

Recovery Strategy for the Slender Bush-clover (*Lespedeza virginica*) in Canada

Slender Bush-clover



2016



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For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](http://www.registrelep-sararegistry.gc.ca)¹.

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¹ <http://www.registrelep-sararegistry.gc.ca>

RECOVERY STRATEGY FOR THE SLENDER BUSH-CLOVER (*Lespedeza virginica*) IN CANADA

2016

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 Slender Bush-clover (Lespedeza virginica) in Ontario* (Part 2) and the *Slender Bush-clover – Ontario Government Response Statement*² (Part 3) under Section 44 of the *Species at Risk Act* (SARA). Environment Canada has included a federal addition (Part 1) which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the Slender Bush-clover in Canada consists of three parts:

Part 1 – Federal Addition to the *Recovery Strategy for the Slender Bush-clover (Lespedeza virginica) in Ontario*, prepared by Environment Canada.

Part 2 – *Recovery Strategy for the Slender Bush-clover (Lespedeza virginica) in Ontario*, prepared by Judith Jones for the Ontario Ministry of Natural Resources³.

Part 3 – *Slender Bush-Clover – Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources and Forestry.

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 26, 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 Slender Bush-clover (Lespedeza virginica) in Ontario*, prepared by Judith Jones for the Ontario Ministry of Natural Resources.

PART 3 – *Slender Bush-Clover – Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources and Forestry.

PART 1 – Federal Addition to the *Recovery Strategy for the Slender Bush-clover (Lespedeza virginica) 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 after the publication of the final document on the SAR Public Registry.

The Minister of the Environment is the competent minister under SARA for the Slender Bush-clover and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. 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 Slender Bush-clover (Part 2) in cooperation with Environment Canada. The Province of Ontario also led the development of the attached Government response (Part 3), which is the Ontario Government's policy response to its provincial recovery strategy and summarizes the prioritized actions that the Ontario government intends to take.

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 Slender Bush-clover 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.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When the recovery strategy identifies critical habitat, there may be future regulatory implications, depending on where the critical habitat is identified. SARA requires that critical habitat identified within federal protected areas be described in the *Canada Gazette*, after which prohibitions against its destruction will apply. For critical habitat located on federal lands outside of federal protected areas, the Minister of the Environment must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies. For critical habitat located on non-federal lands, if the Minister of the Environment forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, and not

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

effectively protected by the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to extend the prohibition against destruction of critical habitat to that portion. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

Acknowledgements

The initial draft of the federal addition was prepared by Holly Bickerton (Consulting Ecologist, Ottawa). Assistance from Judith Jones (Winter Spider Eco-consulting) is gratefully acknowledged. Fieldwork on this species in the past two decades has been undertaken by Sam Brinker (Ontario Ministry of Natural Resources and Forestry (OMNRF), Michael J. Oldham (Natural Heritage Information Centre, OMNRF), Karen Cedar (City of Windsor) and Paul Pratt (formerly City of Windsor), among others. Additional preparation and review of the document was completed by Ken Tuininga, Lauren Strybos, Krista Holmes, Marie-Claude Archambault and Marsha Jeffers-Smith (Environment Canada, Canadian Wildlife Service – Ontario) and Aileen Wheeldon (OMNRF) and Michael J. Oldham (Natural Heritage Information Centre, OMNRF) reviewed and provided comments and advice during the development of this document. Amelia Argue (Ontario Ministry of Natural Resources and Forestry) provided additional information.

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 Slender Bush-clover (Lespedeza virginica) in Ontario* (Part 2) and to provide updated 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 survival/recovery habitat may not directly correspond to federal requirements. Recovery measures dealing with the protection of habitat are adopted; however, whether these measures will result in protection of critical habitat under SARA will be assessed following publication of the federal recovery strategy.

1. COSEWIC* Species Assessment Information

Date of Assessment: May 2013

Common Name: Slender Bush-clover

Scientific Name: *Lespedeza virginica*

COSEWIC Status: Endangered

Reason for Designation:

This perennial species occupies small patches of remnant tallgrass prairie and savanna at just one location in southern Ontario, where it is at risk from the combined impacts of a lack of natural disturbance by periodic fires and the presence of invasive plant species. There is a continuing decline in the quality and area of habitat available for the plant.

Canadian Occurrence: Ontario

COSEWIC Status History:

Designated Endangered in April 1986. Status re-examined and confirmed Endangered in April 1999, May 2000, and May 2013.

*COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

2. Species Status Information

Slender Bush-clover (*Lespedeza virginica*) is known from only a single extant⁵ population consisting of three sub-populations in the City of Windsor in southwestern Ontario. In North America its range extends from Michigan and southern Ontario to Texas and northern Florida.

Slender Bush-clover is listed as Endangered on Schedule 1 of the federal *Species at Risk Act* (SARA) and Endangered under the provincial *Endangered Species Act, 2007* (ESA 2007).

Slender Bush-clover has a global conservation rank of Secure⁶ (G5). In Canada and Ontario, the species is ranked as Critically Imperilled⁷ (N1, S1) (NatureServe 2014). In the United States it is considered Secure (N5), and in 3 of the 32 states in which it is found it is considered Critically Imperilled to Vulnerable (S1-S3), or Presumed Extinct (SX), mainly those at the northern limit of its range (Appendix A). Less than one percent of the species' global range occurs in Canada (COSEWIC 2013).

3. Recovery Feasibility Summary

Based on the following four criteria that Environment Canada uses to establish recovery feasibility, there are unknowns regarding the feasibility of recovery of the Slender Bush-clover. 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 Canada, there is one population made up of three subpopulations⁸ (Ojibway Park, Tallgrass Heritage Park and Black Oak Heritage Park) within the City of Windsor. As recently as August 2014, plants were observed flowering and fruiting in the tallgrass prairie habitat at Ojibway Park (Oldham pers. comm. 2015). Most of the plants observed were in fruit (COSEWIC 2013). Slender Bush-clover also occurs

⁵ A population which is still in existence.

⁶ Globally Secure (G5): At very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from delines or threats.

⁷ Nationally and provincially Critically Imperilled (N1,S1): At 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.

⁸ Follows the NatureServe (2002) and the Natural Heritage Information Centre (NHIC) methods for defining populations of vascular plants - Groups of plants separated from each other by more than 1 km are considered separate populations; groups of plants that are less than 1 km apart from one another are considered subpopulations of a single population. Throughout this document, the term "population" is considered to be synonymous with the term "element occurrence" as used by the NHIC and NatureServe.

widely in dry, open habitats throughout the central and eastern United States, and in many of these areas it is considered secure (NatureServe 2014). The species has been documented from 17 counties in adjacent Michigan (Voss and Reznicek 2012).

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

Unknown. Slender Bush-clover is at the northern limit of its range in Canada, and has been reported only from Windsor and one other (extirpated) location near Leamington (COSEWIC 2013). It is likely that the species only ever occurred in very small numbers in Canada. Only 2.4 percent of the species suitable habitat type, tallgrass prairie, remains in all of North America today (Samson et al. 2004), with less than 1 percent remaining in Ontario (Bakowsky and Riley 1994; Catling and Brownell 1999; Catling 2008). The remaining suitable habitat in Canada that is known to be occupied by the Slender Bush-clover occurs in three small areas within the City of Windsor (Ojibway Prairie Complex), and these areas are succumbing to woody vegetation which is shading the habitat and making it less suitable. Although the habitat could be improved through restoration, other habitat has been irreversibly lost and it is not clear whether restoration would be sufficient to allow for a sustainable Canadian population over the long term.

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

Unknown. The primary threats to the Slender Bush-clover include habitat degradation due to an altered disturbance regime (i.e., a lack of natural fire), and the increasing presence of invasive plant species, especially Autumn Olive (*Elaeagnus umbellata*), Crown Vetch (*Securigera varia*) and Spotted Knapweed (*Centaurea stoebe* spp. *micranthos*) (Oldham pers. comm. 2015). Burning has occurred at all three Windsor sub-population locations at some point in the last three decades. Prescribed burns are undertaken periodically within the Ojibway Prairie, although the frequency and intensity of burns to date may be insufficient to maintain the conditions required for the Slender Bush-clover (Jones 2013). Although the impacts of invasive plant species may to some extent be controlled or mitigated through herbicide use or prescribed burning, their propagules are often abundant within urban areas and burning near urban areas must be carefully controlled to avoid damage to infrastructure or other assets. The effort required to mitigate the impacts of invasive plants on an urban prairie may be significant and ongoing in order to be successful.

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

Unknown. Several techniques are now widely used to restore tallgrass prairie habitats in southern Ontario, including prescribed burning and mowing (e.g., Rodger 1998). Slender Bush-clover is also frequently cultivated, is reportedly

easy to grow, and has been successfully grown from seed at the Ojibway Nature Centre (COSEWIC 2003; Jones 2013). Successful control techniques have also been identified for many invasive plants; however, little information exists on the control of Crown Vetch (Southeastern Wisconsin Invasive Species Consortium 2014).

In Canada, the Slender Bush-clover has a very restricted distribution and is at the northern edge of the species' range. The species has probably always been uncommon in Ontario (COSEWIC 2013), and will likely continue to be rare in Canada despite applying available recovery techniques and maintaining existing populations.

4. Threats

In addition to the known and potential threats outlined in Part 2 - *Recovery Strategy for the Slender Bush-clover (Lespedeza virginica) in Ontario*, another potential threat to the Slender Bush-clover is the decline in pollinator populations. The primary pollinator of Ontario populations has not been identified, however, it is thought that the species is primarily pollinated by bees, moths, and butterflies (Pratt 1986). A number of factors are suspected to be contributing to the decline in insect pollinator populations globally and in Canada, including loss of habitat and food sources, diseases, viruses, pests, and pesticide exposure (Health Canada 2014). Notably, there is growing evidence to suggest that pesticides, including neonicotinoids, may be having negative effects on pollinator populations due to their toxic properties and persistence in soil and water (van der Sluijs et al. 2013; Cutler et al. 2014). Currently, the extent to which the decline of pollinator populations may impact the Slender Bush-clover is not known.

5. Population and Distribution Objectives

The provincial *Recovery Strategy for the Slender Bush-clover (Lespedeza virginica) in Ontario* contains the following recovery goal:

- The recovery goal is to maintain the abundance and distribution of growing plants of the Slender Bush-clover at Ojibway Park at current or greater levels by reducing threats, and if the species is extant in the seed bank at the other two sub-populations, to increase the number of growing plants present there to pre-1995 levels.

The *Government Response Statement* for the Province of Ontario (Part 3) lists the following goal for the recovery of the Slender Bush-clover in Ontario:

- The government's goal for the recovery of the Slender Bush-clover in Ontario is to maintain the existing population at, or increase it to, a sustainable level at existing sites.

