

Recovery Strategy for the Spotted Wintergreen (*Chimaphila maculata*) in Canada

Spotted Wintergreen



2015



Government
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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 Public Registry](http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)¹.

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

RECOVERY STRATEGY FOR THE SPOTTED WINTERGREEN (*Chimaphila maculata*) IN CANADA

2015

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

In the spirit of cooperation of the Accord, the Government of Ontario has given permission to the Government of Canada to adopt the *Recovery Strategy for the Spotted Wintergreen (Chimaphila maculata) in Ontario* (Part 2) under Section 44 of the *Species at Risk Act*. Environment Canada has included an addition (Part 1) which completes the SARA requirements for this recovery strategy.

Environment Canada is adopting the provincial recovery strategy with the exception of section 2.0, Recovery. In place of section 2.0, Environment Canada is establishing its own performance indicators and is adopting the Government of Ontario's goal and the government-led and government-supported actions of the *Spotted Wintergreen: Ontario Government Response Statement*² (Part 3) as the population and distribution objective (replacing the term "population" with "sub-population") and the broad strategies and general approaches to meet the population and distribution objective, respectively.

The federal Recovery Strategy for the Spotted Wintergreen (*Chimaphila maculata*) in Canada consists of three parts:

Part 1 – Federal Addition to the *Recovery Strategy for the Spotted Wintergreen (Chimaphila maculata) in Ontario*, prepared by Environment Canada.

Part 2 - *Recovery Strategy for the Spotted Wintergreen (Chimaphila maculata) in Ontario*, prepared by Ursic et al. for the Ontario Ministry of Natural Resources³.

Part 3 – *Spotted Wintergreen: Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

² The Government Response Statement is the Ontario Government's policy response to the recovery strategy and summarizes the prioritized actions that the Ontario Government intends to take and support.

³ On June 26th, 2014, the Ontario Ministry of Natural Resources became the Ontario Ministry of Natural Resources and Forestry.

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PART 2 - *Recovery Strategy for the Spotted Wintergreen* (*Chimaphila maculata*) in Ontario, prepared by Ursic et al. for the Ontario Ministry of Natural Resources.

PART 3 – *Spotted Wintergreen: Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

PART 1 - Federal Addition to the *Recovery Strategy for the Spotted Wintergreen (Chimaphila maculata) in Ontario*, prepared by Environment Canada

PREFACE

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)⁴ 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 Spotted Wintergreen and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. It has been prepared in cooperation with the Ontario Ministry of Natural Resources. SARA section 44 allows the Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Ontario Ministry of Natural Resources (now the Ontario Ministry of Natural Resources and Forestry) led the development of the attached recovery strategy for the Spotted Wintergreen (Part 2) in cooperation with Environment Canada.

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 Spotted Wintergreen 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.

⁴ <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

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Acknowledgement and thanks is given to all other parties that provided advice and input used to help inform the development of this recovery strategy including various Aboriginal organizations and individuals, landowners, citizens and stakeholders who provided input and/or participated in consultation meetings.

ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT

The following sections have been included to address specific requirements of the federal *Species at Risk Act* (SARA) that are not addressed in the Province of Ontario's *Recovery Strategy for the Spotted Wintergreen* (*Chimaphila maculata*) in Ontario (Part 2) and to provide updates or additional information.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Therefore, statements in the provincial recovery strategy referring to protection of the species' habitat may not directly correspond to federal requirements, and are not being adopted by Environment Canada as part of the federal recovery strategy. Whether particular measures or actions will result in protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

1. Species Status Information

The Spotted Wintergreen (*Chimaphila maculata*) occurs in eastern North America, from Ontario through New England and Michigan, south to Georgia. A separate and disjunct range is found from southern Arizona through Mexico, and into Central America (Ursic et al. 2010). The species has a global conservation rank of Secure⁵ (G5; NatureServe 2014). It has been reported from 27 states in the United States (Table 1); the national conservation rank in the U.S. is Secure (N5; NatureServe 2014).

In Canada, the national conservation rank for the Spotted Wintergreen is Critically Imperilled⁶ (N1), and it is listed as Endangered⁷ on Schedule 1 of the federal *Species at Risk Act* (SARA). In Ontario, where it is extant at nine locations along the north shore of Lake Erie, it is ranked Critically Imperilled (S1), and is listed as Endangered⁸ under the provincial *Endangered Species Act, 2007* (ESA). In Quebec, the only documented sub-population is now believed to be extirpated⁹ (SX; Jacobs 2001; NatureServe 2014).

⁵ Secure: Common, widespread and abundant.

⁶ Critically Imperilled: At a very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats or other factors.

⁷ A wildlife species facing imminent extirpation or extinction in Canada.

⁸ A species that lives in the wild in Ontario but is facing imminent extinction or extirpation.

⁹ Extirpated: Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

Table 1. Sub-national ranking for the Spotted Wintergreen in North America (from NatureServe 2014).

S-Rank	State/ Province
S1 (Critically Imperilled)	Ontario, Illinois
S2 (Imperilled ¹⁰)	Maine, Mississippi, Vermont
S3 (Vulnerable ¹¹)	Arizona (S3? ¹²), Indiana
S4 (Apparently Secure ¹³)	New York
S5 (Secure)	Delaware, District of Columbia, Kentucky, New Jersey, North Carolina, Virginia, West Virginia
SNR (Unranked ¹⁴)	Alabama, Connecticut, Florida, Georgia, Maryland, Massachusetts, Michigan, New Hampshire, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee
SX (Extirpated)	Quebec

The Canadian population of the Spotted Wintergreen occurs along the northern extent of this species' range in North America. The extent of the existing Canadian populations probably represents less than 1% of the global range of this species.

2. Recovery Feasibility

Based on the following four criteria outlined in the draft SARA Policies (Government of Canada 2009), there are unknowns regarding the feasibility of recovery of the Spotted Wintergreen. In keeping with the precautionary principle, a recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

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. In 2012, there were eight known sub-populations¹⁵ of the Spotted Wintergreen in southwestern Ontario supporting approximately 2,600 stems. Because this species reproduces clonally¹⁶, it is likely that many stems represent only one genetic individual;

¹⁰ Imperilled: At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats or other factors.

¹¹ Vulnerable: At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

¹² The question mark (?) denotes an inexact numeric rank.

¹³ Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.

¹⁴ Unranked: Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

¹⁵ The ninth sub-population was discovered in 2014 and contains at least seven stems (Cedar and Pratt pers. comm. 2014)

¹⁶ Asexual reproduction by underground rhizomes (root stalks). Above ground, these plants appear to be distinct individuals, but underground they remain interconnected and are all clones of the same plant.

however, sub-populations have recently been observed in flower and fruit, and are believed to be reproductive (Ursic et al. 2010).

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

Yes. The largest sub-populations in Canada occur within natural areas (i.e., St. Williams Conservation Reserve¹⁷ and Turkey Point Provincial Park) that have additional areas of similar and apparently suitable habitat (Ursic et al. 2010). The existing occupied and adjacent suitable habitat is considered sufficient to meet the population and distribution objectives with respect to maintaining the current abundance and distribution of existing sub-populations and increasing the abundance should it be required and feasible (Ursic et al. 2010). With respect to the latter component of the population and distribution objective (i.e., determining the feasibility of restoring historical sub-populations where the habitat is appropriate), due to this species' likely dependence on mycorrhizal fungi for germination and early development (Massicotte et al. 2008; Hynson et al. 2009; Johannson and Eriksson 2013), restoration of sub-populations into previously occupied areas would require sufficient fungi of the correct type and additional information on seed viability and propagation techniques. The fungal associate(s) for this species is unknown. It is not currently known whether sufficient suitable habitat exists to restore historical sub-populations and, therefore, the availability of suitable restoration habitat needs to be examined in further detail when the determination of the feasibility of restoring historical sub-populations is made.

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

Unknown. Although many threats to this species have been suggested, there has been little documentation or research on their effects on the Spotted Wintergreen sub-populations in Canada (Ursic et al. 2010). With so little empirical evidence on the threats affecting Canadian sub-populations, it is difficult to determine which of these represent the primary threats, or whether they can be adequately avoided or mitigated. Over 60% of sub-populations ever reported in Canada are now considered extirpated; in most cases, the reasons for the declines are unclear.

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

Unknown. Several recovery techniques exist to protect existing habitat and individuals. Several sub-populations occur within natural areas that are already managed to promote and protect biodiversity (e.g., St. Williams Conservation Reserve and Turkey Point Provincial Park). However, because very little is understood about threats to the species, it is difficult to identify recovery techniques that might be required to protect existing

¹⁷ The area referred to in other documents as St. Williams Forest (e.g., Ursic et al. 2010) is now called St. Williams Conservation Reserve.

sub-populations in the long-term. For example, it is not clear whether selective forestry techniques that open the forest canopy are beneficial or detrimental to this species. Spotted Wintergreen is difficult to propagate from seed (Cullina 2000), and this may be related to the species' apparent requirement for an appropriate mycorrhizal fungus, about which little is known. Cultivation may be required within the current scope of the population and distribution objective if it is determined that it is feasible to restore historical sub-populations.

3. Population and Distribution

The *Recovery Strategy for the Spotted Wintergreen* (*Chimaphila maculata*) in Ontario identifies five extant Element Occurrences or populations¹⁸ in Canada (Ursic et al. 2010). Though defined in a similar manner, the Committee on the Status of Endangered Species in Canada (COSEWIC) uses different terminology, in this case "sub-population"¹⁹. Throughout Part 1 of this document, the term "sub-population" will be used, consistent with COSEWIC standardized terminology.

Since the publication of the provincial *Recovery Strategy for the Spotted Wintergreen* (*Chimaphila maculata*) in Ontario, four additional sub-populations are recognized. Two are newly discovered, one is a rediscovery of a previously known sub-population and one is the result of splitting a previously known sub-population into two sub-populations.

One of the newly discovered sub-populations occurs within Turkey Point Provincial Park and was discovered in 2011 (COSEWIC 2012b). The second newly discovered sub-population occurs at the Ojibway Prairie Complex in Windsor, Ontario and was discovered in 2014 (Cedar and Pratt pers. comm. 2014). The rediscovered sub-population occurs in Spooky Hollow Area of Natural and Scientific Interest (ANSI) and was rediscovered in 2011 (COSEWIC 2012b); it was last observed ca. 1970 (NHIC 2011). No immediate threats have been identified for both the Turkey Point Provincial Park and Spooky Hollow ANSI sub-populations. The sub-population at the Ojibway Prairie Complex is nearby a recreational trail and is thus susceptible to trampling and soil compaction (Cedar and Pratt pers. comm. 2014). The population referred to as St. Williams in the provincial recovery strategy is now considered two separate sub-populations: St. William's Forest (Manestar) and St. Williams Forest (Nursery). In total, there are nine sub-populations of Spotted Wintergreen in Ontario (Figure 1; Table 2). Further details on these sub-populations will be published within the COSEWIC status report which is expected to be published shortly after the species re-assessment in the spring of 2015.

¹⁸ Populations are considered to be independent if separated by one kilometre or more of inappropriate habitat, and groupings of plants separated by less than one kilometre are considered sub-populations (Natural Heritage Information Centre 2001).

¹⁹ Sub-populations are defined as geographically (or otherwise) distinct groups between which there is little demographic or genetic exchange (COSEWIC 2012a).

