

Ontario Species at Risk Evaluation Report

for

Small White Lady's-slipper (*Cypripedium candidum*)

Committee on the Status of Species at Risk in Ontario
(COSSARO)

Assessed by COSSARO as ENDANGERED

January 2016

Final

Cypripède blanc (*Cypripedium candidum*)

Le cypripède blanc (*Cypripedium candidum*) est une orchidée vivace courte ornée de petites fleurs blanches qui se trouve dans des parcelles isolées d'un habitat relique situé dans des prairies indigènes et des tourbières riches en calcaire de l'Ontario. Il croît généralement en touffes pourvues de plusieurs tiges. L'espèce est rare et en perte de vitesse dans l'ensemble de son aire de répartition mondiale dans le nord-est de l'Amérique du Nord. Il n'a apparemment jamais été courant en Ontario, où il a déjà été présent dans 11 sous-populations connues. Plusieurs de ces populations sont maintenant disparues ou historiques (peut-être disparues). Le cypripède blanc est maintenant considéré comme une espèce disparue dans seulement deux ou trois « emplacements », c'est-à-dire dans une petite sous-population dans le comté de Hastings au nord du lac Ontario ainsi que dans six sous-populations sur l'île Walpole dans l'extrême sud-ouest de l'Ontario. Il n'y a pas de renseignements récents (>2003) sur les populations pour l'île Walpole. Le cypripède blanc est confronté à plusieurs menaces documentées, dont les principales sont considérées être l'empiètement de la végétation ligneuse et l'accumulation de chaume, l'altération de l'hydrologie ainsi que la construction d'infrastructures et d'habitations. Il a été désigné disparu ou historique dans plusieurs sites en Ontario depuis la dernière partie du XX^e siècle (les années 1980 et 1990) et il n'y a pas de données qui indiquent une augmentation des populations ou une expansion de l'aire de répartition. L'aire de répartition de l'espèce est très limitée avec un indice de zone d'occupation inférieur à 20 km² et une zone d'occurrence de 2 500 km² en Ontario. Il y avait approximativement 536 individus matures (individus en fleurs) dans la sous-population du comté de Hastings en 2011 (248 en 2003), mais la taille actuelle des sous-populations qui sont beaucoup plus grandes sur l'île Walpole est inconnue.

Le cypripède blanc a déjà été évalué comme une espèce en voie de disparition en Ontario en 1999. En 2000, il a été désigné par le COSEPAC comme une espèce en voie de disparition au Canada, mais une réévaluation faite en novembre 2014 l'a abaissé au rang d'espèce menacée, principalement à cause de la découverte de 11 sous-populations additionnelles au Manitoba à la suite d'une intensification des efforts de recherche. Aucune nouvelle population n'a été consignée en Ontario depuis 1979. L'aire de répartition a rétréci depuis ce temps et il n'y a pas de données qui indiquent une amélioration de la situation des sous-populations en Ontario. Le cypripède blanc a été désigné comme une espèce en voie de disparition en Ontario en raison de la petite envergure de son aire de répartition et de la diminution de sa population.

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Executive summary

The Small White Lady's-slipper is a small perennial orchid with small white flowers that occurs in isolated patches of remnant native prairie and rich calcareous fen habitat in Ontario. It typically grows in clumps with several stems. The species is rare and declining throughout its global range in northeastern North America. It was apparently never common in Ontario, at one time occurring in 11 known subpopulations. Several of these populations are now either extirpated or historical (possibly extirpated). It is now considered to be extant in only two or three "locations" - a small subpopulation in Hastings County north of Lake Ontario and six subpopulations on Walpole Island in extreme southwestern Ontario. Recent (>2003) population information for Walpole Island is not available. The Small-flowered Lady's-slipper is faced with a number of documented threats, with the primary threats considered to be encroachment by woody vegetation and thatch accumulation, alteration of hydrology, and infrastructure and residential development. Several sites in Ontario have been designated as extirpated or historical since the latter part of the 20th century (1980s and 1990s), and there are no data to suggest a population increase or range expansion. The species has a very restricted range, with an index of area of occupancy of less than 20 km², and an estimated extent of occurrence of 2500 km² in Ontario. There were approximately 536 mature individuals (flowering individuals) in the Hastings County subpopulation in 2011 (248 in 2003), but the current size of the much larger subpopulations on Walpole Island is unknown.

