for residential purposes, which caused fragmentation, hydrological changes and direct loss of habitat, was primarily a historical threat resulting in the loss of some populations (Punter 1999; COSEWIC 1999), it may still occur in portions of the species range. Development can impact the occurrence and frequency of disturbance events required by the species, such as fire regimes (see section 3.3). It can also increase the introduction and spread of invasive species. On Walpole Island First Nation, Ontario housing construction has increased in response to critical housing shortages (J. Bowles pers. comm. 2006). Residential development south of Brandon, Manitoba has recently affected hydrology at one site (J. Greenall pers. comm. 2011) and additional anticipated development may further threaten the hydrologic integrity of the

site. Installation or maintenance of utility lines is also a concern since many populations occur along roadsides or right-of ways. One site in Manitoba was degraded by installation of a telephone line (Punter 1999).

### ***Resource Competition***

Increasing abundance of invasive species is a concern at many sites, particularly those near Brandon, Manitoba where the highly invasive Leafy Spurge (*Euphorbia esula*) has been rapidly expanding (LSSG 2005). Roadside populations are particularly susceptible to being outcompeted by this invasive species. Shading and competition by Smooth Brome (*Bromus inermis*) has also resulted in the loss of at least one roadside population near Brandon, Manitoba (MB CDC 2010). In Ontario, European Common Reed is a potential threat to all low-lying prairie populations on Walpole Island First Nation (J. Bowles pers. comm. 2006, C. Jacobs, pers. comm. 2012).

### ***Inappropriately-timed Haying/Mowing***

Haying or mowing is an established beneficial management practice for Small White Lady's-slipper, as well as other prairie species. However, if inappropriately timed, mowing can remove flowering stems before maturity, pollination or seed production. Eight Manitoba populations occur exclusively within remnant prairie, in roadsides surrounded by agriculture. This presents a challenge since roadsides are mowed for public safety reasons, typically in June and August with a blade height of 10 – 41 centimeters, leaving thatch behind. June mowing could potentially have an adverse effect on reproduction. Monitoring data suggests that roadside populations are decreasing (MB CDC 2010). One of many possible explanations could be repeated mowing in June, in addition to leaving thatch behind.

### ***Poaching***

Digging up of plants by orchid collectors has been reported numerous times from sites in both Manitoba and Ontario (Environment Canada 2006; MB CDC 2010, Walpole Island First Nation community members, pers. comm. 2012), particularly along roadsides where plants are visible and accessible. Poaching has the potential to have a major affect on the persistence of small populations, such as those along roadsides.

### ***Trampling***

Trampling of plants as well as soil compaction from dirt bikes and all terrain vehicles has been reported at some populations in Manitoba and on Walpole Island First Nation, Ontario (MB CDC 2010; J. Bowles pers. comm. 2006, Walpole Island First Nation community members, pers. comm. 2012). Vehicles involved in mowing or haying can also trample plants as well as compacting soil and creating disturbance that can increase opportunities for colonization by invasive species. Accidental trampling of Small White Lady's-slipper plants by biologists and nature enthusiasts has been observed at Ontario's Hastings County site (C. Brdar pers. comm. 2010.).

### **Shoreline Erosion**

One Small White Lady's-slipper population on the Walpole Island First Nation, Ontario may be threatened by shoreline erosion due to wave action along the St. Clair River (C. Jacobs pers. comm. 2012)

### **Hybridization**

Hybridization of Small White Lady's-slipper with two varieties of Yellow Lady's-slipper (*Cypripedium parviflorum* Salisbury var. *makasin* and *Cypripedium parviflorum* var. *pubescens*) has been reported for populations in the United States and is indicated as a threat to populations in Canada (Figure 4) (Brownell 1981; COSEWIC 1999). Hybridization has been reported at all sites in Manitoba (Foster and Hamel 2006). Hybrid abundance appears to be increasing at some sites in Manitoba in conjunction with a decrease in Small White Lady's-slipper abundance. Hybrid plants also appear to be much more vigorous than Small White Lady's-slipper (e.g., large plants with a greater number of flowering stems per plant, Foster 2008). This could lead to hybrids outcompeting Small White Lady's-slipper for limited resources. While only hybrids were documented at Ontario's Norfolk County site in 1984 during a detailed inventory (Brownell 1984), and in 2002 when the site was burned, a single non-hybrid Small White Lady's-slipper was observed in 1987 and 1993 (see Appendix B). This population has not been visited since 2002 (J. Gilbert pers. comm. 2010).