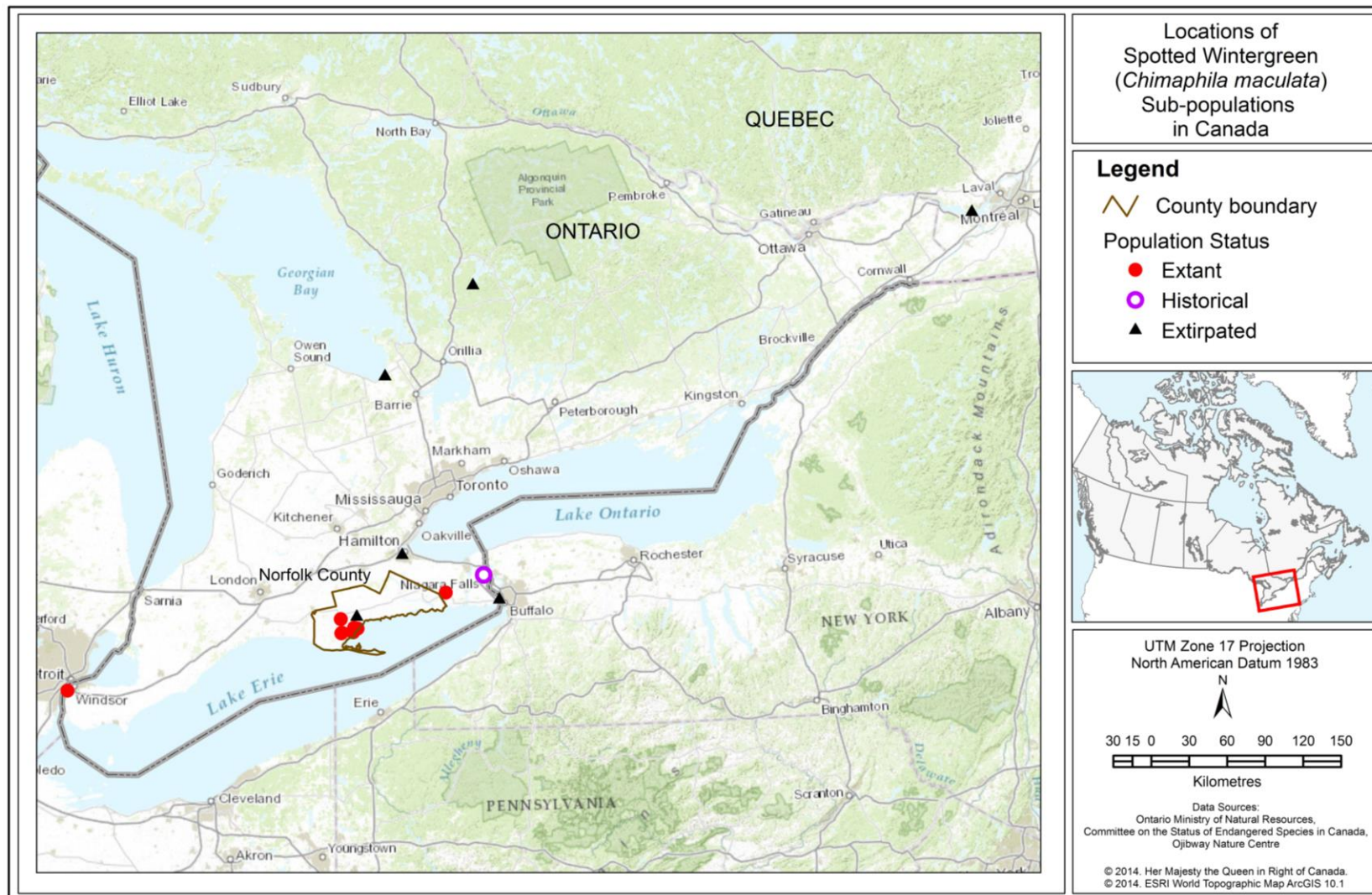


Figure 1. Locations of Spotted Wintergreen Sub-populations in Canada. Note: Several dots representing sub-populations are overlapping. There are seven extant sub-populations in Norfolk County. Historical sub-populations are those where there is a lack of recent (i.e., within last 20-40 years) field information verifying the sub-population's continued existence. Extirpated sub-populations are those for which there is documented destruction of habitat or persuasive evidence of the species eradication based on adequate surveys. Twelve sub-populations are considered extirpated; however, precise locational information does not exist for many of them.

4. Population and Distribution Objectives

The provincial *Recovery Strategy for the Spotted Wintergreen* (*Chimaphila maculata*) in Ontario (Part 2) contains the following recovery goal:

The long-term recovery goals for Spotted Wintergreen are to protect and enhance all extant populations to ensure that sustainable levels are established or maintained, and to restore historical populations and establish new populations in appropriate habitat, if deemed feasible.

The Government Response Statement for the Province of Ontario (Part 3) lists the following goal for the recovery of the Spotted Wintergreen in Ontario:

The government's goal for the recovery of Spotted Wintergreen is to protect and enhance all existing populations to sustainable levels and to determine the feasibility of restoring historical populations where the habitat is appropriate.

Environment Canada supports the provincial recovery goal of protecting and enhancing the Spotted Wintergreen in Ontario. To meet the requirements and processes set out in SARA, Environment Canada has refined this recovery goal into population and distribution objectives for the species. The population and distribution objectives established by Environment Canada for the Spotted Wintergreen are to:

Maintain the current abundance and the distribution of all existing sub-populations of Spotted Wintergreen in Canada, and increase the abundance where it is biologically and technically feasible and required, and

Determine the feasibility of restoring historical populations where the habitat is appropriate.

As with the provincial recovery strategy, emphasis for these objectives is placed upon the protection and maintenance of existing sub-populations. Government-supported protection activities in the Ontario Government Response Statement include the identification and mitigation of threats and securement of habitat as opportunities arise (see Part 3). Determination of the minimum viable population size for the Spotted Wintergreen (government-supported action #4 - Part 3) will be used to determine which sub-populations may need to be increased to attain sustainable levels. In the case of the Spotted Wintergreen, increasing the abundance of existing sub-populations may include activities such as undertaking habitat management and mitigation of existing threats. Dependent upon the outcomes of research on the species' reproductive biology and an assessment to determine the feasibility of restoring historical sub-populations, sub-populations that have not been observed recently may be restored, where habitat is considered suitable.

Spotted Wintergreen is only very rarely cultivated in North America, if at all. It is possible, but unlikely that plants may exist in gardens. Spotted Wintergreen plants that did not

originate from plants native to Ontario or were planted for purposes other than species recovery, ecological restoration or habitat creation, are not considered as existing sub-populations (or portions thereof) in the above objective.

5. Broad Strategies and General Approaches to Meet Objectives

The government-led and government-supported actions tables from the *Spotted Wintergreen: Ontario Government Response Statement* (Part 3) are adopted as the broad strategies and general approaches to meet the population and distribution objective. Environment Canada also includes the following Research approach required to achieve the population and distribution objective:

- Investigate the availability of suitable habitat at historical locations and determine the biological and technical feasibility of restoring historical sub-populations.

Environment Canada is not adopting the Approaches to Recovery identified in section 2.0 of the *Recovery Strategy for the Spotted Wintergreen* (*Chimaphila maculata*) in Ontario (Part 2).

6. Critical Habitat

6.1 Identification of the Species' Critical Habitat

Section 41 (1)c of SARA requires that recovery strategies include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. Critical habitat is defined in the *Species at Risk Act* (S.C.2002, c29) section 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".

Identification of critical habitat is not a component of the provincial recovery strategy under the Province of Ontario's ESA. Under the ESA, when a species becomes listed as endangered or threatened on the Species at Risk in Ontario List, it automatically receives general habitat protection. Spotted Wintergreen currently receives general habitat protection under the ESA; however, a description of the general habitat has not yet been developed. In some cases, a habitat regulation may be developed that replaces the general habitat protection. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species by the Province of Ontario. A habitat regulation has not been developed for the Spotted Wintergreen under the ESA; however, the provincial recovery strategy (Part 2) contains a recommendation on the area for consideration in developing a habitat regulation. This federal recovery strategy identifies critical habitat for the Spotted Wintergreen in Canada to the extent possible, based on this recommendation and on the best available information as of July 2014.

Critical habitat for the Spotted Wintergreen in Canada is identified for the nine known sub-populations in southwestern Ontario (see Figure 2, and also Table 3). Critical habitat is not identified for horticultural specimens and plants that did not originate from Spotted Wintergreen plants native to Ontario or were planted for purposes other than species recovery, ecological restoration/rehabilitation or habitat creation, such as in landscaped settings and urban gardens. More precise critical habitat boundaries may be identified, and additional critical habitat may be added in the future, as new information becomes available. In addition, should Spotted Wintergreen be rediscovered in Quebec, further information on the habitat would be required to determine if the same criteria could be used in Quebec.

The identification of the Spotted Wintergreen critical habitat is based on two criteria: habitat occupancy and habitat suitability, which are discussed in detail below.

6.1.1 Habitat Occupancy

This criterion refers to areas where there is a reasonable degree of certainty of current use by the species.

Habitat is considered occupied when:

- at least one native Spotted Wintergreen individual has been observed since 2006.

Habitat occupancy is based on recent surveys at known extant sub-populations from Ontario's Conservation Data Centre (Natural Heritage Information Centre - NHIC), COSEWIC (2012b) and Cedar and Pratt (pers. comm. 2014), and allows for the inclusion of all nine sub-populations known to be extant.

6.1.2 Habitat Suitability

Habitat suitability relates to areas possessing a specific set of biophysical attributes that can support individuals of the species in carrying out essential aspects of their life cycle.

At extant locations in Canada, the Spotted Wintergreen is generally found in dry, oak-pine mixed forest and other dry woodlands typically dominated by White Pine (*Pinus strobus*), Red Oak (*Quercus rubra*), Black Oak (*Quercus velutina*) and American Beech (*Fagus grandifolia*). The mid-story (or understory) layer generally consists of Round-leaved Dogwood (*Cornus rugosa*) and Witch Hazel (*Hamamelis virginiana*) (Ursic et al. 2010; Kirk 1987). Dominant and/or common groundcover species include Canada Mayflower (*Maianthemum canadense*), Bracken Fern (*Pteridium aquilinum*), Pipsissewa (*Chimaphila umbellata*) and Wild Sarsaparilla (*Aralia nudicaulis*) (Ursic et al. 2010).

The biophysical attributes of suitable habitat (adapted from Ursic et al. 2010; COSEWIC 2012b) for Spotted Wintergreen include:

- Deciduous (oak, oak-maple and poplar) forest (>75% canopy cover)
 - Black Oak, Red Oak, White Oak (*Q. alba*), Red Maple (*Acer rubrum*), Silver Maple (*A. saccharinum*), Trembling Aspen (*Populus tremuloides*), Large-toothed Aspen (*P. grandidentata*), Beech
- Mixed (oak-pine) forest (>75% canopy cover)
 - White Pine with Red Oak and/or White Oak
- Coniferous plantation (pine-dominated; >75% canopy cover)
 - Red Pine, White Pine
- Sparse groundcover resulting in limited competition (e.g., characteristic of dry oak-pine communities in the Norfolk Sand Plain)
- Partial shade
- Slightly acidic soil (pH 4.2 to 6.0)
- Well-drained soils (e.g., sandy soils)
- Nutrient-poor soils
- Presence of mycorrhizal fungal associate
- Moderating climate effects of the Great Lakes

Suitable habitat for the Spotted Wintergreen is described using the Ecological Land Classification (ELC) framework for Ontario (from Lee et al. 1998). The biophysical attributes of Spotted Wintergreen suitable habitat are typically found in the following ELC ecosites: CUP3, FOD1, FOD2, FOD8, FOD9 or FOM2 (Table 2). The ELC framework provides a standardized approach to the interpretation and delineation of dynamic ecosystem boundaries. The ELC approach classifies habitats not only by vegetation community but also considers hydrology and topography, and as such encompasses the biophysical attributes of the habitat for Spotted Wintergreen. In addition, ELC terminology and methods are familiar to many land managers and conservation practitioners who have adopted this tool as the standard approach for Ontario.

Like other members of the tribe²⁰ Pyroleae (within the family Ericaceae), it is likely that the Spotted Wintergreen depends upon the presence of soil mycorrhizal associates. Mycorrhizal relationships have been found for other species in the genus *Chimaphila*, and in other closely related genera (Boullard and Ferchau 1962, cited in Ursic et al. 2010; Largent et al. 1980; Massicotte et al. 2008; Hynson et al. 2009; Johannson and Eriksson 2013). No description of the nature of this relationship could be found for this species, and the type (e.g., species) of fungal associate is not known.

Table 2. Ecological Land Classification (ELC) at Extant Sub-populations of the Spotted Wintergreen in Canada (adapted from Ursic et al. 2010 and COSEWIC 2012b).