Small White Lady's-slipper was previously assessed as Endangered in Ontario in 1999. In 2000, it was designated by COSEWIC as Endangered in Canada, but a re-assessment in November 2014 resulted in a down-listing to Threatened, primarily due to the discovery of 11 additional subpopulations in Manitoba as a result of increased search effort. No new subpopulations have been recorded in Ontario since 1979, the range has contracted since that time, and there are no data to suggest improved status of Ontario subpopulations. The Small White Lady's-slipper in Ontario has been designated as Endangered based upon small distribution, range and decline.

1. Background information

1.1. Current designations

- GRANK: G4 (NatureServe 2015)
- NRANK Canada: N2 (NatureServe 2015)
- COSEWIC: Threatened (COSEWIC 2014) (assessed November 2014)
- SARA: Endangered (Schedule 1) (Species at Risk Public Registry 2015)
- ESA 2007: Endangered (OMNRF 2015a)
- SRANK: S1 (NatureServe 2015)

1.2. Distribution in Ontario

In Ontario Small White Lady's-slipper is found in isolated prairie remnant patches and rich calcareous fen habitat (Environment Canada 2014). It is restricted to three subpopulations in southern Ontario, two on Walpole Island in extreme southwestern Ontario and one in Hastings County north of Lake Ontario (Figure 1). It was never common in Ontario, at one time occurring in 11 subpopulations in southern and southwestern Ontario (COSEWIC 2014) (Figures 1 and 2). Subpopulations that are considered extirpated occurred at Point Edward, Port Elgin, Crystal Beach and Bothwell. Small White Lady's-slipper occurred historically at an additional four sites, three on Walpole Island and one in Norfolk County (COSEWIC 2015).

Figure 1. Location and status of Small White Lady's-slipper subpopulation in Ontario (from COSEWIC 2014).