Under SARA, a population and distribution objective for the species must be established. The population and distribution objective established by Environment Canada for the Slender Bush-clover is to:

- Maintain the existing population of the Slender Bush-clover and where biologically and technically feasible, increase the species' abundance at existing sites.

Maintaining the existing population of the Slender Bush-clover is important since this single population constitutes the entire Canadian distribution. Plants have not been seen in two of the three Windsor sub-populations (i.e., Black Oak Heritage Park and Tallgrass Heritage Park sub-populations) over the last two decades, which is likely due to habitat degradation. Thus, maintaining the existing population for the foreseeable future may require on-going restoration (Jones 2013). This will include significant habitat management and restoration efforts, as well as invasive species control. Appropriate actions for each of the three sub-populations are being initiated (Jones pers. comm. 2015).

Even with active, ambitious, and dedicated habitat management and restoration activities, the long-term sustainability of this small population of only 165 plants is not known. Determining the population viability over the long-term is identified as a research need within the provincial recovery strategy (Jones 2013) and the *Slender Bush-clover – Ontario Government Response Statement* (Part 3). In addition, Environment Canada recognizes the role of cultivating and maintaining specimens at off-site locations for the purpose of supporting research on the feasibility and appropriateness of introducing or reintroducing the Slender Bush-clover at sites in Ojibway Park, Tallgrass Heritage Park and Black Oak Heritage Park (government-supported action #3 - Part 3). Reintroduction may play an important role in the recovery of the species where habitat is considered suitable and in improving the viability of the extant population.

6. Broad Strategies and General Approaches to Meet Objectives

The government-led and government-supported actions tables from the *Slender Bush-clover – Ontario Government Response Statement* (Part 3) are adopted as the broad strategies and general approaches to meet the population and distribution objectives. Environment Canada is not adopting the approaches identified in section 2.3 of the *Recovery Strategy for the Slender Bush-clover* (*Lespedeza virginica*) in Ontario (Part 2).

7. Critical Habitat

7.1 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 provincial recovery strategies under the Province of Ontario's ESA 2007. Under the ESA 2007, when a species becomes listed as endangered or threatened on the Species at Risk in Ontario List, it automatically receives general habitat protection. Slender Bush-clover currently receives general habitat protection under the ESA 2007; 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 protected⁹ as the habitat of the species by the Province of Ontario. A habitat regulation has not been developed for the Slender Bush-clover under the ESA 2007; 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 Slender Bush-clover in Canada to the extent possible, based on this recommendation and on the best available information as of November 2014.

Critical habitat is identified for the one extant population of the Slender Bush-clover, and is sufficient to meet the population and distribution objective. Critical habitat is not identified for horticultural specimens and plants that did not originate from the Slender Bush-clover plants native to Ontario or that were planted for purposes other than species recovery, ecological restoration/ rehabilitation or habitat creation, such as in landscaped settings and urban gardens. Additional critical habitat may be added in the future if new or additional information supports the inclusion of areas beyond those currently identified (e.g., new sites become colonized or are found in adjacent areas).

The identification of critical habitat for the Slender Bush-clover is based on two criteria: habitat occupancy and habitat suitability.

⁹ Under the federal SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy

7.1.1 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:

- there has been an observation of one or more native Slender Bush-clover individuals within the last 50 years.

Habitat occupancy is based on field surveys from Ontario's Conservation Data Centre (Natural Heritage Information Centre - NHIC), COSEWIC (2013), and recent field surveys and imagery completed by Brinker and Oldham (2011) for the three sub-populations in the City of Windsor. These include Ojibway Park, Tallgrass Heritage Park and Black Oak Heritage Park (otherwise referred to as the Ojibway Prairie Complex). A precautionary approach of a period of 50 years was taken to include identifying the areas formerly occupied by the Slender Bush-clover where the seed bank may possibly persist and be viable as well as to include areas most suitable for recovery and restoration efforts. Seeds were successfully germinated from 54 year old herbarium samples (Clewell 1966b); however, it is unknown how long the seeds of the Slender Bush-clover can remain viable within the seed bank. For this reason, the absence of plants in any one year does not indicate the loss of the sub-population (COSEWIC 2013). While no plants have been seen at the Tallgrass Heritage Park and Black Oak Heritage Park sites in over ten years, they are treated as possibly extant based on the potential presence of a viable seed bank.

7.1.2 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.

In Canada, extant sub-populations of the Slender Bush-clover are found in the exposed (non-shaded), sandy soils of dry-mesic tallgrass prairie, savanna or woodland relics (COSEWIC 2013).

The biophysical attributes of suitable habitat for the Slender Bush-clover include:

- Open and semi-open areas ($\leq 60\%$ tree cover) with patches of exposed sandy soils in full sun (for the establishment of seedlings)
 - Typically found in dry-mesic tallgrass prairie, savanna or woodland relics, dominated by Black Oak (*Quercus velutina*)
 - Understory layer generally consists of prairie graminoids and forbs, Big Bluestem (*Andropogon gerardii*), Little Bluestem (*Schizachyrium scoparium*), Crown Vetch (*Securigera varia*), Canadian Tick-trefoil (*Desmodium canadense*), Feather Three-awn (*Aristida purpurascens*), Dense Blazing Star (*Liatris spicata*), Spotted Knapweed (*Centaurea stoebe*) and Indian Grass (*Sorghastrum nutans*)

- Poorly drained sands (e.g., Granby¹⁰ series) with a depth of up to 1 m overlying impermeable clays
- Neutral to slightly alkaline, limestone parent material

Based on the best available information, suitable habitat for the Slender Bush-clover is currently defined as the extent of the biophysical attributes where the Slender Bush-clover exists in Ontario. In addition to the suitable habitat, a critical function zone of 50 m (radial distance) is applied when the biophysical attributes around a plant extend for less than 50 m.

In Ontario, suitable habitat for the Slender Bush-clover can be described using the Ecological Land Classification (ELC) framework for Southern Ontario (Lee et al. 1998). 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 soil moisture conditions and topography, and as such provides a basis for describing the ecosystem requirements (e.g., local effects of the associated hydrologic regime, canopy cover) and encompasses the biophysical attributes of suitable habitat for the Slender Bush-clover. In addition, ELC terminology and methods are familiar to many land managers and conservation practitioners who have adopted this tool as the standard approach in Ontario.

Within the ELC system in Ontario, the ELC vegetation type boundary will capture the biophysical attributes required by the species. The vegetation type includes the areas occupied by the Slender Bush-clover and the surrounding areas that provide suitable habitat conditions to carry out essential life process for the species and should allow for natural processes related to population dynamics and reproduction (e.g., dispersal and pollination) to occur. Slender Bush-clover habitat specificity typically restricts its growth to specific microhabitat conditions found within small open patches. Therefore, using the vegetation type boundaries to delineate critical habitat boundaries would be a precautionary approach to protect the critical microhabitats as the area around the plant may promote ecosystem resilience to invasive species and their subsequent impacts on the critical microhabitat conditions. The additional area may also have restoration potential for the Slender Bush-clover due to the long-lived nature of its seed.

ELC vegetation types containing the Slender Bush-clover have been described in Ontario as Dry Black Oak Tallgrass Savanna or Dry Black Oak Tallgrass Woodland (Jones 2013) but may also include Dry Tallgrass Prairie. Additional habitat assessments are required to delineate and map the extent of specific ELC vegetation types currently occupied by the Slender Bush-clover.

The 50 m distance of was considered as a minimum ‘critical function zone’, or the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g. light, temperature, litter moisture, humidity levels necessary for survival) and which allows some natural processes to occur

¹⁰ The Granby series consists of poorly drained and very poorly drained soils that occur both on plains and uplands.

(e.g., hydrological, dispersal). At present, it is not clear at what distances physical and/or biological processes begin to negatively affect the Slender Bush-clover. Studies on micro-environmental gradients at habitat edges, i.e., light, temperature, litter moisture (Matlack 1993), and on edge effects of plants in mixed hardwood forests, as evidenced by changes in plant community structure and 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 Slender Bush-clover plant is an appropriate minimum distance to ensure that microhabitats are maintained as part of the identification of critical habitat. The area within the critical function zone may include both suitable and unsuitable habitat as the Slender Bush-clover 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, become available, these distances may be refined.

7.1.3 Application of the Slender Bush-clover Critical Habitat Criteria

Critical habitat for the Slender Bush-clover is identified as the extent of suitable habitat (section 6.1.2) where the occupancy criterion (section 6.1.1) is met. In cases where the suitable habitat extends for less than 50 m around a Slender Bush-clover plant, a critical function zone capturing an area within a radial distance of 50 m is also included as critical habitat. In Ontario, as noted above, suitable habitat for the Slender Bush-clover is most appropriately identified as the ELC vegetation type. At the present time, the vegetation type boundaries are not available to support the identification of critical habitat for the population. In the interim, ELC community series level is identified as the area within which critical habitat is found. In Ontario, critical habitat is located within these boundaries where the biophysical attributes described in section 6.1.2 are found and where the occupancy criterion is met (section 6.1.1). When vegetation type boundaries are determined, the identification of critical habitat will be updated.

Application of the critical habitat criteria to the best available data identifies critical habitat for the three known sub-populations within the extant population of the Slender Bush-clover in Canada (Figure 1, See also Table 1), totalling up to 19 ha¹¹. The critical habitat identified is considered a full identification of critical habitat, sufficient to meet the population and distribution objectives.

¹¹ This is the maximum potential extent of critical habitat based on suitable habitat boundaries that can be delineated from high resolution aerial photography (comparable to the ELC community series) and/or a 50m radial distance around the Slender Bush-clover. Actual critical habitat occurs only in those areas described in section 6.1 and therefore the actual area could be less than this and would require field verification to determine the precise amount.

Critical habitat for the Slender Bush-clover is presented using 1 x 1 km UTM grid squares. The UTM grid squares presented in Figure 1 are 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 UTM grid respects data-sharing agreements with the province of Ontario. Critical habitat within each grid square is defined by the criteria established by the description of habitat occupancy (section 6.1.1) and habitat suitability (section 6.1.2). 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 Slender Bush Clover (see section 6.1.2) are not considered critical habitat. More detailed information on critical habitat to support protection of the species and its habitat may be requested on a need-to-know basis by contacting Environment Canada – Canadian Wildlife Service at ec.planificationduretablissement-recoveryplanning.ec@canada.ca.