Sub-population Name	ELC Community Series (ELC Code)	ELC Ecosite (ELC Code)
St. Williams Forest (Manester)	Deciduous Forest (FOD)	Fresh – Moist Poplar – Sassafras Deciduous Forest (FOD8)
St. Williams Forest (Nursery)	Cultural Plantation (CUP)	Coniferous Plantation (CUP3)
	Deciduous Forest (FOD)	Dry – Fresh Oak Deciduous Forest (FOD1)

²⁰ In botany, tribe is a taxonomic rank between family and genus and lies below sub-family.

St. Williams Forest (Turkey Point ²¹)	Cultural Plantation (CUP)	Coniferous Plantation (CUP3)
	Deciduous Forest (FOD)	Dry – Fresh Oak Deciduous Forest (FOD1)
	Cultural Plantation (CUP)	Coniferous Plantation (CUP3)
Turkey Point Provincial Park	Cultural Plantation (CUP)	Coniferous Plantation (CUP3)
	Deciduous Forest (FOD)	Dry – Fresh Oak Deciduous Forest (FOD1)
	Cultural Plantation (CUP)	Coniferous Plantation (CUP3)
Normandale	Mixed Forest (FOM)	Dry-Fresh White Pine – Maple – Oak Mixed Forest (FOM2)
Fishers Glen	Deciduous Forest (FOD)	Dry-Fresh Oak – Maple – Hickory Deciduous Forest (FOD2)
Wainfleet	Deciduous Forest (FOD)	Fresh – Moist Oak – Maple – Hickory Deciduous Forest (FOD9)
Spooky Hollow ANSI	Cultural Plantation (CUP)	Not available
Ojibway Prairie Complex	Deciduous Forest (FOD)	Not available

Suitable habitat for the Spotted Wintergreen is defined as:

- the entire continuous suitable ELC ecosite where the Spotted Wintergreen exists, AND
- the area within a radial distance of 50 m of a Spotted Wintergreen when it occurs less than 50 m from the suitable ELC ecosite boundary within which it is found.

The ecosite level was chosen to delineate critical habitat to support the component of the population and distribution objective related to increasing the abundance of existing sub-populations. The extent of the ecosite should allow for natural processes related to population dynamics and reproduction (e.g., dispersal and pollination) to occur. For seven of the nine extant sub-populations in Ontario, the ELC ecosite has been described following the standard ELC methods; however, the ecosite habitat boundaries have not been mapped (Table 2). ELC ecosite information is not available for the re-discovered sub-population at Spooky Hollow ANSI and the newly discovered sub-population at the Ojibway Prairie Complex. Additional habitat assessments are required to describe and map the specific ELC ecosites currently occupied by the Spotted Wintergreen. Until more detailed habitat information can be obtained, broader habitat information (i.e., ELC community series) is available to guide recovery planning and critical habitat identification for all sub-populations.

The 50 m distance is considered a minimum ‘critical function zone’, or the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g. critical light, moisture, humidity levels necessary for survival). At present, it is not clear at what distance physical and/or biological processes begin to negatively affect Spotted Wintergreen. Studies on micro-environmental gradients at habitat edges, i.e., light, temperature, litter moisture (Matlack 1993), and of edge effects on plants in mixed hardwood forests, as evidenced by changes in plant community structure and

²¹ This subpopulation is named “Turkey Point” in the provincial recovery strategy (Part 2).

composition (Fraver 1994), have shown that edge effects could be detected up to 50 m into habitat fragments, although other studies show that the magnitude and distance of edge effects will vary depending on the structure and composition of adjacent habitat types (Harper et al. 2005). Forman and Alexander (1998) and Forman et al. (2003) found that most roadside edge effects on plants resulting from construction and repeated traffic have their greatest impact within the first 30 to 50 m. Therefore, a 50 m distance from any Spotted Wintergreen plant is deemed an appropriate minimum distance to ensure microhabitat properties for rare plant species occurrences are incorporated in the identification of critical habitat. The area within the critical function zone may include both suitable and unsuitable habitat as Spotted Wintergreen may be found near the transition area/zone between suitable and unsuitable habitat (e.g. within small forest openings, or along woodland edges). As new information on species' habitat requirements and site-specific characteristics, such as hydrology, become available, these distances may be refined.

6.1.3 Application of the Spotted Wintergreen Critical Habitat Criteria

Critical habitat for the Spotted Wintergreen is identified as the entire continuous ELC ecosite boundary where the Spotted Wintergreen exists and the area within a radial distance of 50 m of a Spotted Wintergreen when it occurs less than 50 m from the ELC ecosite boundary within which it is found (section 6.1.2) that meet the habitat occupancy criteria (section 6.1.1), herein referred to as a critical habitat unit.

Application of the critical habitat criteria to the best available data current to July 2014, identifies critical habitat for the nine known extant sub-populations of the Spotted Wintergreen in Canada, (Figure 2; see also Table 3). At this time, critical habitat is generalized to include a broader habitat boundary (i.e., ELC community series), totalling up to 455 ha²², and will be able to direct recovery and protection activities until more detailed habitat boundaries are obtained. The critical habitat identified is considered a full identification of critical habitat, sufficient to meet the population and distribution objectives.

Critical habitat for the Spotted Wintergreen is presented using a 1 x 1 km Standardized UTM grid (Table 3). The 1 x 1 km UTM grid is part of a standardized grid system that indicates the general geographic areas containing critical habitat, which can be used for land use planning and/or environmental assessment purposes. In addition to providing these benefits, the 1 x 1 km Standardized UTM grid respects provincial data-sharing agreements. Critical habitat within each grid square occurs where the description of habitat occupancy (section 6.1.1) and habitat suitability (section 6.1.2) are met. Any human-made structures and any area outside the critical function zone that does not correspond to the biophysical attributes of suitable habitat for the Spotted Wintergreen

²² This is the maximum extent of critical habitat based on suitable habitat boundaries that can be delineated from high resolution aerial photography (comparable to ELC Community Series). Within these boundaries critical habitat would be restricted to the ELC ecosite where the plant resides; therefore, the actual area could be less than this and would require field verification to determine the precise amount.

(see section 6.1.2) are not considered critical habitat. More detailed information on critical habitat may be requested on a need-to-know basis by contacting Environment Canada – Canadian Wildlife Service at RecoveryPlanning.PI@ec.gc.ca.

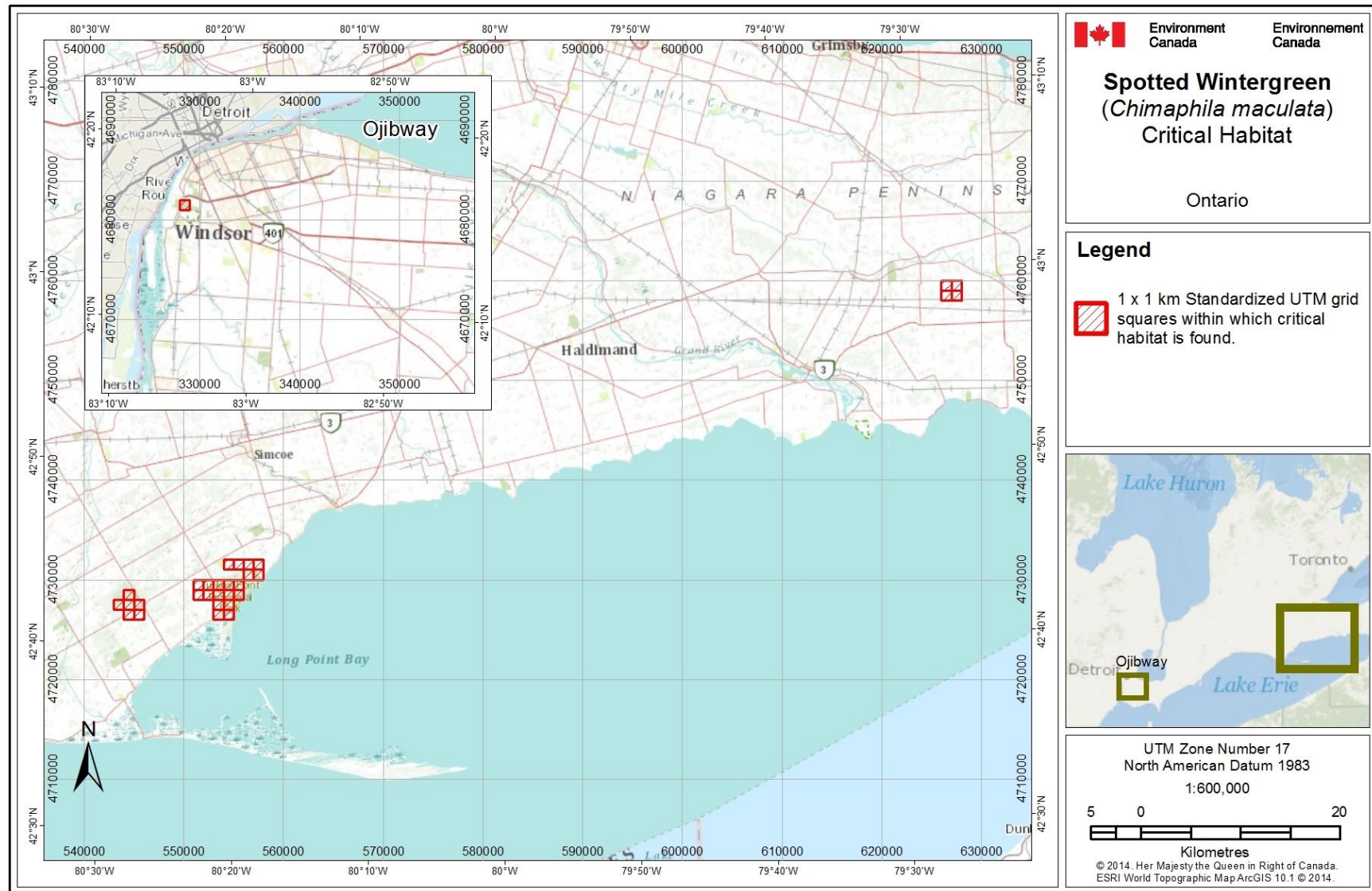


Figure 2. Grid Squares That Contain Critical Habitat for the Spotted Wintergreen in Canada. Critical habitat for the Spotted Wintergreen occurs within these 1 x 1 km standardized UTM grid squares (red hatched outline), where the description of habitat occupancy (section 6.1.1) and habitat suitability (section 6.1.2) are met.

Table 3. Grid Squares That Contain Critical Habitat for the Spotted Wintergreen in Canada.
Critical habitat for the Spotted Wintergreen occurs within these 1 x 1 km standardized UTM grid squares where the description of habitat occupancy in section 6.1.1 and habitat suitability (section 6.1.2) are met.