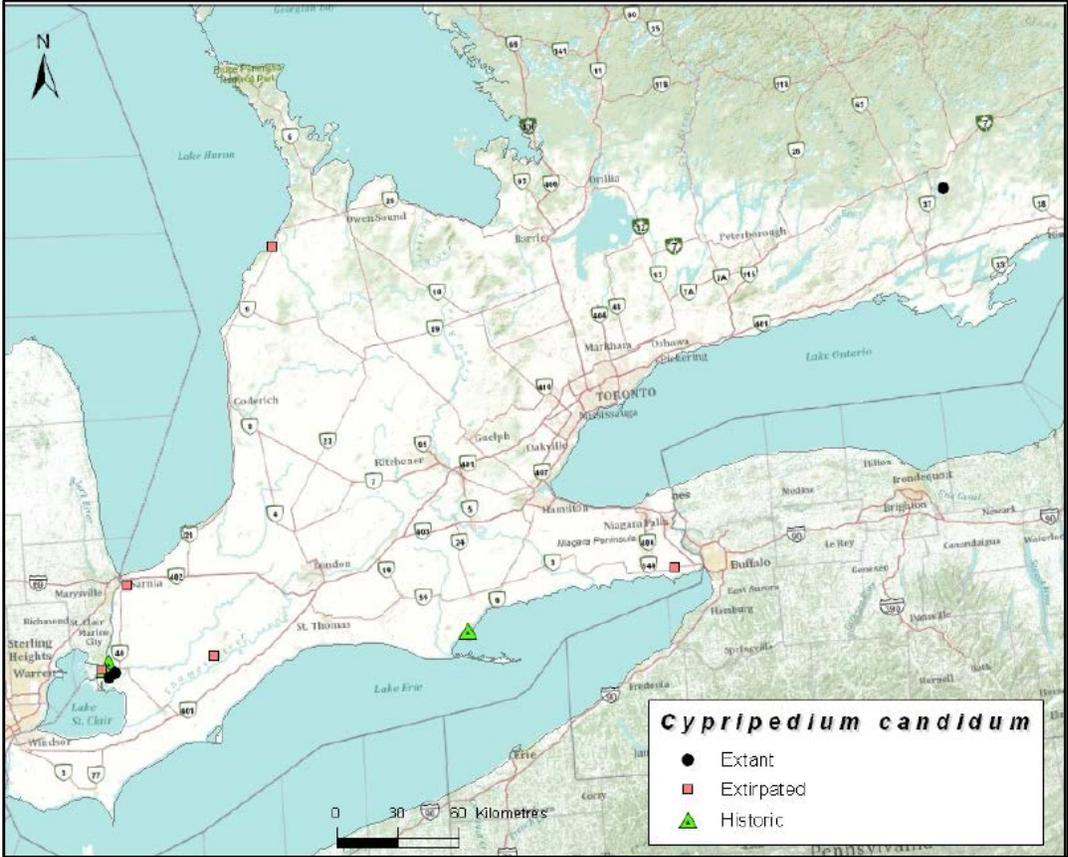
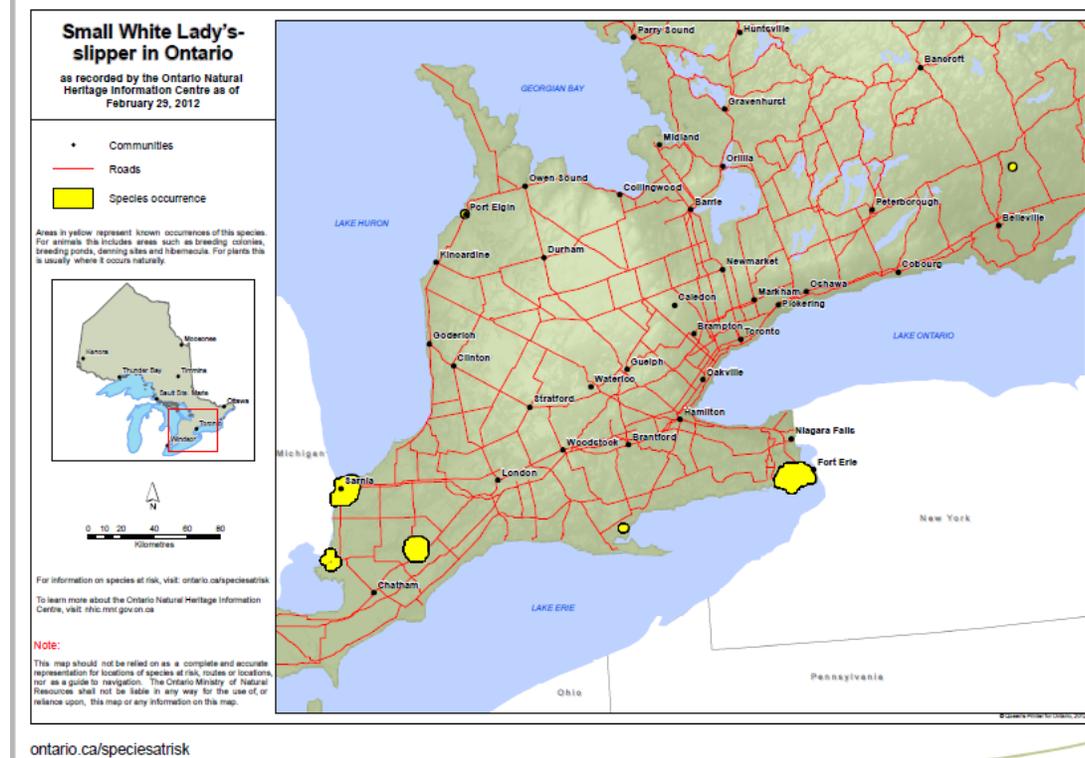


Figure 2. Distribution of Small White Lady's-slipper in Ontario based upon NHIC element occurrences (extant, historical and extirpated locations) (OMNRF 2015).



1.3. Distribution and status outside Ontario

This species is restricted to northeastern North America, and is currently considered extant in 18 states and two provinces (COSEWIC 2014) (Figure 3). In Canada the Small White Lady's-slipper occurs in Ontario and Manitoba, and was historically present in Saskatchewan.

Figure 3. Global distribution of Small White Lady's-slipper (COSEWIC 2014).



1.4. Ontario conservation responsibility

Ontario comprises only a small proportion of the global range, with less than 10% of the global range occurring in Canada (COSEWIC 2014).