Figure 4. An opportunity for hybridization (C. Foster).

Currently there is uncertainty about the severity of the threat that hybridization poses to the continued existence of Small White Lady's-slipper in Canada. Worley et al. (2009) conducted a study on four Manitoba populations to assess evidence for gene flow between Yellow and Small White Lady's-slipper. Analysis of genetic and morphological data indicated that these two species remain distinct, despite some bidirectional gene flow through introgressive hybridization. Further studies are required to determine the severity of this threat to Small White Lady's-slipper. The ecological requirements and relative fertilities of hybrids and parents have yet to be determined.

## **5. POPULATION AND DISTRIBUTION OBJECTIVES**

In Canada, Small White Lady's-slipper is restricted to small isolated populations. Additional populations may be discovered but there is very little remaining suitable habitat. Realistically, this species will not recover to pre-settlement population levels which are assumed to have been much higher than today because of the much greater availability of suitable habitat at that time. Therefore, this species will likely always remain Endangered in Canada.

Because population abundance of Small White Lady's-slipper is difficult to accurately measure (see section 3.2), it is not currently feasible to determine a population objective based on abundance. However, it is feasible to set a population objective based on maintaining the existence of extant populations.

The population and distribution objective for Small White Lady's-slipper is to maintain the current Area of Occupancy for all 25 populations known to exist in Canada within the past 16 years (1995-2010), plus any newly-discovered ones. Populations that have documented occurrences within the past 16 years are considered by Environment Canada to be currently extant, unless habitat is no longer suitable. The rationale for using a 16-year window for establishing these objectives is based on the 12 to 16 year period that may be required before Small White Lady's-slippers flower for the first time (Curtis 1943, 1954).

## **6. BROAD STRATEGIES AND GENERAL APPROACHES TO MEET OBJECTIVES**

### **6.1 Actions Already Completed or Currently Underway**

#### ***Manitoba***

- Information regarding current and historical land uses, and perceived threats has been gathered from some land managers and private landowners (MB CDC 2010).
- Provincial government and non-government agencies are discussing or assisting various landowners and land managers with the implementation of proven beneficial management practices at specific sites (J. Morgan pers. comm. 2010; D. Roberts pers. comm. 2010; M. Latta pers. com. 2011) such as prescribed burning, mowing/haying, compatible grazing or exclusion of grazing, hand removal of shrubs and Leafy Spurge (MB CDC 2010; C. Borkowsky pers. comm. 2010).
- Maps and management recommendations for Small White Lady's-slipper populations are provided on an annual basis for three rural municipalities based on information gathered from provincial road maintenance staff, regional weed control staff and the rural agencies responsible for road maintenance. These populations can be considered when planning road maintenance activities, such as ditch widening/deepening, utility line installations, herbicide spraying and timing of mowing (Foster 2008).
- Discussions regarding mitigation measures for a proposed development near critical habitat are ongoing (J. Greenall pers. comm. 2011).
- Small White Lady's-slipper is listed under Manitoba's *Endangered Species Act*.

#### ***Ontario***

- Efforts by the Walpole Island Heritage Centre to lease lands for conservation have resulted in a reduction in the rate of conversion of prairie and savannah habitat to agriculture (COSEWIC 2009) during the tenure of the 5-year leases.

- The Walpole Island Land Trust purchased a 25 acre portion of prairie with an extant population of Small White Lady's-slipper (C. Jacobs pers. comm. 2012).
- Discussions are underway regarding hydrological studies for a site in Ontario (C. Brdar pers. comm. 2010).
- A site containing Small White Lady's-slippers in Ontario has been fenced to discourage public use and is patrolled to discourage illegal activity (C. Brdar pers. comm. 2010).
- The Walpole Island Heritage Centre maintains some information on the location and abundance of Small White Lady's-slipper clumps on Walpole Island First Nation (Bowles 2005).
- Some sites on Walpole Island First Nation have been burned regularly to prevent woody encroachment and with appropriate stewardship (e.g., removal of invasive or non-native species) have been restored for Small White Lady's-slipper (Environment Canada 2006, Walpole Island First Nation community members, pers. comm. 2012).
- Recovery actions described in the Draft Walpole Island Ecosystem Recovery Strategy (Bowles 2005) included raising awareness in the community about species at risk, including Small White Lady's-slipper. Pamphlets, calendars, newsletter articles, posters and other promotional material have been used to raise awareness of species at risk in the Walpole Island First Nation community.
- The Walpole Island First Nation is currently developing an ecosystem protection plan based on the community's Traditional Ecological Knowledge (TEK) (J. Macbeth, pers. comm. 2011).
- Small White Lady's-slipper is listed under Ontario's *Endangered Species Act, 2007*.