Population	Critical Habitat Unit	1 x 1 km Standardized UTM grid square ID ¹	UTM Grid Square Coordinates ²		Critical Habitat Unit Area (ha) ³	Land tenure ⁴
			Easting	Northing		
St. Williams Forest (Manestar)	St. Williams Forest (Manestar)	17NH42_37	543000	4727000	72	Non-federal Land
		17NH42_46	544000	4726000		
		17NH42_47	544000	4727000		
St. Williams Forest (Nursery)	St. Williams Forest (Nursery)	17NH42_46	544000	4726000	37	Non-federal Land
		17NH42_47	544000	4727000		
		17NH42_48	544000	4728000		
		17NH42_56	545000	4726000		
		17NH42_57	545000	4727000		
St. Williams Forest (Turkey Point)	St. Williams Forest (Turkey Point) 1	17NH52_18	551000	4728000	92	Non-federal Land
		17NH52_19	551000	4729000		
		17NH52_28	552000	4728000		
		17NH52_29	552000	4729000		
		17NH52_38	553000	4728000		
		17NH52_39	553000	4729000		
	St. Williams Forest (Turkey Point) 2	17NH52_38	553000	4728000	17	
		17NH52_39	553000	4729000		
	St. Williams Forest (Turkey Point) 3	17NH52_36	553000	4726000	24	
		17NH52_37	553000	4727000		
		17NH52_46	554000	4726000		
		17NH52_47	554000	4727000		
Turkey Point Provincial Park	Turkey Point Provincial Park	17NH52_38	553000	4728000	69	Non-federal Land
		17NH52_39	553000	4729000		
		17NH52_48	554000	4728000		
		17NH52_49	554000	4729000		
		17NH52_58	555000	4728000		
		17NH52_59	555000	4729000		
Normandale	Normandale	17NH52_58	555000	4728000	5	Non-federal Land
Spooky Hollow ANSI	Spooky Hollow ANSI	17NH53_41	554000	4731000	8	Non-federal
		17NH53_51	555000	4731000		

						Land
Fisher's Glen Conservation Area	Fisher's Glen Conservation Area	17NH53_60	556000	4730000	37	Non-federal Land
		17NH53_61	556000	4731000		
		17NH53_70	557000	4730000		
		17NH53_71	557000	4731000		
Wainfleet	Wainfleet	17PH25_68	626000	4758000	59	Non-federal Land
		17PH25_69	626000	4759000		
		17PH25_78	627000	4758000		
		17PH25_79	627000	4759000		
Ojibway Prairie Nature Reserve	Ojibway Prairie Nature Reserve	17LG28_81	328000	4681000	35	Non-federal Land
				Total	~455 ha	

¹Based on the standard UTM Military Grid Reference System (see <http://www.nrcan.gc.ca/earth-sciences/geography-boundary/mapping/topographic-mapping/10098>), where the first 2 digits represent the UTM Zone, the following 2 letters indicate the 100 x 100 km Standardized UTM grid followed by 2 digits to represent the 10 x 10 km Standardized UTM grid. The last 2 digits represent the 1 x 1 km Standardized UTM grid containing all or a portion of the critical habitat unit. This unique alphanumeric code is based on the methodology produced from the Breeding Bird Atlases of Canada (See <http://www.bsc-eoc.org/> for more information on breeding bird atlases).

²The listed coordinates are a cartographic representation of where critical habitat can be found, presented as the southwest corner of the 1 x 1 km Standardized UTM grid square containing all or a portion of the critical habitat unit. The coordinates are provided as a general location only.

³The area presented is an approximation of the area of critical habitat (rounded up to the nearest 1 ha); the exact area of critical habitat would require field verification.

⁴Land tenure is provided as an approximation of the types of land ownership that exist at the critical habitat units and should be used for guidance purposes only. Accurate land tenure will require cross referencing critical habitat boundaries with surveyed land parcel information.

6.2 Activities Likely to Result in the Destruction of Critical Habitat

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

At present, there is little evidence of direct threats to the species that have been linked to previous declines, and no focused studies on the topic have been conducted. Threats identified for the species in the provincial recovery strategy and the COSEWIC field summary report represent presumptions based on expert opinion, the biology of the species and reasonable judgment; further research is required to determine the actual impacts of these potential threats to the species. Activities described in Table 4 include those most likely to cause destruction of critical habitat for the species based on the threats listed in these documents and destructive activities may not be limited to those listed.

Table 4. Activities Likely to Result in the Destruction of Critical Habitat

Description of Activity	Descriptions of Effect in Relation to Function Loss	Details of Effect
Activities that result in the compaction and/or disturbance of soils, such as ATV use and the operation of heavy equipment	Soil compaction has the potential to alter the leaf litter and/or habitat available for soil fungi which are required for germination and plant establishment. Spotted Wintergreen prefers undisturbed soils and any activities that result in soil disturbance or compaction could be detrimental (NatureServe 2014).	When this activity occurs within critical habitat, the effects would be direct and cumulative. Negative effects would occur if the activity were undertaken in any season except when the ground is completely frozen. This activity is likely to result in destruction of critical habitat because the Spotted Wintergreen is dependent upon soil mycorrhizae for growth and development, and there is evidence that the presence of soil mycorrhizae is negatively affected by compaction.
Activities that result in the moderate to complete removal of the canopy cover of critical habitat (e.g., clear-cut forest harvesting)	Results in an increase in light penetration, reduction in soil moisture, compaction of soils and an increase in the probability of propagules of invasive species being introduced on forestry equipment, and ultimately in habitat no longer being suitable for the species. Activities that remove the canopy nearby critical habitat may affect the microhabitat conditions required by the species (e.g., light penetration, reduction in soil moisture, etc.).	When this activity occurs within or adjacent to (i.e., within 50 m) critical habitat at any time of year, the effects are likely to be direct. This activity is very likely to result in habitat destruction because the Spotted Wintergreen requires at least partial shade in a wooded environment. The information available at this time is insufficient to develop a threshold for this activity. However, the Spotted Wintergreen is tolerant of some light penetration; some botanists have speculated that full shade may be problematic for this species. Some selective thinning of the forest canopy, and/or brush clearing, may be beneficial provided careful precautions are taken (e.g., no heavy equipment, equipment cleaned to remove seeds to avoid spread of propagules, removal of all brush and wood from habitat).
Activities that result in the conversion of forested area, such as agriculture, residential or commercial development	Converts habitat and results in the direct loss of critical habitat upon which the species relies for basic survival, successful seed germination and seedling establishment. Activities that convert habitat nearby critical habitat may affect the microhabitat conditions required by the species (e.g., light penetration, reduction in soil moisture, etc.).	When this activity occurs within or adjacent to (i.e., 50 m) critical habitat at any time of year, the effects may be direct or cumulative. This activity is very likely to result in the destruction of critical habitat because the Spotted Wintergreen requires at least partial shade in a wooded environment.
Activities that introduce exotic plants (e.g., recreational trail use, motorized vehicle use such as ATVs and forest operations equipment)	The introduction of invasive species can result in the Spotted Wintergreen being outcompeted by the invasive species. Physical and chemical changes to habitat may also occur, such that it is no longer suitable for the species.	When this activity occurs within or adjacent to critical habitat at any time of year, the effects may be cumulative. It can result in introduction of an invasive species that can lead to gradual destruction of critical habitat over time.

7. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives. Every five years, success of recovery strategy implementation will be measured against the following performance indicators:

- the current abundance and distribution of all existing sub-populations of Spotted Wintergreen in Canada have been maintained,
- where it is biologically and technically feasible and required, the abundance of existing sub-populations has been increased, and
- the feasibility of restoring historical sub-populations where the habitat is appropriate has been determined.

8. Statement on Action Plans

One or more action plans will be completed for the Spotted Wintergreen and posted on the Species at Risk Public Registry by 2022.

9. 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](#)²³. 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 and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [Federal Sustainable Development Strategy's](#)²⁴ (FSDS) goals and targets.

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

²³ <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

²⁴ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1

Spotted Wintergreen shares the range and a similar habitat to other plant species at risk, especially Virginia Goat's Rue (*Tephrosia virginiana*) and Bird's-foot Violet (*Viola pedata*), which are both found in similar habitats within St. Williams' Conservation Reserve and in the Turkey Point area (Draper et al. 2003; Chambers 2010; Ursic et al. 2010). Other species at risk (e.g., Acadian Flycatcher (*Empidonax virescens*), Eastern Whip-poor-will (*Antrostomus vociferus*), Eastern Hog-nosed Snake (*Heterodon platirhinos*), Eastern Foxsnake (*Pantherophis gloydi*)) are also known from areas of St. Williams Conservation Reserve (White 2012), and are found occasionally in similar habitats within southwestern Ontario.

The potential for this federal recovery strategy to have adverse effects on other species was considered. At this time, the majority of recovery actions for the Spotted Wintergreen focus on conservation and protection of habitat, and research. Few direct management actions are proposed for the Spotted Wintergreen habitat (e.g., invasive species control). Experimental activities, such as selective thinning of the forest canopy or prescribed burning, may be undertaken as part of controlled research activities. Although these have the potential to harm some species in the short term, the ecological risks of these management activities will be assessed before they are completed, in order to avoid potential negative effects. Overall, this recovery strategy will benefit the environment and will not entail significant adverse effects.

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**PART 2 - *Recovery Strategy for the Spotted Wintergreen*
(*Chimaphila maculata*) in Ontario, prepared for the Ontario
Ministry of Natural Resources**



Spotted Wintergreen

(*Chimaphila maculata*) in Ontario

Ontario Recovery Strategy Series

Recovery strategy prepared under the *Endangered Species Act, 2007*

February 2010

Natural. Valued. Protected.

About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the Endangered Species Act, 2007 (ESA, 2007) and the Accord for the Protection of Species at Risk in Canada.

What is recovery?

Recovery of species at risk is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

Under the ESA, 2007, a recovery strategy provides the best available scientific knowledge on what is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA, 2007 outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. There is a transition period of five years (until June 30, 2013) to develop recovery strategies for those species listed as endangered or threatened in the schedules of the ESA, 2007. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of Natural Resources Species at Risk webpage at: www.ontario.ca/speciesatrisk

RECOMMENDED CITATION

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DECLARATION

The Ontario Ministry of Natural Resources has led the development of this recovery strategy for the Spotted Wintergreen in accordance with the requirements of the *Endangered Species Act, 2007* (ESA 2007). This recovery strategy has been prepared as advice to the Government of Ontario, other responsible jurisdictions and the many different constituencies that may be involved in recovering the species.

The recovery strategy does not necessarily represent the views of all of the individuals who provided advice or contributed to its preparation, or the official positions of the organizations with which the individuals are associated.

The goals, objectives and recovery approaches identified in the strategy are based on the best available knowledge and are subject to revision as new information becomes available. Implementation of this strategy is subject to appropriations, priorities and budgetary constraints of the participating jurisdictions and organizations.

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.

RESPONSIBLE JURISDICTIONS

Ontario Ministry of Natural Resources
Environment Canada, Canadian Wildlife Service – Ontario

EXECUTIVE SUMMARY

This recovery strategy outlines the objectives and approaches necessary for the protection and recovery of Ontario populations of Spotted Wintergreen (*Chimaphila maculata*). The strategy is based on a comprehensive review of current and historical population census data and consultations with knowledgeable individuals.

Populations of Spotted Wintergreen occur primarily as distinct colonies composed of few to several individuals. As stems arise from the creeping rhizomes of this plant (Kirk 1987), it is probable that clumps or contiguous groupings of stems actually represent clones or ramets rather than single individuals. In southern Ontario, the plant's flowers generally open in mid-July and are likely pollinated by *Bombus* spp. The morphology of the seeds (small, wingless, tailed and ribbed) suggests that seed dispersal is principally by anemochory (i.e., wind dispersal). Spotted Wintergreen has been reported as having mycorrhizal associations, although the type and nature of the association remains unclear.

The long-term recovery goals for Spotted Wintergreen are to protect and enhance all extant populations to ensure that sustainable levels are established or maintained, and to restore historical populations and establish new populations in appropriate habitat, if deemed feasible. The recovery objectives for this species place greatest emphasis on ensuring the protection of extant populations. To that end, several specific objectives have been identified:

1. Identify and protect habitat for extant populations;
2. Identify and mitigate threats through monitoring and management;
3. Monitor populations regularly to determine trends and habitat conditions;
4. Develop education and stewardship programs for private landowners;
5. Initiate research to fill knowledge gaps;
6. Investigate the feasibility of recovery potential of historic sites or other suitable habitat.

Recovery approaches include the protection of habitat, identification and mitigation of threats to populations through continued monitoring and management, conservation of the genetic pool through gene banking, and experimental micro-propagation.

Many of the recovery activities identified in this recovery strategy are contingent on the outcome of future research initiatives, as basic knowledge of the species' habitat requirements, population biology, and propagation requirements is lacking. The recovery strategy outlines and prioritizes research programs necessary to support the implementation of the identified recovery approaches.

It is recommended that the area to be prescribed as Spotted Wintergreen habitat in a habitat regulation include the area occupied by extant populations and the extent of the vegetation community (based on the Ecological Land Classification (ELC) for southern Ontario) in which it occurs at each site. This will allow for future growth, expansion and migration of these populations.