1.5. Direct threats

The broad threats to Small White Lady's-slipper populations are habitat loss and degradation, introduced or invasive species and disturbance or harm to populations (Environment Canada 2014). In decreasing order of concern, the specific major identified threats are:

- Encroachment by woody vegetation and thatch accumulation. Shrub encroachment contributed to the decline of the Norfolk County subpopulation, and succession of Eastern White Cedar (*Thuja occidentalis*) may be affecting the Hastings County site.
- Alteration of hydrology, both natural (e.g. wave action) and human-caused (e.g. agricultural drainage and stream channelization).
- Infrastructure and residential development was an historical threat causing losses in the past, and is still a threat to some extent today.
- Resource competition with invasive species, such as European Common Reed (*Phragmites australis australis*) on Walpole Island.
- Inappropriately-timed haying and mowing (not considered a threat in Ontario).
- Poaching (illegal collecting).
- Trampling by off-road motorized vehicles.
- Shoreline erosion due to wave action.
- Hybridization with Yellow Lady's-slipper (*Cypripedium parviflorum*), although the

severity of this threat is uncertain (Environment Canada 2014). Most of the plants observed at the Turkey Point site which is no longer considered extant were thought to be hybrids in the last 1-2 decades of its existence (OMNRF-NHIC data). Brinker (2011) documented pale yellow plants in Hastings County which he tentatively identified as *C. x andrewsii* (E. Snyder pers. comm.).

Most of these threats have been documented or suspected for Ontario sites (Table 1). The Walpole Island sites are all considered vulnerable to habitat conversion since populations have been eliminated by human actions since the species was listed under Ontario's previous Endangered Species Act (COSSARO 1999), and there is evidence that some sites on Walpole Island may have been impacted by threats (Environment Canada 2014). The Small White-flowered Lady's-slipper has been identified as a moderate priority in the draft Recovery Strategy for the Walpole Island ecosystem (Bowles 2005), however a final ecosystem recovery strategy is not yet available.

Table 1. Threats that are known or suspected to affect Small White Lady's-slipper subpopulations in Ontario (from Environment Canada 2014).

Threat	Walpole Island	Hastings County
Encroachment by woody vegetation and thatch accumulation	n/a	X
Alteration of hydrology	X	X
Infrastructure and residential development	X	n/a
Resource competition	X	n/a
Inappropriately-timed haying and mowing	n/a	n/a
Poaching	X	n/a
Trampling	X	X
Shoreline erosion	X	n/a
Hybridization	n/a	X

1.6. Specialized life history or habitat use characteristics

In the Great Lakes Region, Small White Lady's-slipper is restricted to prairie remnants and certain wetland habitats (Bowles 1983). This species is shade-intolerant and requires disturbance events for long-term persistence, and active management such as prescribed burning or mowing is often considered necessary to maintain populations by reducing thatch, competition with other plant species and woody species encroachment (COSSARO 1999, Environment Canada 2014, Michigan Natural Features Inventory 2004, Nature Conservancy Canada 2015).

The Small White Lady's-slipper has very specific life history requirements which can limit its ability to increase populations. As the seeds must be buried in the ground to germinate successfully, it can take 12 years or more before a plant will flower for the first time (COSEWIC 2014). Colonies expand very slowly; one study in Wisconsin found only 14 seedlings over four years in two large colonies totaling 7000 plants (COSEWIC 2014). While a number of pollinators that are not host-specific will pollinate Small White Lady's-slipper, it appears that this species is indirectly dependent on the maintenance of a diverse pollinator community, especially halictine bees that in turn are dependent on a

diversity of flowering species being available throughout the growing season (Catling and Knere 1980, COSEWIC 2014).

Specific mycorrhizal fungi are required to initiate germination and support seedling development (COSEWIC 2014), and the occurrence and persistence of these fungi can also be affected by a number of threats.

2. Eligibility for Ontario status assessment

2.1. Eligibility conditions

2.1.1. Taxonomic distinctness

Yes. *Cypripedium candidum* is taxonomically distinct, although there is some documentation of hybridization with Yellow Lady's-slipper.

2.1.2. Designatable units

No. Although the Ontario and Manitoba populations are disjunct in Canada, they are considered one DU as they “are connected via the fragmented prairie remnants in the adjacent U.S. states” (COSEWIC 2014) (see Figure 3). The Hastings County subpopulation appears to be most disjunct, being the most ecologically distinct habitat and well separated from other subpopulations.

2.1.3. Native status

Yes.

2.1.4. Occurrence

Extant. Currently occurs in Ontario.