### **Both Provinces**

- Conservation agreements have been promoted in Manitoba and are underway in Ontario with at least one that has been in place for several years on a site containing Small White Lady's-slipper in Manitoba.
- Fact sheets have been produced by Manitoba Conservation, Ontario Ministry of Natural Resources, the Royal Ontario Museum, Tallgrass Ontario, Ontario Wildflowers, and others and are readily available on the internet.
- Hybridization studies are underway in Manitoba and Ontario (A. Worley pers. comm. 2010).

## 6.2 Strategic Direction for Recovery

Research and management approaches recommended addressing threats as well as key information needs for successful recovery planning are outlined in Table 4.

**Table 4. Recovery Planning Table for Small White Lady's-slipper**

Threat or Limitation	Priority	General Description of Research and Management Approaches
<b>Broad Strategy: Communication, Outreach, and Education</b>		
Encroachment by woody vegetation and thatch; Alteration of hydrology; Resource competition; Residential and infrastructure development; Pesticide applications in or near occupied habitat; Conversion for agriculture; Gravel extraction; Hybridization; Inappropriately-timed haying/mowing; Poaching; Trampling; Direct application of herbicides	High - Manitoba Medium - Ontario	<ul style="list-style-type: none"> <li>- Encourage transfer and archiving of TEK.</li> <li>- Determine needs, and increase communications and education with agencies/individuals responsible for potentially-harmful projects in each region occupied by Small White Lady's-slipper.</li> <li>- Improve two-way communications with landowners/managers regarding information on Small White Lady's-slipper locations, land uses, needs, threats, management and protection.</li> <li>- Develop and implement effective communications strategies appropriate for various purposes and audiences</li> </ul>
<b>Broad Strategy: Habitat Protection, Management, and Stewardship</b>		
Encroachment by woody vegetation and thatch; Alteration of hydrology; Shoreline erosion; Resource competition; Residential and infrastructure development; Pesticide applications in or near occupied habitat; Conversion for agriculture; Gravel extraction; Spread of invasive species (e.g. European Common Reed); Hybridization; Inappropriately-timed haying/mowing; Trampling; Direct application of herbicides	High – Manitoba High - Ontario	<ul style="list-style-type: none"> <li>- Develop, promote, and implement beneficial management practices most appropriate for each population.</li> <li>- Use existing approaches for stewardship and protection such as Conservation Agreements, land purchases or leases by conservation agencies, and local land trusts, municipal and provincial government regulations and policies.</li> </ul>

Threat or Limitation	Priority	General Description of Research and Management Approaches
<b>Broad Strategy: Inventory and Monitoring</b>		
Knowledge Gaps	Medium - Manitoba Medium - Ontario	<ul style="list-style-type: none"> <li>- Develop and implement standardized inventory and monitoring protocols.</li> <li>- Determine area of occupancy for populations for which this attribute is unknown.</li> <li>- Encourage the transfer of TEK and local knowledge amongst landowners/managers and others regarding past trends, land use(s), perceived threats, etc.</li> </ul>
<b>Broad Strategy: Research</b>		
Knowledge Gaps	Medium - Manitoba High - Ontario	<ul style="list-style-type: none"> <li>- Assess impacts of threats to Small White Lady's-slipper and its habitat, especially the threats posed by hydrological alterations and hybridization and invasive species.</li> <li>- Determine potential for restoration of habitats and re-introduction of Small White Lady's-slipper plants, where appropriate, including the presence of soil fungi and pollinators.</li> <li>- Assess and improve knowledge of beneficial management practices for Small White Lady's-slipper.</li> </ul>

### 6.3 Narrative to Support the Recovery Planning Table

Communication and outreach are essential to the recovery of the Small White Lady's-slipper, particularly in Manitoba. Only by raising awareness among key landowners, managers and land users, will it be possible to implement land management practices that will benefit the species. Efforts to manage Small White Lady's-slipper habitat have often been reactive rather than proactive. Some of those responsible for work permits near roads (e.g., Manitoba Infrastructure and Transportation) may currently be unaware of Small White Lady's-slipper locations and activities that could result in destruction of its habitat. Moreover, through communication and education, information is likely to be obtained from landowners/managers that will be valuable with regard to current and past land uses, possible threats, and general population trends. For example, through community sessions it has been noted that this species is known to have medicinal value for some First Nations. Increasing awareness of Small White Lady's-slipper locations needs to proceed with caution due to the threat of poaching and trampling.