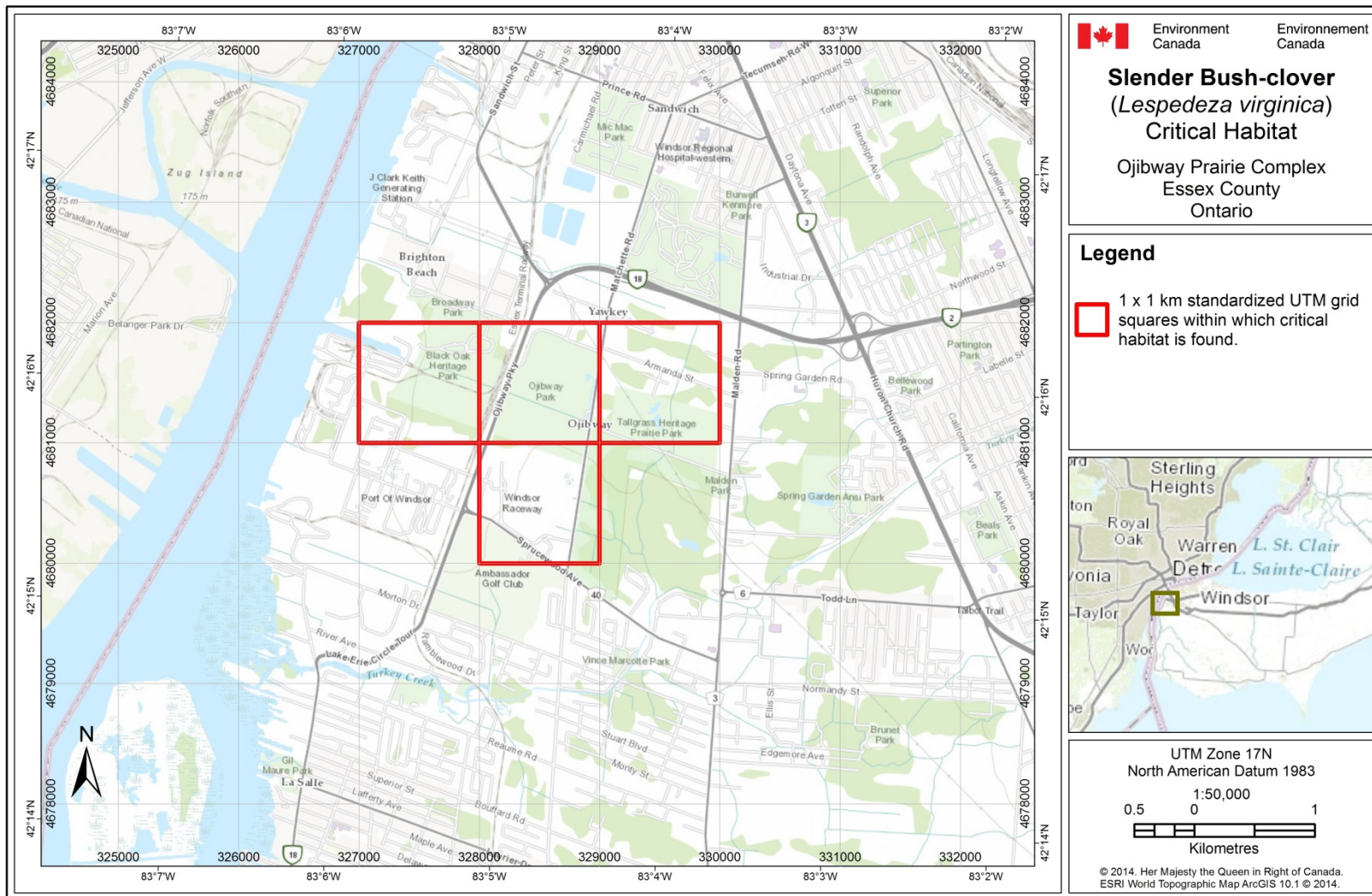


Figure 1. Grid squares that contain critical habitat for the Slender Bush-clover in Canada. Critical habitat for the Slender Bush-clover occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the description of habitat occupancy (section 6.1.1) and habitat suitability (section 6.1.2) are met.

Table 1. Grid squares that contain critical habitat for the Slender Bush-clover in Canada. Critical habitat for the Slender Bush-clover occurs within these 1 x 1 km standardized UTM grid squares where the description of habitat occupancy (section 6.1.1) and habitat suitability (section 6.1.2) are met.

Sub-population	Critical Habitat Unit	1 x 1 km Standardized UTM grid square ID ^a	Province/Territory	UTM Grid Square Coordinates ^b		Estimated area (ha) that contains critical habitat ^c	Land tenure ^d
				Easting	Northing		
Black Oak Heritage Park	Black Oak Heritage Park	17TLG2871	Ontario	327000	4681000	9	Non-federal Land
Ojibway Park	Ojibway Park 1	17TLG2880	Ontario	328000	4681000	3	Non-federal Land
		17TLG2881	Ontario	328000	4681000		
	Ojibway Park 2	17TLG2881	Ontario	328000	4681000	4	
Tallgrass Heritage Park	Tallgrass Heritage Park	17TLG2891	Ontario	329000	4681000	3	Non-federal Land
4 grid squares						~19 ha	

^a Based 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 and letter 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).

^b The 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 may not fall within critical habitat and are provided as a general location only.

^c The area presented is that of the units containing critical habitat (rounded up to the nearest 1 ha); therefore, the actual area of critical habitat may be significantly less. Refer to Section 5.0 for a description of how critical habitat within these areas is defined.

^d Land 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.

7.2 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).

It should be noted that not all activities that occur in or near critical habitat are likely to cause its destruction. Activities described in Table 2 are examples of those likely to cause destruction of critical habitat for the species; however, destructive activities are not necessarily limited to those listed.

Table 2. Activities Likely to Destroy Critical Habitat of the Slender Bush-clover

Description of Activity	Descriptions of Effect in Relation to Function Loss	Details of Effect
Any activity that results in changes to natural disturbance regimes (e.g., fire suppression).	Natural disturbances, which remove woody or competing vegetation and thatch are essential to the Slender Bush-clover as it requires open ground habitat for germination and growth and cannot compete with surrounding vegetation.	As the Slender Bush-clover seedlings require relatively open habitats for establishment, plants are unable to reproduce or survive for more than a few years unless habitat remains open through either fire or some other disturbance. When this activity occurs within or adjacent to critical habitat at any time of year, it can result in habitat degradation or loss of critical habitat due to increased cover; which in turn can ultimately lead to a complete decline and loss of the population.
Activities that introduce exotic plants (e.g., introduction of non-native plant seeds, plants, foreign soil or gravel, composting or dumping of garden waste)	Introducing invasive species can result in competition with the species, and/or physical and chemical changes to habitat such that it is no longer suitable for the species.	Introduction of exotic invasive plants within or immediately adjacent to critical habitat at any time of year can result in destruction of critical habitat. The introduction of exotic invasive plants can lead to the gradual destruction of critical habitat over time.
Development and conversion of lands that results in the clearing of natural vegetation communities (e.g., residential and commercial development and road construction)	Conversion of habitat results in a direct loss of critical habitat which the species relies on for basic survival, successful seed production, development, and establishment.	If these activities were to occur within critical habitat, the effects would be direct and would apply at any time of year. These activities would directly remove substrate and/or alter conditions (vegetation cover type and soil type) that allow for the establishment, germination and dispersal of the Slender Bush-clover. If this activity were to occur outside of critical habitat it may have an indirect impact on microhabitat characteristics (such as hydrology).

8. 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 indicator:

- The existing population has been maintained and where biologically and technically its abundance increased at existing sites.

9. Statement on Action Plans

One or more action plans will be completed for the Slender Bush-clover and posted on the Species at Risk Public Registry by December 31, 2023.

10. 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](#)¹². 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](#)'s¹³ (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 upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

Slender Bush-clover inhabits provincially rare vegetation communities in Ontario. At its single remaining population, it grows with a number of other at-risk and provincially significant plants, including Dense Blazing Star (*Liatris spicata*, THR), Arrow Feather Three-awn (*Aristida purpurascens*, S1), Tall Coreopsis (*Coreopsis tripteris*, S2) and Round-fruited Panic Grass (*Dichanthelium sphaerocarpon*, S3) (COSEWIC 2013). Other provincially and nationally significant plant species growing in the vicinity of the extant sub-population of the Slender Bush-clover at Ojibway Park include Yellow Wild Indigo (*Baptisia tinctoria*, S2), Spotted Wintergreen (*Chimaphila maculata*, S1, END), Ohio Spiderwort (*Tradescantia ohioensis*, S2), Sundial Lupine (*Lupinus perennis*, S3) and Field Thistle (*Cirsium discolor*, S3).

Most other species present are adapted to open prairie and savanna habitats, and are considered to benefit from management activities similar to those identified for the Slender Bush-clover, including burning, vegetation clearing, soil scraping, or raking. Staff at the Ojibway Nature Centre (City of Windsor) are already taking measures to protect fire-sensitive species during prescribed burns (Jones 2013). The management activities

¹² <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

¹³ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1

undertaken may limit the spread of aggressive invasive species, which threaten other significant species in the provincially rare vegetation communities occupied by the Slender Bush-clover. The provincial recovery strategy identifies a need to consider the potential actions of both habitat management and invasive species removal on other rare species present in similar habitat (Jones 2013).

The potential for this recovery strategy to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this strategy will clearly benefit the environment and will not entail significant adverse effects.

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Appendix A: Subnational Conservation Ranks of the Slender Bush-Clover (*Lespedeza virginica*) in Canada and the United States

Slender Bush-clover (<i>Lespedeza virginica</i>)				
Global (G) Rank	National (N) Rank (Canada)	Sub-national (S) Rank (Canada)	National (N) Rank (United States)	Sub-national (S) Rank (United States)
G5	N1	Ontario (S1)	N5	Alabama (SNR), Arkansas (SNR), Connecticut (SNR), Delaware (S5), District of Columbia (SNR), Florida (SNR), Georgia (SNR), Illinois (SNR), Indiana (SNR), Iowa (S4), Kansas (SNR), Kentucky (S5), Louisiana (SNR), Maryland (SNR), Massachusetts (SNR), Michigan (SNR), Mississippi (SNR), Missouri (SNR), New Hampshire (S1), New Jersey (S5), New York (S3?), North Carolina (S5), Ohio (SNR), Oklahoma (SNR), Pennsylvania (SNR), Rhode Island (SNR), South Carolina (SNR), Tennessee (SNR), Texas (SNR), Virginia (S4), West Virginia (S4), Wisconsin (S2)

(NatureServe 2014)

Rank Definitions (NatureServe 2014)

N1/S1: Critically Imperilled (National/State) – At very high risk of extirpation in the jurisdiction (i.e., N - nation, or S -state/province) due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

S2: Imperilled (State) – At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

S3: Vulnerable (State) – At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats or other factors.

S4: Apparently Secure (State) – At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences but with possible cause for some concern as a result of local recent declines, threats or other factors.

G5/N5/S5: Secure (Global/National/State) – At very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.

SNR: Unranked – National or subnational conservation status not yet assessed.

Question mark (?) – Denotes an inexact numeric rank.