2.2. Eligibility results

Small White Lady's-slipper (*Cypripedium candidum*) is eligible for status assessment in Ontario.

3. Ontario status assessment

3.1. Application of endangered/threatened status in Ontario

3.1.1. Criterion A – Decline in total number of mature individuals

Insufficient information. There is some difficulty and inconsistency in determining and reporting the number of mature individuals, as both the number of stems and the

number of clumps have been used. Other difficulties are the delayed time to maturity and the short flowering period (Environment Canada 2014). Because of the lack of recent population information for Walpole Island, COSEWIC (2014) concluded that “there is insufficient data available to determine trends in Small White Lady’s-slipper abundance in Ontario”. The population has clearly recently declined in Ontario as demonstrated by the loss of four of seven sites (57%) that were observed as recently as 1986 or later but are now considered as historical or extirpated (COSEWIC 2014), and a future decline can likely be inferred. For another rare *Cypripedium* species, extinction risk increased as the time between surveys increased, especially for smaller populations (Gray et al. 2012), and there are no data to suggest that the population status has improved. However there are insufficient data on numbers of mature individuals or area of occupancy to calculate past trends or infer future trends. Three generations would be 36 years or longer, which would extend from 2014 back to 1978. This uncertainty is particularly compounded by the lack of recent population data from Walpole Island, which represents by far the majority of Ontario’s population.

3.1.2. Criterion B – Small distribution range and decline or fluctuation

Endangered. Meets B1ab(i, iii, iv) + B2ab(i, iii, iv). The extent of occurrence is estimated to be 2500 km², the index of area of occupancy is 20 km² (much less than the minimum threshold of 500 km²), there are fewer than 5 locations and there is a continuing decline in the index of area of occupancy, the area of habitat and the number of subpopulations. The Norfolk County site is now confirmed as historical since the last observation in 1993 (COSEWIC 2014). The population is not considered severely fragmented despite the Walpole Island and Hastings County sites being > 400 km apart because >50% of its total area of occupancy is not in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse.

3.1.3. Criterion C – Small and declining number of mature individuals

Does not apply. In 2003 all Ontario subpopulations had a reported 14,559 clumps of plants at seven sites (Environment Canada 2014), surpassing the maximum threshold of 10,000 for Threatened. The number of individual stems would be several times larger than the number of clumps. There are likely still many more than 10,000 clumps, but the lack of recent population data for Walpole Island is a concern.

3.1.4. Criterion D – Very small or restricted total population

Threatened. Meets D2. Has a very restricted index of area of occupancy of 20 km². While the threshold for this aspect of the criterion is less than 20 km², given that the IAO was based upon 2x2 km map grids, it is probable that the actual figure is much less than rather than exactly 20 km². The other alternative for this criterion is also met, with only two or three subpopulations.

3.1.5. Criterion E – Quantitative analysis

Insufficient information. A quantitative population viability analysis has not been

conducted for the Small White Lady's-slipper in Ontario.

3.2. Application of Special Concern in Ontario

Does not apply.

3.3. Status category modifiers

3.3.1. Ontario's conservation responsibility

Does not apply. Ranked G4, and Ontario represents much less than 25% of the global range and population.

3.3.2. Rescue effect

Does not apply. Rescue is unlikely, given the imperilled status in more than 50% of adjacent (U.S.) jurisdictions (see Appendix 2), and there does not appear to be sufficient suitable habitat for immigrants (COSEWIC 2014), although there may be some unpopulated habitat adjacent to some populations (Environment Canada 2014). Rescue would also be limited by the requirement for specific soil mycorrhizae, which would require suitable habitat inoculated with certain mycorrhizae, even if propagules arrived in Ontario.

3.4. Other status categories

3.4.1. Data deficient

Does not apply. The primary source of data uncertainty relates to the lack of recent information on the six Walpole Island sites that represent either one or two subpopulations, and represent over 95% of the Ontario population (Environment Canada 2014). These uncertainties for the Walpole Island sites include (from COSEWIC 2014, Environment Canada 2014):

- current population data (including total number of mature individuals) and thus population trend data;
- while critical habitat has been identified for Manitoba sites and one site in Ontario, for the Walpole Island sites “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” (Environment Canada 2014);
- the success of efforts to transplant plants from a construction site to a protected site on Walpole Island;
- no recent assessment of threats, and in particular uncertainty as to the most imminent threat of the subpopulations; and
- the potential threat of European Common Reed.