Habitat protection, management, and stewardship are also key elements in the recovery strategy. Although much is known about managing native prairies in general, site-specific best management practices that take into consideration local environmental conditions and their effects on Small White Lady's-slipper will need to be developed. Effects of various management regimes and their interactions with environmental conditions need to be well documented and communicated so that successful management techniques can be employed at different sites. In particular, the needs of Small White Lady's-slipper and associated species will need to be considered when implementing large-scale burning, mowing and haying operations within the species' habitat.

It will be important to continue monitoring and inventorying populations and habitat of the Small White Lady's-slipper. There is a need to standardize survey approaches to help determine population trends and sizes across Canada. At present, widely-divergent and incompatible methods are being used across the country (e.g., Imrie et al. 2005; Worley et al. 2009) with the result that it is impossible to provide a reliable estimate of abundance for the species.

Research will be an important tool for developing a better understanding of the severity of various threats. One of the key issues regarding Small White Lady's-slipper status and recovery has been the effect that hybridization with Yellow Lady's-slippers may have on this species. Further research is required, some of which is already underway. Research on the effects of hydrological processes on Small White Lady's-slipper is also required to help determine the probable effects of hydrological changes on Small White Lady's-slipper habitat. Finally, research that seeks to better understand the feasibility of restoring the species' habitat and re-introducing it would be beneficial.

## 7. CRITICAL HABITAT

### 7.1 Identification of the Species' Critical Habitat

Critical habitat is defined in SARA (Subsection 2(1)) as “*the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.*”

Critical habitat is identified for Small White Lady's-slipper using the best information available up to January 2011. The locations and attributes of critical habitat were identified using field survey and monitoring data maintained by the Manitoba Conservation Data Centre, Ontario Parks, as well as by using expert knowledge and literature.

The critical habitat identified in this strategy is necessary for the survival of Small White Lady's-slipper in Canada, but is insufficient to achieve the population and distribution objectives. The schedule of studies (Table 5) outlines the activities required to identify additional critical habitat necessary to support the population and distribution objectives. Critical habitat may be amended if new populations are discovered.

Locations that contain critical habitat for the Small White Lady's-slipper were identified based on the following criteria:

- 1) Small White Lady's-slipper populations have been observed within the location between 1995 and 2010.
- 2) Locations occupied by Small White Lady's-slipper have been determined with reasonable accuracy
- 3) Habitat biophysical attributes are as follows:
  - (a) In Manitoba, the habitat is moderately to imperfectly drained, open native prairie; or prairie openings with occasional sparse shrub cover; or prairie openings between tree “bluffs”. Slopes are flat to undulating with ridge and swale topography;
  - (b) In Ontario, the habitat is characterized by moist prairie and savannah or rich calcareous fen with a high water table, organic soils, and marl pools (calcium and magnesium deposits).

Critical habitat for Small White Lady's-slipper has been partially identified in this strategy within 28 quarter sections<sup>6</sup> and within approximately 63 km of road allowances in Manitoba, and at one site in Ontario.

In the best interest of the species, the location information is maintained at Environment Canada, Prairie & Northern Region, Edmonton, Alberta and can be made available to land managers and other potentially-affected parties, upon request.

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<sup>6</sup> The Dominion Land Survey system (McKercher and Wolfe 1986) is the grid system used in the Prairie Provinces to describe land locations. One unit of this system, the quarter-section (65 ha), is particularly useful for mapping critical habitat as it is used for ownership and management purposes.