**PART 2 – *Recovery Strategy for the Slender Bush-clover*
(*Lespedeza virginica*) in Ontario, prepared by Judith Jones for
the Ontario Ministry of Natural Resources**



Slender Bush-clover
(Lespedeza virginica) in Ontario

Ontario Recovery
Strategy Series

Recovery strategy prepared under the Endangered Species Act, 2007

2013

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 (ESA) 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 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 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. 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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Cover illustration: Slender Bush-clover at Ojibway Prairie by Karen Cedar.
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Cette publication hautement spécialisée Recovery strategies prepared under the Endangered Species Act, 2007, n'est disponible qu'en Anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec Pamela Wesley au ministère des Richesses naturelles au 705-755-5217.

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DECLARATION

The recovery strategy for the Slender Bush-clover was developed in accordance with the requirements of the *Endangered Species Act, 2007* (ESA). 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

Slender Bush-clover (*Lespedeza virginica*) is listed as endangered under Ontario's *Endangered Species Act, 2007* and on Schedule 1 of the federal *Species at Risk Act*. It is a perennial herb in the Pea Family with pink flowers and many narrow leaves crowded on upright stems. The seeds can remain viable for decades and can pass unharmed through the gut of an animal.

In Canada, Slender Bush-clover is present only in Ojibway Park and possibly at Tallgrass Heritage Park and Black Oak Heritage Park, all part of the Ojibway Prairie Complex in the City of Windsor, Ontario. Collectively, these three sites comprise a single population. The species has not been seen at Tallgrass Park since 1997 or at Black Oak Park since 1993. It is unknown whether the seed bank is still viable at these locations. Plants growing above ground were seen at Ojibway Park in 2011.

In Ontario, Slender Bush-clover is extremely limited by a lack of suitable habitat. In this province, the species is restricted to dry-mesic tallgrass prairie relicts with patches of exposed sandy soil. It requires full sun and open ground and does not tolerate dense shade or competition from surrounding vegetation. Some type of disturbance is needed to create open soil. Historically, this was probably fire or periodic drought. Existing habitat is highly fragmented into small patches that are isolated from one another by distances of hundreds of metres or more. Disturbance factors are also needed to disrupt the seed coat to improve germination.

Slender Bush-clover may be limited by some aspects of its reproductive biology. First, the relatively short growing season in Ontario might cause lower seed productivity than is found in populations in the southern part of the species' range. Second, factors responsible for breaking seed dormancy (such as fire, abrasion by sand, ingestion by herbivores) might be lacking at extant sites. Finally, the small, isolated Canadian population of Slender Bush-clover is at risk of being destroyed by a single stochastic event, such as a flood or wind storm.

The most serious threat to Slender Bush-clover is alteration of the natural disturbance regime (e.g., suppression of natural wildfire), which allows natural succession to proceed, resulting in habitat degradation or loss. Invasive species are another threat in need of urgent attention. All-terrain vehicle and dirt bike use are no longer threats.

The recovery goal is to maintain the abundance and distribution of growing plants of Slender Bush-clover at Ojibway Park at current or greater levels by reducing threats, and if the species is extant in the seed bank at the other two subpopulations, to increase the number of growing plants present there to pre-1995 levels. The protection and recovery objectives are to:

1. maintain or improve habitat suitability at the three existing sites;
2. reduce presence of invasive species at the three existing sites;
3. fill knowledge gaps; and
4. increase population size and extent if deemed feasible.

It is recommended that a habitat regulation cover all three Windsor sites and that at Ojibway Park the entire opening where the species occurs plus a protective zone of 50 m around the outside of the opening be prescribed. A definition of "opening" is given in the body of the text. At Tallgrass and Black Oak Heritage Parks it is recommended that a 50 m zone around the former area of live plants be prescribed as habitat to protect the seed bank and allow disturbance to occur even though live plants have not been seen in recent years. It is recommended that the Tallgrass and Black Oak sites be prescribed for 50 years unless live, growing plants of Slender Bush-clover re-emerge in which case habitat would remain prescribed beyond this time. It is recommended that restoration populations be regulated if they are planted within the three parks where the species is endangered and in natural vegetation but not in garden beds.

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1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Slender Bush-clover

SCIENTIFIC NAME: *Lespedeza virginica*

SARO List Classification: Endangered (within Tallgrass Prairie Heritage Park, Ojibway Park and Black Oak Heritage Park in the City of Windsor)

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

COSEWIC Assessment History: Endangered (2000, 1986)

SARA Schedule 1: Endangered

CONSERVATION STATUS RANKINGS:

GRANK: G5

NRANK: N1

SRANK: S1

The glossary provides definitions for the abbreviations above and for other technical terms in this recovery strategy.

1.2 Species Description and Biology

Species Description

Slender Bush-clover (*Lespedeza virginica* (L.) Britton) is a perennial herb in the Legume or Pea Family (Fabaceae). The upright hairy stems, 30 to 100 cm tall, arise from a woody rhizome and sometimes branch near the top. Numerous narrow, three-parted leaves that are strongly ascending (pointing up) grow from the main stem on short (1 cm) stalks, giving the stem a crowded, spike-like profile. In late summer, small, purple to pink pea-like flowers, 4 to 7 mm across, are produced in short clusters in the axils of the leaves (Figure 1). Two types of flowers are produced: those that open and have showy petals, and those that are smaller, remain closed, and are self-fertile. Following pollination, a flat, oval-shaped pod 4-7 mm in diameter containing one seed is produced from both types of flowers (Clewell 1966, Gleason and Cronquist 1991).

Slender Bush-clover may be distinguished from other species of Bush-clover that have upright stems and purple-coloured petals by the following characteristics:

- narrow, strap-shaped leaves (not oval shaped);
- leaves somewhat hairy (but not densely velvety);
- numerous, non-opening flowers present (more than just a few present), and
- flowers with open corollas on short stalks or sitting directly on the stem (not on stalks nearly the length of leaves).



Figure 1. Flowering clusters of Slender Bush-clover showing both the showy and the non-opening flowers. (Photo: P.A. Woodliffe. This photo may not be reproduced separately from this document without permission of the photographer.)

Species Biology

Slender Bush-clover is a perennial that comes up each year from underground woody rhizomes. Clewell (1964) counted the annual growth rings on rhizomes of Hairy Bush-clover (*L. hirta*) and Wand-like Bush-clover (*L. intermedia*) in southern Indiana and found plants lived up to 13 to 17 years, which may give an indication of the potential life span of the growing plants of Slender Bush-clover as well. Like other plants in the Legume family, Slender Bush-clover has nitrogen-fixing bacteria in nodules on the rhizome (Yao et al. 2002). This symbiotic association enables Slender Bush-clover to grow in nitrogen-poor soils.

In Ontario, Slender Bush-clover flowers in August and September and produces both open (chastogamous) flowers and closed (cleistogamous) flowers that self-pollinate. Both kinds of flowers produce viable seed. The ratio of the different flower types produced may change in response to different environmental conditions or stresses (Clewell 1964, Schutzenhofer 2007). More closed flowers are produced when plants are stressed. These flowers have smaller petals and no nectar and require less energy to produce. Thus, they may be a smaller energy investment that guarantees reproduction when conditions are less than optimal.

The open flowers of Slender Bush-clover are likely pollinated by a variety of insect

species, with bees, butterflies, and moths probably being the main pollinators (Pratt 1986). Clewell (1966) observed honeybees and several types of bumblebees on bush-clovers in Indiana. Simpson (1999) removed competing species in plots to see if Slender Bush-clover was limited by pollination. In the first year, she found an increase in insect visits but no increase in seed-set and concluded that pollination was already above a threshold level for seed set. In the second year, she found a stronger correlation between insect visits and amount of seed set because overall visitation was low. This suggests that Slender Bush-clover can be limited by pollination depending on conditions for pollinators in any given year.

Both the showy and non-opening flowers of Slender Bush-clover produce viable seeds. However, seeds of non-opening flowers have slightly lower viability (Schutzenhofer 2007). Schutzenhofer (2007) examined the effects of herbivory on the production of both types of flowers and found that herbivory resulted in an increase in the ratio of non-opening flowers over showy flowers. Since seeds of non-opening flowers have lower viability, this change in ratio may have consequences for overall reproductive success. No significant difference was found in germination rates between seeds produced from showy flowers and those of non-opening flowers, but rates for both types of seeds were low. No analysis has been done that would take into consideration any benefit provided if herbivory results in increased seed dispersal distances or improved seed germination rates. It can be speculated that the amount of herbivory within a patch, as well as the parts of the plant eaten, may make a difference.

The seeds of Slender Bush-clover have a hard, impervious seed coat that permits them to pass unharmed through animal digestive systems and to remain viable in the soil for long periods of time. The seed coat must be scarified or disrupted in some way before germination can occur. Passage through an animal gut may improve germination for seeds of Slender Bush-clover. Blocksome (2006) found improved germination rates for seeds of Chinese Bush-clover (*L. juncea* var. *sericea*) after passage through the gut of quail. Clewell (1966) reported a 100% germination rate for seeds of Slender Bush-clover manually scarified with a scalpel versus 0% for seed that was not scarified. As well, Clewell (1966) successfully germinated seeds taken from a 54-year-old herbarium specimen, showing that under some conditions seeds may remain viable for many decades. The actual time that Slender Bush-clover seeds can remain viable outdoors in soil is unknown. If seeds do not pass through an animal gut, some other natural process may be needed to disrupt the seed coat. It can be speculated that fire or possibly abrasion by sand may provide this function.

At the Ontario location for Slender Bush-clover, in the Ojibway Prairie Complex in the City of Windsor, a number of animals and birds are present that may eat the seeds of Slender Bush-clover, including White-tailed Deer (*Odocoileus virginianus*), Northern Bobwhite (*Colinus virginianus*), Wild Turkey (*Meleagris gallopavo*) and Mourning Dove (*Zenaida macroura*), as well as many small mammals such as mice and rats (Pratt 1986, Blocksome 2006, Ojibway Nature Centre 2012). The seed of Slender Bush-clover may be dispersed by animals if eaten and expelled in feces at another location. It is not known whether animals are the main dispersal vector of Slender Bush-clover,

but some other species of bush-clovers are dispersed primarily by animals (Blocksome 2006). The likelihood of the seed of Slender Bush-clover passing through the gut rather than being broken down during digestion is not known, but it is possible that an animal may be both a seed predator and an occasional dispersal vector. There may be a trade-off between having a seed that is an attractive food source to animal vectors and losing some seed to animal digestion. If not eaten, the fruits of Slender Bush-clover stay on the plant through the fall and winter, eventually falling and opening to release the seed (Clewell 1966).