The lack of recent population data is quite concerning, although there appear to be sufficient data so as to not warrant a designation of Data Deficient. A population viability

analysis for the rare and declining Clustered Lady's Slipper (*Cypripedium fasciculatum*) in the northwestern U.S. found that both extinction risk increased as the time between visits increased, especially for smaller populations (Gray et al. 2012).

3.4.2. Extinct or extirpated

Not applicable.

3.4.3. Not at risk

Not applicable.

4. Summary of Ontario status

Small White Lady's-slipper (*Cypripedium candidum*) is classified as Endangered in Ontario based on meeting criterion B1ab(i, iii, iv) + B2ab(I, iii, iv) for small distribution range and decline. It was previously designated by COSSARO as Endangered in 1999. While the species was previously designated by COSEWIC as Endangered, a re-assessment in November 2014 resulted in a downlisting to Threatened. This change was precipitated because of "the discovery of additional populations, increased habitat protection, and active management for this species" (COSEWIC 2014). Increased search effort resulted in the discovery of 11 additional subpopulations in Manitoba, but none in Ontario (COSEWIC 2014), so it appears that the change in status designation was due entirely to changes in information for Manitoba. In Ontario, no new subpopulations have been recorded since 1979, and the range has contracted since that time (COSEWIC 2014). There are no data to suggest improved status of Ontario subpopulations.

5. Information sources

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Appendix 1: Technical summary for Ontario

Species: Small White Lady's-slipper (*Cypripedium candidum*)

Demographic information

Demographic attributes	Value
Generation time. Based on average age of breeding adult: age at first breeding = X year; average life span = Y years.	Likely > 12 years
Is there an observed, inferred, or projected continuing decline in number of mature individuals?	Unknown. Recent information lacking for Walpole Island. Decline can be inferred from the recent loss of other populations.
Estimated percent of continuing decline in total number of mature individuals within 5 years or 2 generations.	Unknown. Recent information lacking for Walpole Island
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over the last 10 years or 3 generations.	Unknown. Recent information lacking for Walpole Island
Projected or suspected percent reduction or increase in total number of mature individuals over the next 10 years or 3 generations.	Unknown. Recent information lacking for Walpole Island
Observed, estimated, inferred, or suspected percent reduction or increase in total number of mature individuals over any 10 years, or 3 generations, over a time period including both the past and the future.	Unknown. Recent information lacking for Walpole Island
Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	a. Yes b. Yes c. No
Are there extreme fluctuations in number of mature individuals?	No

Extent and occupancy information in Ontario.

Extent and occupancy attributes	Value
Estimated extent of occurrence.	Less than 5000 km ² (estimated 2500 km ²)

Index of area of occupancy (IAO).	Within Ontario the IAO is 20 km ² , comprising 16 km ² on Walpole Island and 4 km ² in Hastings County (COSEWIC 2014). The total area occupied by this species in Ontario may be less than 150 ha (Environment Canada 2014).
Is the total population severely fragmented? (i.e. is >50% of its total area of occupancy is in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?)	<p>a. No b. No</p> <p>However the Hastings County is considered to be disjunct and essentially isolated from the remainder of the extant population on Walpole Island.</p>

<p>Number of locations (<i>as defined by COSEWIC</i>).</p>	<p>COSEWIC (2015) identified two or three locations in Ontario – “one in Hastings County and two, or possibly one, on Walpole Island”. COSEWIC (2015) noted that “the type of threat likely to have the most impact on each subpopulation is unknown and will ultimately depend on the landscape context and management of each”. There is considerable variability in the number of subpopulations reported:</p> <ul style="list-style-type: none"> • The COSEWIC status report indicates three extant subpopulations (Hastings County, two on Walpole Island) (COSEWIC 2014). • The recovery strategy indicates seven extant populations, six of which are on Walpole Island (plants within 1 km are considered part of the same population) (Environment Canada 2014) • OMNRF mapping shows several extirpated locales (OMNRF 2015) <p>Applying the COSEWIC definition of locations as “a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon”, and given that all of the Walpole Island sites appear vulnerable to development-related habitat disturbance, it seems reasonable to consider all Walpole Islands subpopulations as one location.</p>
<p>Number of NHIC Element Occurrences:</p>	<ul style="list-style-type: none"> • 4 extant (one of these now considered by COSEWIC (2015) to be extirpated) • 4 extirpated • 3 historical