## **Manitoba**

In Manitoba, Small White Lady's-slipper critical habitat is identified for small populations that occur in remnant prairie located in roadside ditches and right-of-ways, as well as for large populations that span multiple quarter sections. Critical habitat within roadsides is bounded lengthwise by intersecting or ending roads and widthwise by the road edge and the property line in order to include suitable habitat adjacent to Small White Lady's-slipper occurrences. Intersecting or ending roads, road edges and property lines were used to bound the critical habitat in roadsides because they often create uniform conditions of hydrology and habitat along the roadside that are suitable for the plants, whereas land adjacent to the roadsides is likely to be characterized by different habitat because of differences in hydrology and land use. However, in situations where Small White Lady's-slippers would grow across property lines, the portion of private property where the species occurs would also be considered critical habitat and would consist of the portion of the private property with biophysical features described in 3(a). In addition, the roadside habitat between intersecting and/or ending roads serves to provide increased connectivity between fragmented populations. Critical habitat in right-of-ways between roads and railways (2 populations) was located within a triangular-shaped area with a maximum width of between 130-200 m. Critical habitat within such areas was bounded by the edge of the road beds and rail beds because these areas are composed of uniform habitat with appropriate biophysical attributes that is often surrounded by unsuitable habitat such as cultivated land. For populations located in quarter sections, critical habitat consists of the portion of the quarter section with biophysical features as described in 3(a).

Critical habitat in Manitoba encompasses the entire area of occupancy for the 18 populations in that province. Within these quarter sections and road allowances, critical habitat is identified as all prairie habitat described in 3(a). Unsuitable habitat such as forests, marshes, cultivated land, road beds, rail beds, buildings, driveways, and trails located within the general critical habitat locations is not necessary for the survival and recovery of the species and, therefore, is not critical habitat. Manitoba populations for which critical habitat is identified are indicated in Table 1. Figure 3 shows the general locations of critical habitat in Manitoba.

## **Ontario**

In Ontario, critical habitat for the Small-White Lady's-slipper has been identified for one extant population located in Hastings County (Table 2). Critical habitat is identified as the extent of contiguous suitable habitat as described in 3(b) encompassing the species' occurrence.

In Ontario, critical habitat is not currently identified for the six Walpole Island First Nation populations. Given the known historical and current threats to the species, confirmation of the location and extent of Small White Lady's-slipper populations is required for the identification of critical habitat.

At this time, the information required to identify critical habitat for the Small White Lady's slipper for the Walpole Island First Nation populations is not available to Environment Canada. The available information is from 2003 and the specific data required to be able to identify

critical habitat sites (i.e., location and extent of population, biophysical attributes of the habitat), are not yet available to Environment Canada. In addition, existing evidence indicates that certain threats may have impacted portions of these populations (J. Bowles pers. comm. 2006). Once adequate information is obtained for populations at Walpole Island First Nation, additional critical habitat will be identified and may be described within a multi-species at risk action plan developed in collaboration with the Walpole Island First Nation.

## 7.2 Schedule of Studies to Identify Critical Habitat

Further work is required to identify additional critical habitat necessary to support the population and distribution objectives for the species. This additional work includes the following activities:

**Table 5.** Schedule of Studies

<b>Description of Activity</b>	<b>Rationale</b>	<b>Timeline</b>
Confirm/obtain population and habitat information for Ontario's Walpole Island First Nation and Norfolk County populations.	Confirm location and extent of population. Confirm habitat associations, habitat attributes and determine extent of suitable habitat.	2014-2018
Conduct research to assess the amount of land around occurrences that may be required for Small White Lady's-slipper survival and recovery.	Required to determine if critical habitat is identified to fully meet population and distribution objectives.	2014-2018

## 7.3 Activities Likely to Result in the Destruction of Critical Habitat

Destruction is determined on a case by case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single or multiple activities at one point in time or from the cumulative effects of one or more activities over time (Government of Canada 2009).

Activities likely to result in destruction may occur within the critical habitat but may also occur outside of the critical habitat. Activities that are likely to result in destruction of critical habitat include but are not limited to:

1. Compression, covering, inversion, or excavation/extraction of soil – Examples of compression include the creation or expansion of permanent/temporary structures, trails, roads, repeated motorized traffic, and objects that concentrate livestock activity and alter current patterns of grazing pressure such as spreading bales, building new corrals, or adding more water troughs. Compression can damage soil structure and porosity, or reduce water availability by increasing runoff and decreasing infiltration, such that the habitat is

destroyed. Examples of covering the soil include the new creation or expansion of permanent/temporary infrastructure, spreading of solid waste materials, or roadbed construction. Covering the soil prevents solar radiation and water infiltration needed for germination and survival of plants, such that habitat is destroyed. Examples of soil inversion and excavation or extraction include new or expanded cultivation, sand and gravel extraction pits, dugouts, road construction, pipeline installation, and removal of topsoil. Soil inversion or extraction can alter soil porosity along with temperature and moisture regimes, such that vegetation communities change to those dominated by competitive weedy or invasive species. This then results in habitat destruction.