Several ecological processes must occur for successful germination. These include suitable disturbance to expose mineral soils (ground fires, scraping, etc.) and actions that scarify or disrupt the seed coat (fire, passage through an animal gut, being rubbed by sand, etc.) as well as suitable moisture conditions. In controlled garden trials in Indiana, Clewell (1966) found plants of Hairy and Wand-like Bush-clover were able to reach maturity and bear seed in the first year after germination, but found seedlings in natural populations either didn't flower in the first year or flowered but produced few seeds. It is unknown whether flowering in the first year is possible for Slender Bush-clover in Ontario. The species also is able to spread from short, underground stolons or from fragments of the woody rhizome (Clewell 1964). The presence of underground woody rhizomes, a hard seed coat, and the ability to spread from fragments are adaptations that allow Slender Bush-clover to survive the fire or other disturbance that is required to create and maintain suitable habitat.

Slender Bush-clover appears to be a poor competitor and grows best when not crowded by other vegetation. In a study of several species of bush-clover growing on both eroded and non-eroded soils, Slender Bush-clover grew taller and had increased yield (dried biomass), increased winter survival and greater survival of seedlings in plots that were weeded to reduce competition regardless of soil type (Harris and Drew 1943).

1.3 Distribution, Abundance and Population Trends

In Canada, Slender Bush-clover has been documented only in southwestern Ontario (Figure 2). In the United States, Slender Bush-clover is found in 26 states, and in northern Mexico it is present in the state of Nuevo Leon. Table 1 shows the state or provincial conservation rankings (S ranks) for Slender Bush-clover (NatureServe 2012). The species is not considered rare within the core of its Midwestern range but is ranked rare in northern areas. In addition, Slender Bush-clover is legally listed as threatened in New Hampshire and Wisconsin. Globally, the species is considered secure and ranked G5 (NatureServe 2012).

Recovery Strategy for the Slender Bush-clover in Ontario

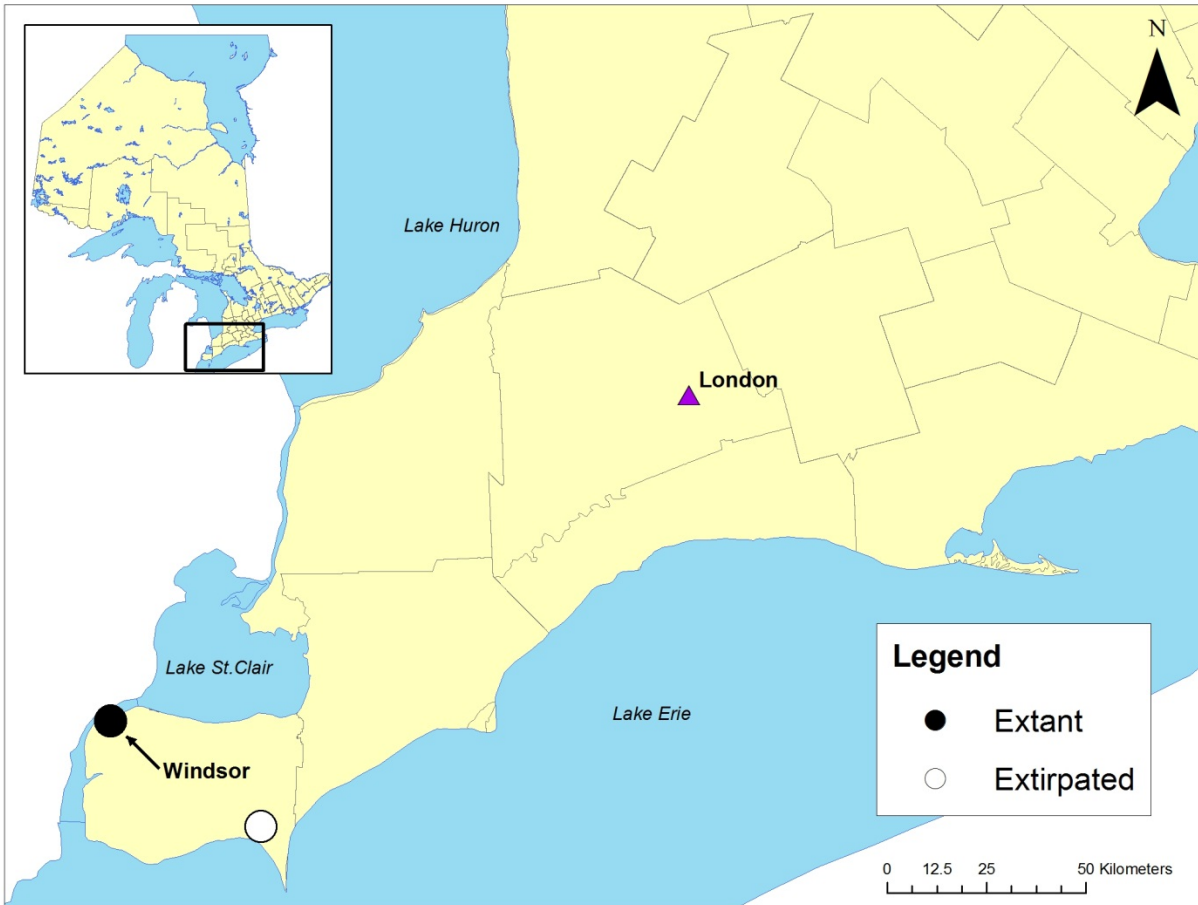


Figure 2. Historical and current distribution of Slender Bush-clover in Ontario.
 Solid circle: extant population consisting of three subpopulations in the Ojibway Prairie Complex in the City of Windsor. Open circle: historical record from the Leamington area not seen since 1892.

Table 1. Conservation ranking for Slender Bush-clover by state or province (NatureServe 2012).

State or Provincial Conservation Rank	States with this rank
Critically imperilled (S1)	New Hampshire, Ontario
Imperilled (S2)	Wisconsin
Possibly vulnerable (S3?)	New York
Apparently secure (S4)	Iowa, Virginia, West Virginia
Secure (S5)	Delaware, Kentucky, New Jersey, North Carolina
Not ranked (SNR)	Alabama, Arkansas, Connecticut, District of Columbia, Florida, Georgia, Illinois, Indiana, Kansas, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas; Mexico: Nuevo Leon

In Ontario, Slender Bush-clover is present only in the Ojibway Prairie Complex in the City of Windsor. In that area, the species has been documented from three sites, Tallgrass Heritage Park, Black Oak Heritage Park, and Ojibway Park, all of which qualify as subpopulations of a single population or occurrence according to the criteria used by the Natural Heritage Information Centre (NHIC 2012)¹. All three sites are in parks managed by the City of Windsor, Department of Parks and Recreation.

The species was first discovered at Tallgrass Heritage Park in 1977. Plants were observed there in 1978, 1979, 1982, 1984 and 1997 but were not found in 2000 or 2011 (NHIC 2012). Abundance was not documented except in 1984 when approximately 150 plants were reported. In 2000, the site was reported to be too shaded-in and dense with understory vegetation (NHIC 2012), and the loss of the Slender Bush-clover plants at this site has been attributed to natural succession (COSEWIC 2012a).

In 1993, a single Slender Bush-clover plant was observed in Black Oak Heritage Park along a walking trail. The site was visited in 1997 and 2011 but the species was not found and may have been destroyed by all-terrain vehicles (ATVs) (COSEWIC 2000, COSEWIC 2012a).

In 1979, Slender Bush-clover was discovered at Ojibway Park. The plants were not found in 1984 for the first COSEWIC status report (Pratt 1986) but were observed and documented in 1986, 1997, 2000 and 2011 (COSEWIC 2000, NHIC 2012). Abundance of Slender Bush-clover at this site is shown in Table 2.

Table 2. Abundance of Slender Bush-clover at the Ojibway Park site (NHIC 2012)

Date	Abundance	Observers
1979	~50 plants	P.D. Pratt
1984	0	P.D. Pratt
1986	"a few"	M.J. Oldham
1997	160	K. Cedar
2000	>24	D. Jacobs, P.D. Pratt, P.A. Woodliffe & K. Cedar
2011	165	S.R. Brinker, M.J. Oldham, C.D. Jones

Due to Slender Bush-clover's long-lived seed viability, it is possible the species may be extant in the seed bank and could potentially reoccur at any of the three sites in the Ojibway Prairie Complex even though live plants of Slender Bush-clover have only been seen in recent years at the Ojibway Park site. Therefore, all three sites must still be considered extant locations.

Only generalized conclusions can be made about population trends because the populations have not been consistently observed, but overall there appears to be a

¹ All patches that occur within 1 km of each other are considered to belong to the same population or occurrence. Patches at greater distance may also be included if there is no significant break or change in the habitat. See NHIC (2012) for a detailed definition of occurrence.

decline in population size in the last 25 years. The loss of the plants at the Tallgrass Heritage Park site, from 150 plants in 1984 to 8 plants in 1997 to 0 in 2011, likely due to succession (COSEWIC 2000), is certainly a decline. The loss of the plants at Black Oak Heritage Park, probably from ATVs, is another decline. At the Ojibway Park site, the data show many fluctuations and an overall slight increase from the previous high of 160 in 1997 to 165 in 2011 (NHIC 2012). However, generally, the trend in the last 25 years in Ontario appears to be one of decline and possibly the loss of sites.

Historically, Slender Bush-clover was also present in the Leamington area, where it was collected by Macoun in 1892 (NHIC 2012). However, the population there has never been relocated despite many focused searches. The area is now heavily urbanized or converted to agriculture (Pratt 1986). In addition, there is a historical report of Slender Bush-clover from the Niagara Region made by W. Scott in 1896; however, the report is not backed up by a collected specimen and the record is considered likely an error (COSEWIC 2000).

1.4 Habitat Needs

In Canada, Slender Bush-clover is restricted to dry-mesic tallgrass prairie relicts with patches of exposed sandy soil. In 2011, the Ontario habitat was reported to be sandy openings in oak woods with Little Bluestem (*Schizachyrium scoparium*), Crown Vetch (*Securigera varia*), Black Oak (*Quercus velutina*), Canadian Tick-Trefoil (*Desmodium canadense*), Feather Three-awn (*Aristida purpurascens*), Dense Blazing Star (*Liatris spicata*), and Spotted Knapweed (*Centaurea stoebe*) (NHIC 2012). The Ecological Land Classification (ELC) vegetation type (Lee et al. 1998) of the current Ontario location is described as Dry Black Oak Tallgrass Savannah (TPS1-1) (P.A. Woodliffe, pers. comm. 2012) or possibly Dry Black Oak Tallgrass Woodland (TPW 1-1) at the sites where vegetation cover has increased and closed in most of the open area. As the species occupies the open patches within these vegetation community types, it can be assumed that Dry Tallgrass Prairie (TPO1-1) would also provide suitable habitat. The species requires full sun and open ground for establishment of seedlings and does not appear to be able to grow in dense shade or withstand even moderate levels of competition from surrounding vegetation (Pratt 1986, COSEWIC 2000). The opening at Ojibway Park where the species currently occurs is approximately .33 ha.