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1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Spotted Wintergreen

SCIENTIFIC NAME: *Chimaphila maculata*

SARO List Classification: Endangered

SARO List History: Endangered (2008), Endangered – Regulated (2004)

COSEWIC Assessment History: Endangered (2000)

SARA Schedule 1: Endangered (June 5, 2003)

CONSERVATION STATUS RANKS:

GRANK: G5

NRANK: N1

SRANK: S1

The glossary provides definitions for the abbreviations above.

1.2 Species Description and Biology

Species Description

Spotted Wintergreen (*Chimaphila maculata*) is a small, rhizomatous evergreen herb or sub-shrub. It is similar to Pipsissewa (*Chimaphila umbellata*), and the two share the same habitat, but they differ in that Pipsissewa lacks the conspicuous white stripes along the veins on the upper surface of the leaves (Kirk 1987). Although isolated individuals do occur, large colonies of clones (ramets) may be formed by the growth of shallow, horizontally spreading rhizomes that produce erect shoots. The plant can grow to a height of 50 centimetres high (Flora of North America 2009). Each shoot bears several whorls of smooth leaves and a terminal cluster of one to five white or pinkish fragrant flowers (from Standley et al. 1988, Kirk 1987). The fruit is a roundish capsule up to one centimetre across (Flora of North America 2009).

Species Biology

Populations of Spotted Wintergreen occur primarily as distinct colonies composed of few to several individuals. As stems arise from the creeping rhizomes of this plant (Kirk 1987), it is probable that clumps or contiguous groupings of stems actually represent clones or ramets rather than single individuals, however no research has been undertaken to test this hypothesis.

The pollination biology of Spotted Wintergreen has been examined in one scientific paper by Standley et al. (1988), who studied sympatric populations of Spotted Wintergreen and Pipsissewa in a Massachusetts deciduous forest. This study found that

both species flower for approximately 14 days beginning in early to mid-July and that they are both visited primarily by bumblebees of the genus *Bombus*. Spotted Wintergreen was visited primarily by *Bombus perplexus*, whereas Pipsissewa was visited by *Bombus bimaculatus*, *B. vagans* and *B. perplexus*. Knudsen and Oleson (1993) also found that Pipsissewa was visited exclusively by *Bombus* spp. except that the visitors were exclusively males.

Various field botanists and ecologists have observed that, in southern Ontario, the plant's flowers generally open in mid-July for approximately 17 days and that plants produce abundant seed (Kirk 1987, K. Ursic pers. comm. 2001). These individuals also noted that fruiting occurs in August with the capsule splitting and releasing its seeds, many of which persist in the capsule into the next spring, and that seeds are small (0.4–0.6 mm long, 0.1–0.2 mm wide), wingless, tailed and ribbed (Kirk 1987). The morphology of the seeds suggests that seed dispersal is principally by anemochory (i.e., wind dispersal).

Spotted Wintergreen has been reported as having endotrophic mycorrhizal associations (i.e., with fungal filaments that may penetrate the plant cells), although the type and nature of the association remains unclear, and the fungal associates remain unknown. Boullard and Ferchau (1962) describe a mycorrhizal association of the ericoid type on root samples of Spotted Wintergreen collected from North Carolina, West Virginia, New York, New Hampshire and interestingly, Ripples, New Brunswick. However, given that Spotted Wintergreen has never been reported in New Brunswick prior or subsequent to Boullard and Ferchau's (1962) publication, and that this location is outside of the plant's known range, it places their plant identification(s) into question.

1.3 Distribution, Abundance and Population Trends

Global Range

Spotted Wintergreen occurs naturally in eastern North America, Mexico and Central America. Its range in eastern North America is from southern Michigan and Ontario to southern New Hampshire and Maine, south to Mississippi and northern Florida (Figure 1). The western limits appear to be western Kentucky and Tennessee, and eastern Illinois. Its southern range is from Central America, through Mexico to Arizona. However, available information limits a detailed analysis of the global abundance of this species.

The global conservation status rank for Spotted Wintergreen is G5, which is considered secure (NatureServe 2009). NatureServe also applies conservation status ranks at the national (N) and sub-national (S) (i.e., state or provincial) level. In Canada, Spotted Wintergreen is ranked N1 (critically imperilled), and is listed as endangered federally under the *Species at Risk Act* and provincially on the Species at Risk in Ontario (SARO) List. Spotted Wintergreen is considered secure (S5) in the United States, but within the U.S., Spotted Wintergreen is considered critically imperilled (S1) in Illinois, and imperilled (S2) in Vermont, Maine, and Mississippi (NatureServe 2009). Furthermore, the species

is legally protected in Illinois and Maine, where it has been designated as endangered, and in New York, where it is considered exploitably vulnerable (USDA, NRCS 2009).

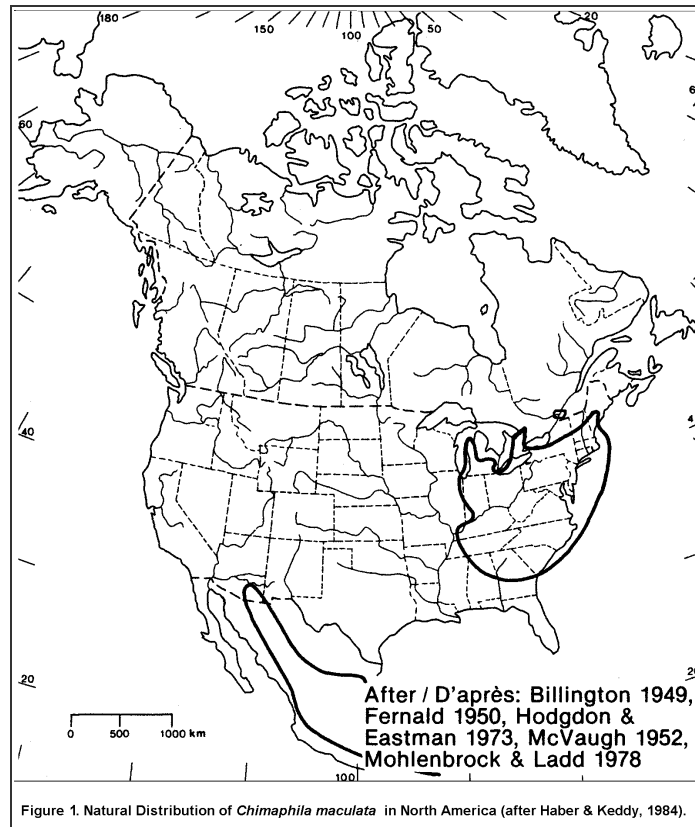


Figure 1. Distribution of Spotted Wintergreen in North America (after Haber and Keddy, 1984)

Canadian Range

The current extant distribution of Spotted Wintergreen in Canada is restricted to a few locations in Ontario (Figure 2) that support an estimated 2,700 stems. Historically, Spotted Wintergreen was more widely distributed throughout southwestern and south central Ontario; however, it has since been extirpated from Simcoe Kent, Middlesex and York Counties, Hamilton-Wentworth Region and the District of Muskoka. In Quebec, a single population was discovered in 1992 at Parc d'Oka in Deux-Montagnes County in the southwestern part of the province (Jacobs 2001), and is now presumed extirpated there.

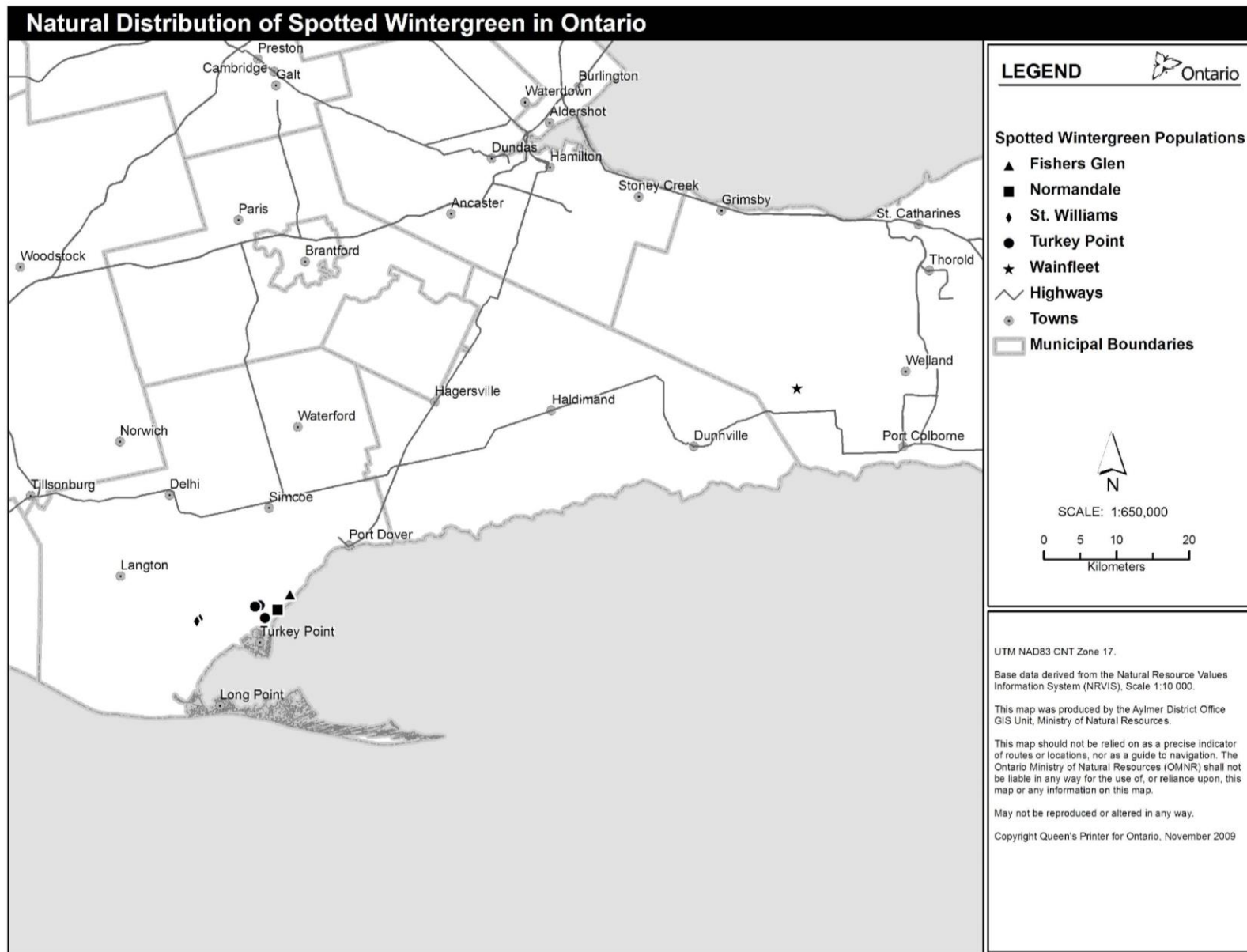


Figure 2. Current distribution of Spotted Wintergreen in Ontario

An estimated 11 populations have been extirpated from a total of 16 known occurrences in Ontario. Populations are considered to be independent if separated by one kilometre or more of inappropriate habitat, and groupings of plants separated by less than one kilometre are considered sub-populations (Natural Heritage Information Centre 2001).

There are insufficient data available on extant populations to estimate long-term trends in population size for this species. Inconsistent methodology in population estimation and delineation of sub-populations as well as a lack of reliable data have made it equally difficult to estimate short-term trends for some extant populations.

Table 1. Estimated abundance of Spotted Wintergreen in Ontario

County/Region	Population Name	Year of Last Survey	Approximate Number of Stems
Norfolk	St. Williams	2007	1923
Norfolk	Turkey Point	2009	591
Norfolk	Normandale	2005	165
Norfolk	Fishers Glen	2007	51
Niagara	Wainfleet	2007	7

In recent years, three populations have had notable increases in abundance, one population has had a marginal increase in abundance, and one additional population was recently discovered. In Norfolk County, a sub-population at the St. Williams site increased from 41 stems in 1985 to 1923 stems in 2007; similarly, the Normandale population increased from 10–15 stems in 1996 to 165 stems in 2005; seven new sub-populations have been discovered since 2004 at the Turkey Point site, bringing the estimated population for this site up to 591 in 2009, compared to 61 in 2008. The Fisher's Glen population increased from 23 stems in 2000 to 51 stems in 2007. A new population was recently discovered in the Township of Wainfleet, Regional Municipality of Niagara.