2. Planting of shrubs, trees or invasive alien species. Once established, these species can alter hydrology and soil nutrient and moisture availability and create shade resulting in direct competition with Small White Lady's-slippers, such that population declines occur. This effectively destroys the critical habitat.
3. Indiscriminate application of fertilizers and pesticides. Application of fertilizers may kill the rare soil fungi required by the Small White Lady's-slippers to reproduce. Fertilizer runoff can also alter soil nutrient status, creating new conditions that will be suitable for some plant species and unsuitable for others. Changes to soil nutrient status will also influence the outcome of interspecific competition for nutrients. Pesticide runoff and drift can alter plant and pollinator communities, thereby possibly reducing the capability of the habitat for supporting Small White Lady's-slipper.
4. Hydrological alterations due to damming, ditching, drainage, or culvert installation or removal may change soil moisture, which is an important component of the Small White Lady's-slipper habitat needs. As a result, changes in hydrological conditions may result in reduced viability, or extirpation of the species within the critical habitat. An increase in moisture could also lead to increased encroachment by woody vegetation and some invasive species such as Common Reed, which are threats to the species. Hydrological alterations may also affect nutrient supply and leaching.

## 8. MEASURING PROGRESS

The performance indicator presented below provides a way to define and measure progress toward achieving the population and distribution objectives.

Progress towards meeting the population and distribution objectives, must be reported within five years after this recovery strategy is finalized. Success of recovery strategy implementation will be measured against the following indicator:

- Area of occupancy for all 25 currently-existing populations and any newly-discovered ones is maintained.

## **9. STATEMENT ON ACTION PLANS**

One or more Action Plan(s) for Small White Lady's-slipper will be posted on the Species at Risk Public Registry by 2017. The action plan(s) may include an area-based, multi-species approach for some areas and will be prepared in collaboration with the Government of Ontario; Walpole Island First Nation, Ontario; Government of Manitoba; and Nature Conservancy of Canada, Manitoba Region.

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## APPENDIX A: SMALL WHITE LADY'S-SLIPPER CONSERVATION STATUS ACCORDING TO NATURE SERVE (2011)

Region	NatureServe Rank	Conservation Status <sup>1</sup>
Global	G4	Apparently Secure
Canada	N2	Imperilled
United States	N4	Apparently Secure
Manitoba	S2	Imperilled
Ontario	S1	Critically Imperilled
Saskatchewan	SH	Possibly Extirpated
Connecticut	SNR	Unranked
Alabama	S1	Critically Imperilled
Illinois	S2	Imperilled
Indiana	S2	Imperilled
Iowa	S3	Vulnerable
Maryland	S1	Critically Imperilled
Michigan	S2	Imperilled
Minnesota	S3	Vulnerable
Nebraska	S1	Critically Imperilled
New Jersey	S1	Critically Imperilled
New York	S1	Critically Imperilled
North Dakota	S2 S3	Imperilled/Vulnerable
Ohio	S1	Critically Imperilled
Pennsylvania	SX	Presumed Extirpated
South Dakota	S1	Critically Imperilled
Virginia	S1	Critically Imperilled

<sup>1</sup> – Presumed extirpated - believed to be extirpated from the jurisdiction (i.e., nation or state/province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

Possibly extirpated - Known from only historical records but still some hope of rediscovery.

Critically Imperilled - extreme rarity or some other factor(s) such as very steep declines make it especially vulnerable to extirpation from the jurisdiction

Imperilled - rare due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from jurisdiction

Vulnerable - due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

Apparently secure - uncommon but not rare; some cause for long-term concern due to declines or other factors