The requirement for open soil indicates that some type of disturbance (such as fire, periodic drought or anthropogenic disturbance) is needed for maintenance of suitable habitat conditions. Without it, the open ground would be expected to become covered with thatch from a build-up of leaves and organic materials and to fill in with vegetation from natural succession, becoming unsuitable for Slender Bush-clover. Historically, bare ground probably resulted from fire but now likely comes mainly from other types of disturbance. Pratt (1986) reports that at the Tallgrass Heritage Park site, Slender Bush-clover plants were located in an area where the ground was scraped. He adds that 1948 air photos show an open trail a few metres east of where the plants were located, so the trail may also have previously provided some disturbance. However, he also

reports that spring fires burned through the area in 1978, 1980 and 1983 and occurred within 100 m of the population in 1976, 1977 and 1984, so it is possible that fire helped maintain the openness of the area during the time that the habitat remained suitable.

The frequency at which disturbance is required, or the time period over which the habitat may become too heavily vegetated to be suitable, is unknown. According to Pratt (1986), the scrape at Tallgrass Heritage Park probably dated from around 1958, and was therefore roughly 26 years old in 1986. Between 1975 and 1986, Pratt observed little apparent change in the site, indicating a very slow rate of succession, especially in the centre of the scraped area, during that nine-year period. This was also a period in which fire and human disturbance were occurring sporadically. By 1997, there was almost no open mineral soil present (COSEWIC 2000) and only eight Slender Bush-clover plants were found. Thus, it appears the habitat became significantly degraded in the 13 years between 1984 and 1997. It can be speculated that fire or disturbance may be needed every 3 to 13 years, and probably closer to the more frequent end of that range since plants had nearly disappeared after 13 years.

Optimal habitat for Slender Bush-clover contains a specific association of prairie forbs (Pratt 1986), but species composition in the habitat has probably changed somewhat in the last 25 years, possibly indicating an overall degradation. Pratt (1986) listed 12 species frequently associated with Slender Bush-clover and 12 rare species (based on Argus and White 1977, 1982 and 1983, and Argus and Keddy 1984) that were found within 1 m of Slender Bush-clover. Of these, only two of the former frequent associates and only three of the former rare species were present in 2011 (COSEWIC 2012a). Still, it is possible that some of this difference may be due to the reduction in the number of sites as well.

COSEWIC (2012a) listed 34 plant species growing within 1 m of Slender Bush-clover during fieldwork in September of 2011. Most are prairie-obligates or species of old fields. One of these, Dense Blazing Star (*Liatris spicata*) is federally and provincially listed as Threatened, and three are listed as rare in Ontario: Arrow Feather Three-awn (*Aristida purpurascens* – S1), Tall Coreopsis (*Coreopsis tripteris*—S2), and Round-fruited Panic Grass (*Dicanthelium sphaerocarpon*—S3) (COSEWIC 2012b, NHIC 2012).

In Michigan, Slender Bush-clover is found in 17 counties in habitats that include dry open woods (especially oak), prairies, shores, fields, railroad banks and open hills (Voss 1985, Reznicek et al. 2011). It is unknown why the species occurs in more locations and in a wider range of habitats in Michigan than in Ontario. Throughout its global range, the species is not restricted to sandy soils, and in some states the species is found at latitudes more northerly than Windsor.

1.5 Limiting Factors

In Ontario, Slender Bush-clover is extremely limited by a lack of suitable habitat. Of the hundreds of square kilometres of tallgrass prairie and savannah documented in early

settlement times, only about 2100 ha or 0.5% remains, with the majority lost to agricultural use and residential development (Bakowsky and Riley 1994). Today, apart from the Ojibway Prairie Complex and areas on Walpole Island, most remnant patches are small (less than 2 ha) and isolated. Natural ecological processes, such as the occurrence of wildfire, are severely compromised in such small patches. Suitable prairie habitat for Slender Bush-clover is highly fragmented into small patches that are isolated from one another by distances of hundreds of metres or more. This probably limits the ability of Slender Bush-clover to expand into new areas (COSEWIC 2000).

Mature fruiting plants of Slender Bush-clover produce only a few hundred seeds, which may reduce the reproductive capacity of the species (COSEWIC 2000). In addition, these seeds require scarification before they can germinate and the natural factors which historically may have provided this process (such as fire, specific types of animal vectors, etc.) may now be uncommon or no longer occur. Low reproductive capacity is not an inherent limitation in the genus since some species of bush-clovers, such as Silky Bush-clover (*Lespedeza cuneata*) are invasive on rangeland (Blocksome 2006).

It is possible that the climate of Ontario, the northern part of the species range, may be a limitation to Slender Bush-clover. The species flowers at the end of the summer and must set seed before the end of the growing season. This time frame is shorter in Ontario than it is in the core of the species' range in the central Midwest, and probably occasionally results in low or lost seed set in years when there is early frost or snowfall.

Finally, the population of Slender Bush-clover in Canada is very small and isolated and thus at risk of being destroyed by a single stochastic event, such as a flood or wind storm. A severe storm wiped out a population that had been planted in Lambton County as part of an experimental restoration (R. Ludolph, pers. comm. 2012). A single event could remove the entire population, especially since the live plants currently occupy an area of only 9 by 4 m (COSEWIC 2012a).

1.6 Threats to Survival and Recovery

Observed Threats

Altered Disturbance Regime

The most serious current threat to Slender Bush-clover is degradation or loss of habitat from fire suppression or other changes to the natural disturbance regime. Without disturbance of some type, natural succession takes place and open areas fill in with vegetation, covering up the open ground required for germination and growth. Slender Bush-clover does not compete well with surrounding vegetation, so the increased cover of other plants is a serious detriment that can ultimately lead to a complete decline and loss of the population. Degradation of habitat continues to be an active threat despite all three locations for the species being in protected, managed parks. The filling in of vegetation is likely the main factor responsible for the lack of growing plants and possible loss of the Tallgrass Heritage Park population (COSEWIC 2012a).

Periodic burning is conducted within the Ojibway Prairie Complex and all three sites for Slender Bush-clover have been burned occasionally in the past with enough intensity to remove leaf litter and blacken soil. However, the frequency of burns has been low in Ojibway Park and Tallgrass Prairie Heritage Park (P.D. Pratt, pers. comm. 2012). Whether due to low intensity, low frequency or a combination, it appears that the burning done was insufficient to maintain the habitat at the Tallgrass and Black Oak Park sites. Lack of fire or other disturbance contributes to habitat loss by allowing a build-up of leaves and organic materials (dead plants and grass) to cover patches of exposed soil.

Invasive Species

Crown Vetch (*Securigera varia*), Autumn Olive (*Elaeagnus umbellata*) and Spotted Knapweed (*Centaurea stoebe* ssp. *micranthos*) are present within 1 m of Slender Bush-clover plants (COSEWIC 2012a). These non-native species have the capacity to spread quickly, take over open ground and eliminate most other surrounding plant species. None of these species is mentioned by Pratt (1986) or COSEWIC (2000), indicating that their presence is a recent occurrence.

Crown Vetch forms a low ground cover that carpets open sand. Because it spreads quickly and has tenacious roots, it is frequently planted in highway construction projects to prevent erosion. According to COSEWIC (2012a), in 2011 this species had already succeeded in covering up most of the open sand patches in the small prairie remnant where Slender Bush-clover is found. Spotted Knapweed is known to be highly invasive due to its allelopathic effects (secreting toxins from its roots into the soil). It was listed as rare in the vicinity of the Slender Bush-clover plants. Autumn Olive is a fast-growing woody species that is present in the habitat. It has the capacity to grow tall and shade out shorter plants.

Historical threats

In the past, ATV and dirt bike use occurred near the Canadian Slender Bush-clover subpopulations (Pratt 1986). All-terrain vehicle use can be a threat if it damages or breaks plants and causes rutting and displacement of soil. However, disturbance from ATVs probably also contributed to maintaining the exposed ground the species requires. All terrain vehicles and dirt bikes are no longer permitted in the protected parks where Slender Bush-clover occurs. This has eliminated the threat of damage to Slender Bush-clover plants but it has also removed a factor that helped to maintain suitable habitat in the absence of natural disturbance. Reinstating ATV use is certainly not recommended, but the issue is mentioned here to show that light levels of some types of human disturbance may be beneficial, although striking the correct balance where no harm is done may be difficult.

1.7 Knowledge Gaps

Whether Slender Bush-clover is still present and viable in the seed bank at Tallgrass and Black Oak Heritage Parks is a knowledge gap that must be filled in order to know if

these two sites (where live Slender Bush-clover plants have not been seen recently) still require recovery efforts. In addition, the processes needed to allow Slender Bush-clover plants to be successfully re-established from the seed bank are not known. Research to fill these gaps generally requires taking soil cores and germinating all seeds present in a controlled environment.

Many other knowledge gaps need to be filled to guide recovery for the Ojibway Park occurrence and possibly for the other two sites. These include limited understanding of:

- the viability of the occurrence;
- the frequency and intensity of burning that could be beneficial for habitat maintenance and improvement;
- productivity (i.e., amount of seed set and effects of weather);
- seed viability and germination rates;
- genetic uniqueness and possible effects of inbreeding;
- availability of pollinators and degree of reliance on self-fertilization versus cross-pollination;
- current rates and distances of seed dispersal and availability of animal vectors; and
- the severity of the threat from invasive species as well as the mechanism of the threat (e.g., shading, competing for pollinators, allelopathy, etc.).

The location and health of any transplanted occurrences would also be useful to know to assist with potential future restorations.

1.8 Recovery Actions Completed or Underway

All subpopulations of Slender Bush-clover are within parks that are managed by the City of Windsor. No motorized vehicles are allowed, so the threat of damaged or broken plants and habitat degradation from ATVs and dirt bikes has been eliminated. In addition, controlled burning is done in Ojibway Park, Tallgrass Prairie Heritage Park, Ojibway Prairie Provincial Nature Reserve, and Spring Garden Natural Area, although the frequency and intensity of burning in Slender Bush-clover habitat probably needs to be adjusted to ensure burning actually contributes to the on-going maintenance of suitable habitat and possibly provides new areas for colonization. Invasive Crown Vetch and Autumn Olive have been removed periodically by hand at the Ojibway Park Slender Bush-clover site (P.D. Pratt, pers. comm. 2012).

In 2005, the Tallgrass Recovery Team produced the draft National Recovery Strategy for Tallgrass Communities of Southern Ontario and Associated Species at Risk (Ambrose and Waldron 2005). The overall goal of the plan was to recover, reconstruct, and conserve a representative network of tallgrass communities, along with the full complement of plant and animal species that inhabit these diverse ecological communities. This strategy covered 138 plant species and 45 animal species that are rare or at risk, all of which are restricted to or associated with tallgrass ecosystems. Slender Bush-clover is one of these species. While most recovery efforts have since

shifted to working on species individually, this plan brought a lot of attention to the benefits of recovering the ecosystem as a whole in order to improve the situation for many species together. There are still several multi-species recovery plans being developed and implemented from this group of species.