1.4 Habitat Needs

The key habitat attributes for Spotted Wintergreen, detailed below, include:

- association with dry to fresh oak-pine or oak dominated woodlands;
- limited competition with other groundcover species;
- partial shade;
- slightly acidic surface soil conditions (soil pH 4.2 to 6.0);
- well-drained soils (especially sandy soils) and sites;
- nutrient-poor soil conditions;
- moderated climate.

Spotted Wintergreen typically occurs in dry oak-pine mixed forest and dry woodland habitats (M. Gartshore pers. comm. 2001). Recent and available field observations have confirmed that Spotted Wintergreen is a woodland understorey species typically

associated with dry–fresh oak and oak–pine mixed forests and woodlands. Ecological Land Classification (ELC) ecosites (Lee et al. 1998) for extant populations are CUP3, FOD1, FOD8, FOD9, or FOM2 (Table 2). These communities typically have semi-closed canopy conditions. The semi-open conditions of the vegetation communities in Ontario are a result of past disturbance, and will likely require further disturbance in the future to maintain suitable conditions for Spotted Wintergreen (A. Woodliffe pers. comm. 2006). The associated communities are characterised by an overstorey of White Pine (*Pinus strobus*), Red Oak (*Quercus rubra*), Black Oak (*Quercus velutina*) and American Beech (*Fagus grandifolia*), an understorey of Round-leaved Dogwood (*Cornus rugosa*), Pipsissewa and Witch Hazel (*Hamamelis virginiana*), and a groundcover layer of False Lily-of-the-Valley (*Maianthemum canadense*), Bracken Fern (*Pteridium aquilinum*) and Wild Sarsaparilla (*Aralia nudicaulis*) (T. Farrell pers. comm. 2001). Table 3 includes a summary of species noted in habitats occupied by Spotted Wintergreen for North America.

Table 2. Ecological Land Classification (ELC) Codes for sites that support extant populations* of Spotted Wintergreen in Ontario

Site Name	ELC Community (ELC Code)
St. Williams	Red Pine Coniferous Plantation Type (CUP3-1)
	Fresh – Moist Poplar Deciduous Forest Type (FOD8-1)
	Fresh – Moist Poplar Deciduous Forest Type (FOD8-1)
Turkey Point	White Pine Coniferous Plantation Type (CUP3-2)
	Dry – Fresh Black Oak Deciduous Forest Type (FOD1-3)
	Red Pine Coniferous Plantation Type (CUP3-1)
	White Pine Coniferous Plantation Type (CUP3-2)
	Fresh – Moist Poplar Deciduous Forest Type (FOD8-1)
Normandale	Dry - Fresh White Pine – Oak Mixed Forest Type (FOM2-1)
Fishers Glen	Dry - Fresh White Pine – Oak Mixed Forest Type (FOM2-1)
Wainfleet	Fresh – Moist Oak – Maple Deciduous Forest Type (FOD9-2)

* For the purposes of this recovery strategy, populations are considered to be independent if separated by one kilometre or more, and that groupings of plants separated by less than one kilometre are considered sub-populations.

Table 3. Summary of species noted in habitats occupied by Spotted Wintergreen either currently or historically, as described in the available sources for North America

Site Location	Dominant Overstorey	Dominant Understorey	Noted Groundcover
St. Williams, (Kirk 1987)	Black Oak (<i>Quercus velutina</i>), White Oak (<i>Q. alba</i>), Eastern White Pine (<i>Pinus strobus</i>)	Witch Hazel (<i>Hamamelis virginiana</i>), Maple-leaved Viburnum (<i>Viburnum acerifolium</i>), Black Cherry (<i>Prunus serotina</i>)	Bracken Fern (<i>Pteridium aquilinum</i>), Pennsylvania Sedge (<i>Carex pensylvanica</i>), False Solomon's Seal (<i>Maianthemum racemosum</i>), Shinleaf (<i>Pyrola elliptica</i>), Indian Pipe (<i>Monotropa uniflora</i>), Pale Blueberry (<i>Vaccinium pallidum</i>), Pipsissewa (<i>C. umbellata</i>)
Wasaga Beach, (extirpated) (Kirk 1987)	Large-toothed Aspen (<i>Populus grandidentata</i>), Red Oak (<i>Q. rubra</i>), Eastern White Pine		
Wellesley, Massachusetts (Standley et al. 1988)	Red Oak, White Oak, Pignut Hickory (<i>Carya glabra</i>), Shagbark Hickory (<i>Carya ovata</i>), Red Maple (<i>Acer rubrum</i>), Eastern White Pine	Low Sweet Blueberry (<i>Vaccinium angustifolium</i>), Mountain Laurel (<i>Kalmia latifolia</i>), Sheep Laurel (<i>Kalmia angustifolia</i>), Black Huckleberry (<i>Gaylussacia baccata</i>), Nannyberry (<i>Viburnum lentago</i>), Maple-leaved Viburnum	Bracken Fern, False Lily-of-the-Valley (<i>Maianthemum canadense</i>), Shinleaf, Indian Pipe, Pink Ladyslipper (<i>Cypripedium acaule</i>), Sessile-leaved Bellwort (<i>Uvularia sessilifolia</i>), Wintergreen (<i>Gaultheria procumbens</i>), Pipsissewa
Norridgerock, Maine (Eastman 1976)	Red Oak, Eastern White Pine, American Beech (<i>Fagus grandifolia</i>)	Round-leaved Dogwood (<i>Cornus rugosa</i>)	Running Club-moss (<i>Lycopodium clavatum</i>), Bracken Fern, Pennsylvania Sedge, False Lily-of-the-Valley, Wild Sarsaparilla (<i>Aralia nudicaulis</i>), Green Shin-leaf (<i>Pyrola chlorantha</i>), Pipsissewa, Ram's Head Lady Slipper (<i>Cypripedium arietinum</i>), Hooker's Orchid (<i>Plantanthera hookeri</i>), Showy Orchis (<i>Galearis spectabilis</i>)
Peaked Mountain, Hiram, Maine (Eastman 1976)	Red Oak, White Birch (<i>Betula papyrifera</i>), American Beech	Witch Hazel, Maple-leaved Viburnum	
Lusk Creek, Illinois (Jones and Fralish 1974)	Black Oak, White Oak, Scarlet Oak (<i>Q. coccinea</i>), Hickory (<i>Carya</i> spp.)		False Dandelion (<i>Krigia biflora</i>), Dittany (<i>Cumila origanoides</i>), Solomon's Seal (<i>Polygonatum biflorum</i>), False foxglove (<i>Aureolaria flava</i>), Wild Licorice (<i>Galium circaeans</i>)

As White (1998) pointed out, all extant sites in Ontario are close to large bodies of water and the moderating effect on the climate may be an important factor. Kirk (1987) provided site-specific information with respect to climate at the St. Williams site, and mentions the moderating effect of Lake Erie and Georgian Bay as a factor at the St. Williams site and (former) Wasaga beach sites respectively.

Information on microsite preferences for Spotted Wintergreen is limited. The plant appears to have a relatively narrow pH range. Standley et al. (1988) recorded soil pH values of 4.2 to 4.6 at a Spotted Wintergreen site in Massachusetts. Other studies report that the species prefers an average soil pH below 7 (Eastman 1976, Kirk 1987), but actual soil sampling at any of the Ontario sites has yet to be conducted. Interestingly, Kirk (1987) noted that based on field observations, Spotted Wintergreen differs from its close relative *Pipsissewa* in that it is unable to tolerate the higher acidity found in pure pine stands created by dense layers of needle duff, and appears to prefer mixed oak-pine woodlands.

The plant tends to occur on sandy soils that are essentially stone-free with low organic content, having good drainage and nutrient poor status (Kirk 1987). The Ontario populations of Spotted Wintergreen occur on relict sand dunes (A. Woodliffe pers. comm. 2006). Kirk (1987) also noted that the plant appears to prefer insolated sites (i.e., sites with some sun exposure) lacking soil moisture extremes. However, no quantitative assessment of the habitat conditions for this species has been undertaken to date.

1.5 Limiting Factors

Reproductive Biology

Although aspects of the reproductive biology of Spotted Wintergreen may be limiting factors, there has been far too little study on the subject to draw any definitive conclusions. Standley et al. (1988) point out that having a limited number of shared pollinators, as is the case with Spotted Wintergreen, can reduce aspects of plant fitness (e.g., reduced seed set, production of infertile hybrids, reduced floral visitation). They acknowledge that their results do not allow testing of these hypotheses and that further study is required. Further scientific research is also required to determine whether seed dispersal is a limiting factor.

It is also possible that lack of sexual reproduction of Ontario populations may represent a potential limiting factor for Spotted Wintergreen. Unfortunately, the only scientific reports on this topic for this genus deal with *Pipsissewa* (Barrett and Helenurm 1988a, b). These studies found that *Pipsissewa* exhibited mostly clonal growth and, like many boreal forest herbs, was limited in fruit-set production by pollen limitation and predation of developing fruit. However, further research into modes and mechanisms of reproduction in Spotted Wintergreen are required to determine if this holds true for this species as well.

Spotted Wintergreen is capable of reproducing either clonally or by seed (Standley et al. 1988). Clones may consist of few to several hundred stems (ramets), and therefore, a population consisting of several hundred stems may represent only one to several individuals. However, determining the precise number of clones or individuals within a large and/or tightly spaced population requires excavation or genetic analysis that has not been completed for a population of Spotted Wintergreen. Although the Ontario populations do appear to flower and produce seed regularly, it has been hypothesized that low seed viability and dispersal must be limiting intrinsic factors to population growth, given that unoccupied suitable habitats are readily available at most extant sites (Kirk 1987). However, once again, additional scientific research is required to confirm this hypothesis.

Mycorrhizal Associations

The mycorrhizal status of Spotted Wintergreen may also present a limiting factor if mycorrhizae are required for survival, and its fungal associates are uncommon. Some studies of the mycorrhizae of Spotted Wintergreen are questionable, as discussed in section 1.2. Nonetheless, it seems likely that Spotted Wintergreen has a mycorrhizal association to some degree, since other species of this genus display various types of mycorrhizal associations (Largent et al. 1980, Boullard and Ferchau 1962, Henderson 1919).

Soil Requirements

Spotted Wintergreen occurs on well-drained slightly acidic sandy soils and is typically associated with dry–fresh oak and oak pine forest communities. Research at the Hazelwood Botanical Preserve in Ohio indicated that a soil pH in excess of seven would exclude Spotted Wintergreen. Given the predominance of alkaline soils in southern Ontario, Spotted Wintergreen’s preference for slightly acidic soils may represent another limiting factor for this species, although even on generally basic soils, surface reactions may be acidic. No Spotted Wintergreen sites in Ontario have been tested to determine soil pH; therefore, it is difficult to evaluate the degree to which soil type is limiting.

Population Isolation

Habitat for Spotted Wintergreen is fragmented, resulting in isolated populations, restricted gene flow and reduced genetic diversity. Poor genetic exchange within and among populations can reduce overall species fitness. Not enough is known about the population biology of the species to determine the minimum habitat size or number of individuals necessary to support a viable population.

1.6 Threats to Survival and Recovery

Forest Management

Current land uses and activities can potentially conflict with conservation of the species. Such activities could include: a commercial tree nursery, a logging road related to silvicultural operations, use and/or maintenance of an irrigation line, and prescribed

burning for management of other species. These activities could result in canopy removal, alteration of species composition of associated plant communities, soil compaction, or could provide a vector for the introduction of invasive species. Habitat changes associated with the conversion of open dunes, savannas and woodlands to pine plantations and increased levels of anthropogenic disturbance may have contributed to the loss of extirpated populations. In a recent survey report of the Wasaga Beach Provincial Park sites by Bowles (2001), Dr. A. Reznicek has remarked on the extent of canopy closure that has occurred in the plantations over the past 25 years due to better fire suppression.