Unranked – conservation status not yet assessed

## APPENDIX B: SMALL WHITE LADY'S-SLIPPER POPULATIONS NOT OBSERVED SINCE 1995\*

Population name	Province	County/municipality	Year last observed
1. Point Edward	ON	Lambton County	1906
2. Port Elgin	ON	Bruce County	1903
3. Bothwell	ON	Kent County	1924
4. Crystal Beach	ON	Regional Municipality of Niagara	Before 1986
5. Norfolk Co.	ON	Norfolk County	1993 <sup>a</sup>
6. Treherne	MB	Rural Municipality of South Norfolk	1980
7. Pembina Hills	MB	Rural Municipality of Pembina and Stanley	Before 1957
8. Brandon	MB	Rural Municipality of Cornwallis	Before 1994
9. Brandon	MB	Rural Municipality of Cornwallis	Before 1994
10. Brandon	MB	Rural Municipality of Cornwallis	Before 1994
11. Brandon	MB	Rural Municipality of Cornwallis	Before 1994
12. Indian Head	SK	Rural Municipality of Indian Head	1895

\*The information contained in this appendix was extracted from COSEWIC 1999, please consult this document and references within for more information.

a: a non-hybrid Small White Lady's-slipper was also observed in 1987 (M. Oldham pers. comm. 2011)

## APPENDIX C: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

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](#)<sup>7</sup>. 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 upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

Small White Lady's-slipper management practices are aimed at maintaining or improving remnant native prairie and/or fen habitats. For the most part managing for healthy native ecosystems will benefit non-target species, natural communities, and ecological processes. However, the timing and frequency of management activities such as burning or mowing/haying have the potential to affect other species negatively in the short or long-term. For example, Poweshiek Skipperling (*Oarisma poweshiek*) occurs in the Manitoba TGPP and can be negatively affected by burning or mowing depending on timing, area, and frequency. COSEWIC (2003) suggests mowing in late summer/fall and using rotational spring burning on a smaller scale for the Manitoba TGPP. Rough Agalinis (*Agalinis aspera*) and Dakota Skipper (*Hesperia dacotae*) both co-occur with Small White Lady's-slipper at one of the largest Small White Lady's-slipper sites in Manitoba. Rough Agalinis, as well as Dakota Skipper, can be negatively affected by mowing if done in late summer/fall. The peak blooming period of Rough Agalinis in this region is quite variable from year to year ranging from August 8 to September 10 (Foster 2008, COSEWIC 2006).

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<sup>7</sup> <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

Species at risk which reside in similar habitat as Small White Lady's-slipper that may be impacted by this recovery strategy include, but are not limited to: Species Name	SARA Designation
<b>Vascular Plants</b>	
Climbing Prairie Rose ( <i>Rosa setigera</i> )	Special Concern
Colicroot ( <i>Aletris farinosa</i> )	Threatened
Dense Blazing Star ( <i>Liatris spicata</i> )	Endangered
Eastern Prairie Fringed-Orchid ( <i>Platanthera leucophaea</i> )	Endangered
Gattinger's Agalinis ( <i>Agalinis gattingeri</i> )	Endangered
Skinner's Agalinis ( <i>Agalinis skinneriana</i> )	Endangered
Great Plains Ladies'-tresses ( <i>Spiranthes magnicamporum</i> )	Not Assessed (Endangered in Manitoba)
Pink Milkwort ( <i>Polygala incarnata</i> )	Endangered
Riddell's Goldenrod ( <i>Solidago riddellii</i> )	Special Concern (Threatened in Manitoba)
Rough Agalinis ( <i>Agalinis aspera</i> )	Endangered
Showy Goldenrod ( <i>Solidago speciosa</i> )	Endangered
Western Prairie Fringed-orchid ( <i>Platanthera praeclara</i> )	Endangered
White Prairie Gentian ( <i>Gentiana alba</i> )	Endangered
Willowleaf Aster ( <i>Symphyotrichum praelatum</i> )	Threatened
<b>Invertebrates</b>	
Dakota Skipper ( <i>Hesperia dacotae</i> )	Threatened
Monarch Butterfly ( <i>Danaus plexippus</i> )	Special Concern
Poweshiek Skipperling ( <i>Oarisma poweshiek</i> )	Threatened
<b>Birds</b>	
Henslow's Sparrow ( <i>Ammodramus henslowii</i> )	Endangered
Northern Bobwhite ( <i>Colinus virginianus</i> )	Endangered
Sprague's Pipit ( <i>Anthus spragueii</i> )	Threatened
<b>Reptile</b>	
Spotted Turtle ( <i>Clemmys guttata</i> )	Endangered
Eastern Foxsnake ( <i>Pantherophis gloydi</i> )	Endangered
Butler's Gartersnake ( <i>Thamnophis butleri</i> )	Threatened
Queensnake ( <i>Regina septemvittata</i> )	Threatened