From 1985 to at least the mid-1990s, Slender Bush-clover was grown in gardens at the Ojibway Nature Centre using seeds from the Tallgrass Park site (COSEWIC 2000, R. Ludolph, pers. comm. 2012). The plants were planted out by the Rural Lambton Stewardship Network as part of restoration work in the historical range of tallgrass prairie. However, the main location where plants were successfully growing was destroyed in a storm and information on any other locations has been lost. The species is reportedly easy to grow and is good for attracting wildlife (R. Ludolph, pers. comm. 2012). A few plants still survive in the garden at the nature centre (P.D. Pratt, pers. comm. 2012).

The Ojibway Prairie Complex, which consists of several parks, has been well studied and botanized, so the area is well known and has been searched intensively without finding additional sites for Slender Bush-clover. Furthermore, many other Ontario prairie sites have also been well studied and searched for species at risk, and Slender Bush-clover has not been found. This includes Walpole Island (Walpole Island Heritage Centre 2006). The species also has not been found during new field work in the corridor of the Detroit River International Crossing (Canada-U.S.-Ontario-Michigan Border Transportation Partnership 2009), in which several new populations of other species at risk have been discovered (G.E. Waldron, pers. comm. 2010, P.A. Woodliffe, pers. comm. 2010). Thus, it is rather unlikely that additional populations of Slender Bush-clover will be found.

2.0 RECOVERY

2.1 Recovery Goal

The recovery goal is to maintain the abundance and distribution of growing plants of Slender Bush-clover at Ojibway Park at current or greater levels by reducing threats, and if the species is extant in the seed bank at the other two subpopulations, to increase the number of growing plants present there to pre-1995 levels.

Rationale for Recovery Goal

First, two of three known subpopulations of Slender Bush-clover appear to have been lost to habitat degradation. Therefore, recovery must focus on maintaining the last remaining location where live, growing plants of the species are present. Second, the known historical distribution of Slender Bush-clover in Canada includes only the Ojibway Prairie Complex in Windsor and a site near Leamington where the species has not been seen since 1892. Therefore, recovery will focus on maintaining the current distribution in the Ojibway Prairie Complex. Finally, whether there is a viable seed bank of Slender Bush-clover has to be determined before recovery can be considered for Tallgrass and Black Oak Heritage Parks.

Given the small population size and extremely limited distribution, it is unlikely that recovery will ever result in downlisting of this species. Still, halting habitat loss may result in stable or even somewhat expanded populations which might require less attention to ensure their persistence.

2.2 Protection and Recovery Objectives

To meet the recovery goal, the protection and recovery objectives for Slender Bush-clover are as follows:

Table 3. Protection and recovery objectives

No.	Protection or Recovery Objective
1	Maintain or improve habitat suitability at the three existing sites.
2	Reduce presence of invasive species at the three existing sites.
3	Fill knowledge gaps.
4	Increase population size and extent if deemed feasible.

Note that the knowledge gap regarding the seed bank must be filled (Objective 3) before it will be known if Objectives 1, 2, and 4 should be applied to the Tallgrass and Black Oak Heritage Park sites.

2.3 Approaches to Recovery

Table 4. Approaches to recovery of the Slender Bush-clover in Ontario.

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1. Maintain or improve habitat suitability at the three existing sites.				
Critical	Short-term	Management and Stewardship	1.1 Assess type of habitat improvement actions that are needed and appropriate for each of the three sites. These may include burning, cutting back vegetation, scraping, raking or other actions.	<ul style="list-style-type: none"> Habitat degradation or loss
Critical	Short-term	Management and Stewardship	1.2 Assess potential positive or negative impacts on other rare species present in the same habitat from habitat improvement actions for Slender Bush-clover.	<ul style="list-style-type: none"> Habitat degradation or loss
Critical	Ongoing	Management and Stewardship	1.3 Plan and execute appropriate actions to improve habitat at each site. -- Search for partners and volunteers to help with labour.	<ul style="list-style-type: none"> Habitat degradation or loss
Necessary	Ongoing	Monitoring and Assessment	1.4 Monitor results of 1.3.	<ul style="list-style-type: none"> Habitat degradation or loss
Necessary	Ongoing	Management and stewardship	1.5 Based on 1.4, plan next actions. Consider frequency and intensity at which action is required.	<ul style="list-style-type: none"> Habitat degradation or loss
2. Reduce presence of invasive species at the three existing sites.				
Critical	Short-term	Management and Stewardship	2.1 Assess best method to reduce presence of the invasive species for each of the three sites. Consult current literature for best management practices.	<ul style="list-style-type: none"> Invasive species
Critical	Short-term	Management and Stewardship	2.2 Assess potential positive or negative impacts of invasive species removal on other rare species present in the same habitat.	<ul style="list-style-type: none"> Invasive species

Recovery Strategy for the Slender Bush-clover in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Critical	Short-term	Management and Stewardship	2.3 Plan and execute appropriate actions to reduce invasive species presence. -- Search for partners and volunteers to help with labour.	<ul style="list-style-type: none"> • Invasive species
Necessary	Ongoing	Monitoring and Assessment	2.4 Monitor effects of 2.3.	<ul style="list-style-type: none"> • Invasive species
Necessary	Ongoing	Management and Stewardship	2.5 Based on 2.4, plan next actions. Consider frequency and intensity at which action is required.	<ul style="list-style-type: none"> • Invasive species
3. Fill knowledge gaps.				
Critical	Ongoing	Research	3.1 Plan and conduct research on seed bank of Slender Bush-clover. -- Search for partners to conduct research.	<ul style="list-style-type: none"> • Whether a viable seed bank is present • How to bring Slender Bush-clover back from seed bank
Beneficial	Long-term	Research	3.2 Plan and conduct research on other knowledge gaps as funding and partners become available.	<ul style="list-style-type: none"> • Population viability and productivity • Seed viability and germination • Genetics • Pollinators • Dispersal rates and distances • Severity of threats • Location and health of transplanted populations
4. Increase population size and extent if deemed feasible.				
Necessary	Long-term	Management	4.1 Establish new populations as feasible to prevent extirpation of the species due to stochastic events and as a precaution in case of failure to manage current threats.	<ul style="list-style-type: none"> • All threats

Recovery Strategy for the Slender Bush-clover in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Beneficial	Long-term	Management	4.2 Pending outcome of 1.4, conduct recovery actions to increase presence of Slender Bush-clover at all three sites.	<ul style="list-style-type: none"> • Limiting factor: small population.
Beneficial	Long-term	Management	4.3 Pending outcome of 3.1, conduct recovery actions to increase presence of Slender Bush-clover from seed bank.	<ul style="list-style-type: none"> • Limiting factor: small population.

Narrative to Support Approaches to Recovery

All recovery actions for Slender Bush-clover need to be carefully assessed and planned before being carried out. This is to ensure that actions do not harm the existing small population of Slender Bush-clover or any of the other species at risk or rare species that are present in the same habitat.

However, most other species present would probably benefit from additional clearing and opening up of the habitat (P.D. Pratt, pers. comm. 2012, S.R. Brinker, pers. comm. 2012), and staff at Ojibway Prairie are already taking care to protect fire-sensitive species at risk during burning (P.D. Pratt, pers. comm. 2012). However, best management practices (BMPs) for invasive-species control also need to be considered during recovery work to keep invasives from being favoured by habitat clearing. To prevent spreading the invasives, it is likely that several types of recovery actions would need to be done in combination (for example, burning followed by herbicide use, or clipping of shrubs followed by burning).

Although the Canadian population is very small, with recovery actions, the prognosis for Slender Bush-clover could be very positive. In Illinois, efforts to recover a similar species, Prairie Bush-clover (*Lespedeza leptostachya*—threatened in the U.S.), have included the use of fire, herbicide and grazing by bison to reduce competition from grasses and other plants. Preliminary analyses show these treatments have resulted in an increase in seedling production, an increase in number of individuals overall, and in plants that are more robust (P. Vitt, pers. comm. 2012, Chicago Botanic Garden 2012).

As a precaution, it would be beneficial to establish some plantings of Slender Bush-clover in locations separate from the current patch to ensure that the species is not extirpated in case of an accidental event, such as a storm. The few plants in the garden bed at the Ojibway Nature Centre could be augmented to ensure a stable garden population. Slender Bush-clover is listed on Schedule 1 of the ESA as endangered only within Ojibway Park, Black Oak Heritage Park and Tallgrass Heritage Park, so the plants would not have legal protection elsewhere. Therefore, it might be advisable to establish an additional restoration population somewhere within one of these parks to ensure the plants would be protected. Relocation of the restoration sites where the species was planted in Lambton County would also be beneficial to see if any restored populations of Slender Bush-clover have survived.

2.4 Area for Consideration in Developing a Habitat Regulation

Under the ESA, 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 author will be one of many sources considered by the Minister when developing the habitat regulation for this species.

In establishing the area to be prescribed as habitat in a regulation, several considerations need to be mentioned.

First, although seeds of Slender Bush-clover are known to remain viable for decades, it is unknown whether Slender Bush-clover is still viable in the seed bank at the Black Oak and Tallgrass Heritage Park sites. Therefore, it is recommended that all sites where Slender Bush-clover has been observed in the Ojibway Prairie Complex come under a habitat regulation even if no live plants are present, until this knowledge gap is filled or until a 50-year time limitation has passed (see #4 below).

Second, the habitat of Slender Bush-clover must have periodic disturbance in order to remain suitable. This disturbance may come from several different types of activities or processes including some types of human usage. Therefore, it is recommended that legal regulation and protection of habitat should not cause the exclusion of all human activities from the regulated area.

Third, the current habitat of Slender Bush-clover occurs within the recognizable ELC types, Dry Black Oak Tallgrass Savannah or Dry Black Oak Tallgrass Woodland. However, suitable habitat is only some small open patches within the savannah or woodland matrix, so the habitat required is much smaller than the entire ELC vegetation type polygon. Thus, ELC vegetation type is not a precise enough guide to prescribe habitat.

Finally, although dispersal habitat is an important consideration for recovery, for Slender Bush-clover it is not possible to base the size of the habitat to be prescribed on dispersal distances. Dispersal in animal or bird feces is unpredictable, and the distances covered by these vectors may be quite large, even on the order of kilometres.

Therefore, it is recommended that habitat be prescribed as follows:

- 1) At Ojibway Park, where live Slender Bush-clover plants continue to be observed, it is recommended that the regulated habitat include the entire opening in which the plants occur, as well as a protective zone of 50 m around the outside of the open area, including any disturbed, human-made components such as scraped areas since light soil disturbance may be helpful to the species. Should any suitable openings extend beyond the 50 m, it is suggested that all of this open area also be prescribed. For this prescription, "open" or "opening" may be defined as the area in which total tree cover is less than 25 percent, with ground dominated (greater than 50%) by herbaceous plants, shrubs or exposed soil, and not shaded by trees. These criteria are consistent with the ELC characteristics of tallgrass prairie and cultural meadow (Lee et al. 1998). The boundaries of the opening at Ojibway Park would be the point at which tree cover becomes continuous and the ground too shaded. The exact boundary line of the Ojibway Park opening is probably best assessed and mapped in the field.