Is there an observed, inferred, or projected continuing decline in extent of occurrence?	Yes. Extent of occurrence has decreased in Ontario due to extirpations (COSEWIC 2014)
Is there an observed, inferred, or projected continuing decline in index of area of occupancy?	Yes. Area of occupancy has declined in association with extirpations (COSEWIC 2014).
Is there an observed, inferred, or projected continuing decline in number of populations?	Yes. At least six subpopulations exclusive of Walpole Island have not been observed since 1995 (Environment Canada 2014). COSEWIC (2014) reports four extirpated subpopulations and four historical subpopulations (including three from Walpole Island).
Is there an observed, inferred, or projected continuing decline in number of locations?	Yes
Is there an observed, inferred, or projected continuing decline in area, extent and/or quality of habitat?	Yes (inferred), although recent information on Walpole Island unavailable
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 sub-population or total population (if known).

Sub-Population	Number of mature individuals (clumps) (Year) Environment Canada 2014
Hastings County	536 (2011)
Walpole Island	In 2003 there were 14,311 plants among six subpopulations on Walpole Island
Total	14,847

Quantitative analysis (population viability analysis conducted)

Insufficient information.

Rescue effect

Rescue effect attribute	Likelihood
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Is immigration of individuals and/or propagules between Ontario and outside populations known or possible?	Possible for Walpole Island
Would immigrants be adapted to survive in Ontario?	Likely
Is there sufficient suitable habitat for immigrants in Ontario?	No.
Is the species of conservation concern in bordering jurisdictions?	Yes. Status in adjacent USA Jurisdictions - Pennsylvania (SX), New York (S1), Ohio (S1), and Michigan (S2) (Appendix 2). It is considered S3 (Vulnerable) in Minnesota, although Minnesota populations are far from those in Ontario. Globally the species is considered most abundant in Minnesota and less common elsewhere (NatureServe 2015). Even in Minnesota, which probably has more plants than all other states and Canadian provinces combined, the species has experienced a 95%+ population decline that is continuing (Minnesota DNR 2015).
Is rescue from outside populations reliant upon continued intensive recovery efforts?	No

Appendix 2: Adjoining jurisdiction status rank and decline

Information regarding status rank and decline of Small White Lady's-slipper

Jurisdiction	Subnational rank	Population trend	Sources
Ontario	S1	Declining – shrinking range	COSEWIC 2014, NatureServe 2015
Quebec	Not present	n/a	NatureServe 2015
Manitoba	S2	19 of 28 known subpopulations are considered extant. A slight range retraction has occurred. New subpopulations have been located.	COSEWIC 2014, NatureServe 2015
Michigan	S2	Declining. Threatened, about 1/3 of subpopulations have been lost due to habitat loss associated with ecological succession or development.	Michigan Natural Features Inventory 2004
Minnesota	S3	Declining. Special concern species. Nearly 200 occurrences, and probably has more plants than the rest of the global range, making Minnesota the global stronghold for this species. However the species has experienced an estimated 95% decline in Minnesota, which is continuing .	Minnesota DNR 2015
Nunavut	Not present	n/a	NatureServe 2015
New York	S1	Rare and endangered. Only one subpopulation in New York	Chapman 1998
Ohio	S1	66% of historical populations lost. Post-1980 records from four counties, and pre-1980 records from six counties.	Ohio DNR 2008
Pennsylvania	SX	Extirpated	Bowles 1983, NatureServe 2015
Wisconsin	S3	50% of historical populations lost	Bowles 1983

Acronyms:

COSEWIC: Committee on the Status of Endangered Wildlife in Canada

COSSARO: Committee on the Status of Species at Risk in Ontario

ESA: Endangered Species Act

GRANK: global conservation status assessments

IAO: index of area of occupancy

MNRF: Ministry of Natural Resources and Forestry

NHIC: Natural Heritage Information Centre

NNR: Unranked

NRANK: National conservation status assessment

SARA: Species at Risk Act

SRANK: subnational conservation status assessment

S1: Critically imperiled

S2: Imperiled

S3: Vulnerable

SX: Presumed extirpated

COSEPAC: Le Comité sur la situation des espèces en péril au Canada