Competition with Other Plant Species

Although Pipsissewa shares Spotted Wintergreen's range and habitat, even at a microsite level, it is unclear whether it poses any kind of competition threat (Standley et al. 1988). Presumably, invasive species would also be a potential threat, although this threat has not been confirmed at any of the extant sites. Disturbance due to recreational trails and tree harvesting could provide a vector for the introduction of invasive species.

Trampling/Soil Compaction

Any activity that would result in trampling could potentially harm the species. Spotted Wintergreen prefers undisturbed soils, and any activities that result in soil disturbance or compaction could be detrimental (NatureServe 2009). Kirk (1987) comments that the site of the extirpated population from near the town of Simcoe, Norfolk County, was a small woodlot that had experienced extensive disturbance from all-terrain vehicles (ATVs), possibly contributing to the elimination of the species at that location. Several sites have recreational trails for hiking, walking, snowshoeing, and ATV use, all of which have a potential to result in trampling and soil compaction. The effects of these activities are unknown, but could affect populations by altering habitat conditions or destroying plants.

Waste Disposal

Waste disposal is a threat at the Wainfleet site. When the site was surveyed, a few old car parts were found near the site (T. Staton pers. comm. 2009). If additional scrap is accidentally deposited directly on top of the plants, the entire population could be eliminated due to the very limited extent of this site.

Collecting

Although White (1988) reported human threats from collecting on one occasion, the threat is currently considered to be low. Populations are primarily located in moderately low traffic areas and knowledge of the species' whereabouts is limited. No empirical evidence of the above noted threats has been collected to date.

Animal Foraging

There are no documented natural browsers for this species, but the Woodland Vole (*Pitymys pinetorum*), which is a special concern species on the SARO List, has a range, distribution, and habitat similar to Spotted Wintergreen and is suspected to forage on the rhizomes of this species. This constitutes a potential threat, but conversely could

benefit Spotted Wintergreen by assisting in its dispersal (M. Gartshore pers. comm. 2001), thus the role of small mammals needs to be clarified through further research.

Foraging activities of Wild Turkey (*Meleagris gallopavo*) have caused significant forest floor disturbance at the St Williams site, where Wild Turkeys gather in high concentrations, particularly during the winter (Gould 2001). Scratching and uprooting behaviour of turkeys might potentially damage rhizomes of Spotted Wintergreen and create openings in the groundcover where invasive species could colonize. The actual impact of this activity is currently unknown.

Table 4 provides a summary of an evaluation of human threats to individual populations and categorizes the threats based on their source, type, spatial and temporal extent, as well as the certainty that the threat is currently affecting the population. Natural threats (animal foraging and competition) occur at all sites.

Table 4. Evaluation of threats to Spotted Wintergreen

Population	Source of Threat	Temporal Extent	Certainty
St. Williams	Trampling/Soil Compaction*	Ongoing	probable
	Forest Management**	Occasional	speculative
	Collecting	Short-term	confirmed
Turkey Point	Trampling/Soil Compaction*	Ongoing	probable
	Forest Management**	Occasional	speculative
	Collecting	Short-term	speculative
Normandale	Forest Management**	Occasional	speculative
	Collecting	Short-term	speculative
Fishers Glen	Forest Management**	Occasional	speculative
	Collecting	Short-term	speculative
Wainfleet	Trampling/Soil Compaction*	Ongoing	probable
	Forest Management**	Occasional	speculative
	Waste Disposal	Ongoing	probable

* Trampling/Soil Compaction includes use of trails for ATV riding, walking, etc.

** Forest management activities include logging, pesticide/herbicide use for silviculture, and maintenance of logging roads.

1.7 Knowledge Gaps

Based on a review of the literature it is clear that the available information on Spotted Wintergreen is very limited. Additional research is required to obtain knowledge that will contribute to the protection and recovery of this species. Basic research needs for the species are listed below in order of importance:

1. Census and verification of all extant populations using standardized, objective and repeatable methods.

2. Research into feasibility of gene banking material from vulnerable populations, survey of genotypic diversity, species propagation and translocation.
3. Research into the population and reproductive biology of this species.
4. Research into the specific habitat requirements of this species.
5. Research potential threats to populations of this species.

Survey Requirements

Reliable, accurate, and current census information on populations of Spotted Wintergreen in Ontario is incomplete or lacking. Inconsistencies in naming and geographical referencing of populations and sub-populations have prevented detailed comparative analyses of population trends. Information collection needs to be standardized to reflect reliable baseline data, from which future recovery actions will be developed.

Biological / Ecological Research Requirements

At present, the population biology, genetics and ecology of Spotted Wintergreen are not well understood. Information on the genetic variability within and among populations is necessary to assess population viability. A population viability assessment (PVA) is necessary to more precisely define the population and habitat size thresholds necessary to achieve self-sustaining populations of this species. Understanding the minimum viable population is essential in guiding recovery actions.

Aspects of the reproduction of Spotted Wintergreen that remain unclear are: the primary mode of reproduction (whether clonal or sexual), the relative importance of its pollination biology, and the role of pollinators. Furthermore, there has been little research into characterizing habitat conditions and requirements for the species, including the nature of its mycorrhizal associations and soil pH requirements specific to southern Ontario. Additional research is required in all these fields.

Threat Clarification Research Requirements

At present, there is no research that directly examines natural and human threats to this species. Most of the threats to this species are speculative and require further research to ascertain their potential impact. All potential threats to Spotted Wintergreen should be investigated empirically and weighted against limiting factors, such as potentially low seed viability or specific affinities for particular habitats. It is critical to have good empirical data available to guide the development of appropriate threat mitigation activities.

Despite the knowledge gaps, priority recovery approaches that could benefit the species should be implemented immediately.

1.8 Recovery Actions Completed or Underway

Recovery actions for Spotted Wintergreen that are complete or currently underway include:

- Population census and habitat monitoring for some sub-populations has been completed up to 2009;
- Ecological Land Classification designations/mapping to support the delineation of the area recommended to be prescribed as habitat in a habitat regulation has been completed for most sub-populations
- Conservation Land Tax Incentive Program mapping was completed in 2001 for some sub-populations;
- Habitat management on public lands is on-going as necessary (e.g., creation of Species at Risk signage at St. Williams Conservation Reserve, forest management advice);
- Education and stewardship with private landowners is on-going as necessary (e.g., forest management advice).

Ontario Ministry of Natural Resources staff last performed a complete census of all Norfolk County populations in April and May of 2005, and only some sub-populations from 2006 and 2008. Niagara Peninsula Conservation Authority staff completed a census of the Wainfleet population in 2007. A consultant surveyed some sub-populations at Turkey Point in 2009.

Some of the actions being taken to implement the federal Tallgrass Communities of Southern Ontario Recovery Plan focus on conservation of prairies, savanna and woodland vegetation communities. These actions may also provide habitat for Spotted Wintergreen populations. That recovery plan involves the identification of prairie related sites and a landowner contact program that began in the summer of 2001, and may reveal additional information about Spotted Wintergreen.

2.0 RECOVERY

2.1 Recovery Goals

The long-term recovery goals for Spotted Wintergreen are to protect and enhance all extant populations to ensure that sustainable levels are established or maintained, and to restore historical populations and establish new populations in appropriate habitat, if deemed feasible.

2.2 Protection and Recovery Objectives

The recovery objectives for this species place greatest emphasis on ensuring the protection of extant populations. To that end, several specific objectives have been identified (Table 5).

Table 5. Protection and recovery objectives

No.	Protection or Recovery Objective
1	Identify and protect habitat for extant populations
2	Identify and mitigate threats through monitoring and management
3	Monitor populations regularly to determine trends and habitat conditions
4	Develop education and stewardship programs for private landowners
5	Initiate research to fill knowledge gaps
6	Investigate the feasibility of recovery potential of historic sites or other suitable habitat

2.3 Approaches to Recovery

Table 6. Approaches to recovery of the Spotted Wintergreen in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1. Identification and protection of habitat for extant populations				
Critical	Short-term	Protection	1.1 Identify area required to protect extant populations <ul style="list-style-type: none"> – Identify key habitat features – Delineate area to be prescribed as Spotted Wintergreen habitat in a habitat regulation 	<ul style="list-style-type: none"> • Habitat Requirements
Critical	Short-term	Protection	1.2 Habitat Protection <ul style="list-style-type: none"> – Protect habitat of extant populations through land acquisition or other mechanisms 	<ul style="list-style-type: none"> • Forest Management, Trampling/Soil Compaction
2. Identification and mitigation of threats through monitoring and management				
Necessary	Long-term	Protection, Management	2.1 Management on public lands <ul style="list-style-type: none"> – Work with land managers to develop management plans – Implement actions to reduce site-specific threats on an as-needed basis 	<ul style="list-style-type: none"> • Forest Management, Trampling/Soil Compaction
Critical	Long-term	Inventory, Monitoring and Assessment, Research	2.2 Threat Clarification, Reduction and Mitigation <ul style="list-style-type: none"> – Conduct research to quantify and evaluate potential threats – Develop approaches to mitigate threats 	<ul style="list-style-type: none"> • All Threats
Necessary	Long-term	Management, Research	2.3 Habitat Management <ul style="list-style-type: none"> – Develop approaches for habitat management based on research and monitoring 	<ul style="list-style-type: none"> • Habitat Disturbance

Recovery Strategy for the Spotted Wintergreen in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
3. Regular monitoring of population trends and habitat conditions				
Necessary	On-going	Inventory, Monitoring and Assessment	3.1 Population Census <ul style="list-style-type: none"> – Conduct an inventory of extant populations on an annual basis using standardized inventory methods 	<ul style="list-style-type: none"> • Survey Requirements
Necessary	On-going	Inventory, Monitoring and Assessment	3.2 Habitat Monitoring <ul style="list-style-type: none"> – Monitor general habitat conditions of extant populations annually 	<ul style="list-style-type: none"> • Competition, Natural and Anthropogenic Disturbance
4. Development of supportive education and stewardship programs for private land				
Necessary	On-going	Stewardship	4.1 Education and Stewardship <ul style="list-style-type: none"> – Provide information and resources (e.g., fact sheets) to private landowners, property managers and other stakeholders for the purposes of assisting recovery efforts 	<ul style="list-style-type: none"> • Forest Management, Trampling/Soil Compaction, Collecting
5. Initiate research to fill knowledge gaps				
Necessary	Long-term	Research	5.1 Species Ecology and Habitat Research <ul style="list-style-type: none"> – Initiate research programs to characterize species ecology (e.g., role of fire) – Initiate research programs to characterize habitat requirements (e.g., nutrient, pH, soil texture, moisture regime, light levels, temperature, soils, mycorrhizal associations,) 	<ul style="list-style-type: none"> • Reproductive Biology, Habitat Requirements, Competition
Necessary	Long-term	Research	5.2 Population Biology and Genetics Research <ul style="list-style-type: none"> – Initiate research on population biology, in particular pollination, dispersal and seed viability – Conduct genetic analysis and minimum viable population size for comparison across Ontario habitats 	<ul style="list-style-type: none"> • Reproductive Biology

Recovery Strategy for the Spotted Wintergreen in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Necessary	Long-term	Research	5.3 Genetic Conservation <ul style="list-style-type: none"> Collect seed and/or tissue culture from extant populations and deposit with a gene bank repository for long-term storage and analysis of genetic variability among populations 	<ul style="list-style-type: none"> Reproductive Biology
Necessary	Long-term	Research	5.4 Plant Propagation Research <ul style="list-style-type: none"> Initiate experimental micro-propagation trials from seed or tissue culture sources Genetic variability and potential out crossing trial should be attempted if genetics research suggests gene transfer is a limiting factor 	<ul style="list-style-type: none"> Reproductive Biology
6. Initiate research on species conservation, including recovery potential of historic or other suitable sites				
Necessary	Long-term	Research	6.1 Species Reintroduction and Restoration Research <ul style="list-style-type: none"> Evaluate feasibility of restoring historical populations and establishing additional populations in suitable habitat 	<ul style="list-style-type: none"> Reproductive Biology, Population Isolation

Narrative to Support Approaches to Recovery

Recovery efforts require close coordination with recovery actions for other species of concern in the area since the plant shares its habitat with other threatened and/or endangered species. For example, controlled burns are used as a management tool for Virginia Goat's-rue (*Tephrosia virginiana*, endangered both provincially and federally) and Bird's-foot Violet (*Viola pedata*, endangered provincially and federally), which could have a potential impact on Spotted Wintergreen populations. Consideration should be given to initiating recovery actions that would benefit multiple species, particularly in the Norfolk County area.

Spotted Wintergreen is known to be difficult to propagate artificially and immediate recovery efforts should focus on working with populations *in situ* before attempting to grow the plant *in vitro* (Duncan and Kartesz 1981). Cullina (2000) reports complete lack of success in germinating the seed, possibly due to the need for fungal associates; however, Cullina states that Spotted Wintergreen is easily propagated from cuttings taken in midsummer. The Plants for a Future website (2009) suggests using soil from the collection site (because of presumed mycorrhizal associations) and minimizing root disturbance as much as possible during transplantation. They also recommend using a moist sphagnum substrate. The noted sensitivity of the root systems may explain why the plant may be susceptible to anthropogenic disturbances such as trampling or ATV use.

The highest research priority and level of recovery effort should be directed toward the largest populations (St. Williams, Turkey Point, and Normandale), which appear to be viable and expanding. These populations could serve as living laboratories in which to research the population biology, habitat requirements, propagation and gene banking potential for future population augmentation or re-introduction programs.

The population at Fishers Glen is also showing some expansion, but much more slowly. For this smaller population, as well as the newly discovered Wainfleet population, emphasis should be placed on monitoring and assessment of habitat conditions and threats. Based on current limited understanding of the population biology and habitat requirements of this species, it is unlikely that the recommended approaches could be effectively implemented over the short term for these populations. A long-term approach could implement recommendations derived from research on the larger populations, to attempt to improve survival and re-establishment.

2.4 Performance Measures

The success of recovery efforts can be measured through ongoing monitoring of populations and threats, assessment of habitat conditions and evaluating the status and progress of the specified research, management, stewardship and education programs (Table 7). Performance measures should be based on the extent to which goals and objectives have been met.

Table 7. Performance measures for the recovery of Spotted Wintergreen

Objective	Performance Measure
1. Identification and protection of habitat for extant populations	<ul style="list-style-type: none"> • Key areas and habitat features delineated for all populations • All habitat protected under the ESA 2007 and through land acquisition
2. Identification and mitigation of threats through monitoring and management	<ul style="list-style-type: none"> • Approaches for managing Spotted Wintergreen habitat and mitigating threats developed • Threats mitigated as necessary to achieve recovery goal
3. Regular monitoring of population trends and habitat conditions	<ul style="list-style-type: none"> • Standardized inventory techniques developed • Population census conducted at all sites • Habitat of extant populations monitored annually
4. Development of supportive education and stewardship programs for private land	<ul style="list-style-type: none"> • Landowners, property managers and stakeholders provided with information on Spotted Wintergreen
5. Initiate research to fill knowledge gaps	<ul style="list-style-type: none"> • Source funding secured for specified research programs • Information gathered regarding species and population biology, ecology and habitat requirements • Gene conservation measures implemented
6. Initiate research on species conservation, including recovery potential of historic or other suitable sites	<ul style="list-style-type: none"> • Recovery potential of historic sites investigated

2.5 Area for Consideration in Developing a Habitat Regulation

Under the ESA 2007, a recovery strategy must include a recommendation to the Minister of Natural Resources on the area that should be considered in developing a habitat regulation. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species. The recommendation provided below by the recovery team will be one of many sources considered by the Minister when developing the habitat regulation for this species.

The minimum area that should be prescribed as habitat in a habitat regulation for Spotted Wintergreen should include the area occupied by all extant populations and the surrounding extent of the vegetation community (based on the ELC for Southern Ontario) in which it occurs. Additional setbacks may be required for specific activities to protect against direct or indirect threats. This allows for future growth, expansion and migration of these populations and is consistent with provincial habitat mapping guidelines for the Conservation Land Tax Incentive Program (Ontario Ministry of Natural Resources 1998). Known Ecological Land Classifications for extant sites are described in section 1.4, Table 2. These boundaries should be refined as more information is gained on the factors that may influence habitat suitability and quality.

In Ontario, the current occupied habitats are restricted to the southwestern part of the province. However, historical records for Ontario indicate that, given the appropriate site conditions, Spotted Wintergreen has established itself throughout southern Ontario and as far north as Muskoka District. Consequently, potential habitats, after further study, may include historical locations within the species' range as well.

Habitat that is not currently occupied by the species, or not currently known to be occupied, may also be required for recovery of the species. Before suitable habitat for reintroduction can be identified (including historic sites), further research is necessary to define optimum habitat attributes. Potential recovery areas would include sites within the species' range that exhibit many of the key habitat attributes listed in section 1.4. Presumably a natural site with these attributes would also support the fungal species that may be required to establish the appropriate mycorrhizal associations with the plant. In addition, given the plant's potential sensitivity to trampling and ATV use, it would be advisable to select locations where these activities are restricted.

GLOSSARY

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community that primarily conveys the degree of rarity of the species or community at the global (G), national (N) or sub-national (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate geographic scale of the assessment. The numbers mean the following:

- 1 = critically imperiled
- 2 = imperiled
- 3 = vulnerable
- 4 = apparently secure
- 5 = secure

Endangered Species Act, 2007 (ESA 2007): The provincial legislation that provides protection to species at risk in Ontario.

Species at Risk Act (SARA): The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk to which the SARA provisions apply. Schedules 2 and 3 contain lists of species that at the time the act came into force needed to be reassessed. After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the *Endangered Species Act, 2007* that provides the official status classification of species at risk in Ontario. This list was first published in 2004 as a policy and became a regulation in 2008.

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**PART 3 – *Spotted Wintergreen: Ontario Government
Response Statement*, prepared by the Ontario Ministry of
Natural Resources**

Spotted Wintergreen

Ontario Government Response Statement



Photo: Allen Woodliffe

PROTECTING AND RECOVERING SPECIES AT RISK IN ONTARIO

Species at risk recovery is a key part of protecting Ontario's biodiversity. Biodiversity – the variety of living organisms on Earth – provides us with clean air and water, food, fibre, medicine and other resources that we need to survive.

The *Endangered Species Act, 2007* (ESA) is the Government of Ontario's legislative commitment to protecting and recovering species at risk and their habitats. As soon as a species is listed as extirpated, endangered or threatened under the ESA, it is automatically protected from harm or harassment. Also, immediately upon listing, the habitats of endangered and threatened species are protected from damage or destruction.

Under the ESA, the Ministry of Natural Resources (the Ministry) must ensure that a recovery strategy is prepared for each species that is listed as endangered or threatened. A recovery strategy provides science-based advice to government on what is required to achieve recovery of a species.

GOVERNMENT RESPONSE STATEMENTS

Within nine months after a recovery strategy is prepared, the ESA requires the Ministry to publish a statement summarizing the government's intended actions and priorities in response to the recovery strategy. The recovery strategy for Spotted Wintergreen was completed on February 18, 2010.

(<http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@species/documents/document/286972.pdf>)

The response statement is the government's policy response to the scientific advice provided in the recovery strategy. In addition to the strategy, the response statement is based on input from stakeholders, other jurisdictions, Aboriginal communities and members of the public. It reflects the best available traditional, local and scientific knowledge at this time and may be adapted if new information becomes available. In implementing the actions in the response statement, the ESA allows the Ministry to determine what is feasible, taking into account social and economic factors.

Spotted Wintergreen is an evergreen perennial herb or sub-shrub. In Canada, it is currently restricted to a few locations in Ontario that support an estimated 2,700 stems. Historically, it was more widely distributed throughout southwestern and southcentral Ontario. Threats to this species include forestry and land use activities, competition from other plant species, trampling and soil compaction, waste disposal, collection and animal foraging.

MOVING FORWARD TO PROTECT AND RECOVER SPOTTED WINTERGREEN

The Spotted Wintergreen is listed as an endangered species under the ESA, which protects both the plant and its habitat. The Act prohibits any damage or destruction of that habitat without authorization. Such authorization would require that conditions established by the Ministry of Natural Resources be met.

The government's goal for the recovery of Spotted Wintergreen is to protect and enhance all existing populations to sustainable levels and to determine the feasibility of restoring historical populations where the habitat is appropriate.

Protecting and recovering species at risk is a shared responsibility. No single agency or organization has the knowledge, authority, or financial resources to protect and recover all of Ontario's species at risk. Successful recovery requires inter-governmental co-operation and the involvement of many individuals, organizations and communities.

In developing the government response statement, the Ministry considered what actions are feasible for the government to lead directly, and what actions are feasible for the government to support its conservation partners to undertake.

GOVERNMENT-LED ACTIONS

To help protect and recover Spotted Wintergreen, the government will directly undertake the following actions:

- Educate other agencies and planning authorities on the requirement to consider the protection of Spotted Wintergreen and its habitat in planning activities and environmental assessment processes.
- Encourage the submission of Spotted Wintergreen data to the Ministry of Natural Resources' central repository at the Natural Heritage Information Centre.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Protect Spotted Wintergreen and its habitat through the ESA.
- Support conservation, agency, municipal and industry partners to undertake activities to protect and recover Spotted Wintergreen. Support will be provided through funding, agreements, permits (including conditions) and advisory services.
- Establish and communicate annual priority actions for government support in order to encourage collaboration and reduce duplication of efforts.

GOVERNMENT-SUPPORTED ACTIONS

The government endorses the following actions as being necessary for the protection and recovery of Spotted Wintergreen. Actions which are noted as “high” will be given priority consideration for funding or for authorizations under the ESA. The government will focus its support on these high priority actions over the next five years.

Focus Area:	Protection and Management
Objective:	Develop, implement and assess approaches to mitigate threats at each population occurrence.
	Actions: <ol style="list-style-type: none">1. (HIGH) Conduct research to identify threats, evaluate their impacts and develop potential approaches to mitigate them.2. (HIGH) Implement site-specific management approaches to mitigate threats.3. As opportunities arise, support the securement of habitat of Spotted Wintergreen through existing land securement and stewardship programs.
Focus Area:	Research
Objective:	Address knowledge gaps and determine the minimum viable population size for the species.
	Actions: <ol style="list-style-type: none">4. Conduct research to determine the species’ reproductive biology, habitat and disturbance requirements, and the minimum viable population level.
Focus Area:	Monitoring
Objective:	Monitor populations to determine trends and habitat conditions.
	Actions: <ol style="list-style-type: none">5. Monitor the number of individuals and the general habitat conditions of existing populations.
Focus Area:	Awareness
Objective:	Increase the awareness of landowners and land managers of Spotted Wintergreen and increase their level of engagement in stewardship programs.
	Actions: <ol style="list-style-type: none">6. Develop and provide information and materials to private landowners, property managers and other stakeholders to increase their awareness of the species and promote recovery efforts.

IMPLEMENTING ACTIONS

Financial support for the implementation of actions may be available through the Species at Risk Stewardship Fund, Species at Risk Farm Incentive Program, or Community Fisheries and Wildlife Involvement Program. Conservation partners are encouraged to discuss project proposals related to the actions in this response statement with the Ministry of Natural Resources. The Ministry can also advise whether any authorizations under the ESA or other legislation may be required for undertaking the project.

Implementation of the actions may be subject to changing priorities across the multitude of species at risk, available resources and the capacity of partners to undertake recovery activities. Where appropriate, the implementation of actions for multiple species will be co-ordinated across government response statements.

REVIEWING PROGRESS

The ESA requires the Ministry to conduct a review of progress towards protecting and recovering a species not later than five years from the publication of this response statement. The review will help identify whether adjustments are needed to achieve the protection and recovery of Spotted Wintergreen.

ACKNOWLEDGEMENT

We would like to thank everyone who participated in the development of the “Recovery Strategy for the Spotted Wintergreen in Ontario” for their dedication to protecting and recovering species at risk.

For additional information:

Visit the species at risk website at

ontario.ca/speciesatrisk

Contact your MNR district office

Contact the Natural Resources Information Centre

1-800-667-1940

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