A distance of 50 m has been shown to provide a minimum critical function zone for the maintenance of microhabitat properties, such as light, temperature, litter moisture, vapor

pressure deficit and humidity for rare plants. A study on micro-environmental gradients at habitat edges (Matlack 1993) and a study of forest edge effects (Fraver 1994) found that effects could be detected as far as 50 m into habitat fragments. 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 m to 50 m. In addition, in the case of Slender Bush-clover, a 50 m protective zone may also provide additional area for seed dispersal by small animals.

2) At the Tallgrass and Black Oak Heritage Park sites where live Slender Bush-clover plants have not been seen for some time, it is still possible that fire or other disturbance could create new habitat and allow new Slender Bush-clover plants to arise from the seed bank. Therefore, it is recommended that habitat be regulated at these sites in order to protect the seed bank and to allow suitable disturbance to occur. However, these sites are currently not open enough to use the characteristics listed in #1 to prescribe habitat, so other criteria are suggested.

At these sites, it is recommended that a zone of 50 m be drawn around the outside of the approximate former location of live Slender Bush-clover plants and that the resulting polygon be prescribed as habitat. The area inside this polygon is similar to the size of the habitat where the current live plants are present, which is the current known minimum patch size for suitable habitat for this species. As well, 50 m is recommended as a protective distance because if Slender Bush-clover is present in the seed bank, it may be important to maintain microhabitat conditions so that some future disturbance may be able to recreate suitable habitat and allow new plants of Slender Bush-clover to emerge.

3) Should any new populations of Slender Bush-clover be discovered or should new live plants emerge at Tallgrass or Black Oak Heritage Parks, it is recommended that the criteria of #1 should be applied to the new site.

4) Due to the long-lived nature of the seed, it is recommended that sites where Slender Bush-clover plants are no longer found be regulated for a period of 50 years unless live plants reappear (in which case habitat would be prescribed as per #1) or it can be shown that there is no viable seed bank. The time that Slender Bush-clover seeds can remain viable in the seed bank is an unknown, as is the natural periodicity of disturbance that would create new habitat, such as a stand-replacing forest fire. Furthermore, the area surrounding Black Oak and Tallgrass Heritage Parks is urban, so the possibility that a major forest fire would be allowed to burn unchecked is highly unlikely. Therefore, after a period of time, it can be assumed that new suitable habitat conditions are not going to be created, regardless of whether or not there is a viable seed bank. The period of 50 years should be given to allow ample time for recovery actions, such as habitat clearing and controlled burning, to be considered and undertaken.

5) Slender Bush-clover is legally listed as endangered within Ojibway, Tallgrass Heritage and Black Oak Heritage Parks. If any populations of Slender Bush-clover are planted for

restoration within the parks where the species is endangered, it is recommended that they be protected by a habitat regulation, according to the criteria in #1 above. It is recommended that restoration populations in these three parks be regulated as long as they are within natural or semi-natural vegetation (e.g., not in garden beds). Populations planted elsewhere would not require regulation unless a change is made to the way the species is listed in *ESA 2007*.

GLOSSARY

Ascending: Sloping or leading upwards. Describes leaves or other parts that point up.

Axil: The angle where a leaf joins the stem.

Chastogamous flower: A flower that opens to allow pollination by outside agents, such as insects or the wind.

Cleistogamous flower: A self-pollinating flower that sets seed without opening.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee established under section 14 of the *Species at Risk Act* that is responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community to convey the degree of rarity at the global (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. Conservation status is ranked on a scale from 1 to 5 as follows:

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

Corolla: The petals of a flower, usually in a whorl around the reproductive organs.

Ecological Land Classification: A system for evaluating different types of vegetation, such as Sugar Maple Deciduous Forest, Cattail Mineral Shallow Marsh, etc. The current standard for Ontario is based on the work by Lee et al. 1998.

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

Fix nitrogen: To take atmospheric nitrogen and change it into a form that is accessible to living organisms.

Forb: A broad-leaved, herbaceous plant.

Nodule: A swelling on a leguminous root containing symbiotic bacteria.

Prairie obligate: A species that only lives in the prairie ecosystem because it must have prairie conditions to survive.

Rhizome: A horizontal stems that grows along the ground.

Scarification: To make cuts or scratches or to break the surface of something.

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. 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.

Symbiotic: Interaction between different organisms that usually provides a mutual advantage to both.

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**PART 3 – *Slender Bush-clover* – Ontario Government
Response Statement, prepared by the Ontario Ministry of
Natural Resources**

Slender Bush-Clover

Ontario Government Response Statement



Photo: Allen Woodriff

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 and Forestry (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 Slender Bush-clover (*Lespedeza virginica*) in Ontario was completed on November 22, 2013 (http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_rs_sldr_bhcr_en.pdf).

The response statement is the government's policy response to the scientific advice provided in the recovery strategy. All recommendations provided in the recovery strategy were considered and this response statement identifies those that are considered to be appropriate and necessary for the protection and recovery of the species. 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.

Slender Bush-clover is a perennial herb in the Pea family that grows to 100 cm in height. The species has purple to pink flowers, and numerous narrow leaves growing on upright, hairy stems. In Ontario, Slender Bush-clover occurs only within the Ojibway Prairie Complex in the City of Windsor.

MOVING FORWARD TO PROTECT AND RECOVER SLENDER BUSH-CLOVER

Slender Bush-clover is listed as an endangered species under the ESA, which protects both the plant and its habitat. The ESA prohibits harm or harassment of the species and damage or destruction of their habitat without authorization. Such authorization would require that conditions established by the Ministry be met.

Slender Bush-clover's distribution ranges from southwestern Ontario to northern Mexico. In Canada, only a single population of Slender Bush-clover is known to exist, and it occurs entirely within the Ojibway Prairie Complex in the City of Windsor, Ontario. In the Ojibway Prairie Complex, the species has been documented to occur at three distinct locations, each within a park managed by the city's Department of Parks and Recreation. Slender Bush-clover was first observed within the Tallgrass Heritage Park in 1977, however it was last observed at this site in 1997 and may have been lost due to natural succession. The species was also observed in Black Oak Heritage Park in 1993, however it has not been found within this park since then, and may have been lost from this location as a result of all-terrain vehicle (ATV) use. Within Ojibway Park, the third location in the complex, Slender Bush-clover was first observed in 1979. The species has been observed at this location on several occasions since then, most recently in 2011, at which time 165 plants were observed. While recent observations of Slender Bush-clover are limited to Ojibway Park, the species is considered to remain at all three locations within the Ojibway Prairie Complex, as viable seed may still be in the soils within the other two parks.

Slender Bush-clover was also historically documented to exist in the Leamington area in 1892. However this population is considered to be extirpated, as it has not been observed since, despite several targeted searches.

The most significant threat to Slender Bush-clover at all three remaining locations is habitat loss and degradation due to alteration of natural disturbance regimes. Without natural disturbances such as fire, or other disturbances (e.g., soil scraping), natural succession occurs and vegetation begins to cover the open soil the species requires for germination and growth. Invasive species such as Crown Vetch (*Securigera varia*), Autumn Olive (*Elaeagnus umbellata*) and Spotted Knapweed (*Centaurea stoebe* ssp. *micranthos*) present another threat to Slender Bush-clover as these species have the capacity to rapidly take over its habitat. Historically, threats also included ATV and dirt bike use; however these activities are no longer permitted in the parks where Slender Bush-clover remains.

A number of environmental and biological factors also contribute to the rarity and vulnerability of Slender Bush-clover in Ontario. First, remaining suitable habitat patches in the province are rare and isolated, thus limiting the species' ability to expand naturally into new areas. Second, where the species exists, there may be reduced establishment as a result of human influences, such as suppression of the natural fire regime. Third, Slender Bush-clover in Ontario occurs near the northern edge of the species' range where the climate may affect recruitment. Finally, because only a single small population remains in Ontario, Slender Bush-clover is also highly vulnerable to the effects of random weather events such as floods and wind storms.

Ever since plant inventories were first undertaken in the province, Slender-bush Clover has not been found to be common in Ontario. Its distribution and abundance prior to this period are unknown. As suitable habitat in Ontario is rare and isolated, the distribution of the species is unlikely to expand. Thus, recovery efforts for this species will focus on improving habitat, reducing threats, and exploring opportunities to establish or re-establish the species

at sites with suitable habitat in the three parks where the species has been observed within the Ojibway Prairie Complex.

The government's goal for the recovery of the Slender Bush-clover in Ontario is to maintain the population at, or increase it to, a sustainable level at existing sites.

As the response of Slender Bush-clover to management activities is monitored, the government's goal and approach for the recovery of the species may be re-evaluated to consider alternate recovery actions, such as establishing Slender Bush-clover at other sites within its natural range.

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 Slender Bush-clover, the government will directly undertake the following actions:

- Continue to implement the Ontario Invasive Species Strategic Plan to address the invasive species (e.g., Crown Vetch) that threaten Slender Bush-clover.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Slender Bush-clover data to the Ministry's central repository at the Natural Heritage Information Centre.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Protect the Slender Bush-clover and its habitat through the ESA.
- Support conservation, agency, municipal and industry partners, and Aboriginal communities and organizations to undertake activities to protect and recover the Slender Bush-clover. Support will be provided where appropriate through funding, agreements, permits with appropriate conditions, and/or advisory services.
- Encourage collaboration, and establish and communicate annual priority actions for government support in order to reduce duplication of efforts.

GOVERNMENT-SUPPORTED ACTIONS

The government endorses the following actions as being necessary for the protection and recovery of the Slender Bush-clover. Actions identified as “high” will be given priority consideration for funding under the ESA. Where reasonable, the government will also consider the priority assigned to these actions when reviewing and issuing authorizations under the Endangered Species Act. Other organizations are encouraged to consider these priorities when developing projects or mitigation plans related to species at risk. The government will focus its support on these high-priority actions over the next five years.

Focus Area: Protection and Management
Objective: Maintain or improve habitat suitability and reduce the presence of invasive species in Slender Bush-clover habitat.

Actions:

1. (HIGH) Develop and implement plans for improving habitat conditions and managing invasive species and native woody vegetation at occupied sites, as appropriate, with consideration for other rare species present on site. Actions may include prescribed burns, vegetation removal, scraping, raking, or other actions. Monitor the effectiveness of actions taken and revise management plans as appropriate.
2. Explore opportunities to establish or re-establish the species in existing suitable habitat within Ojibway Park, Black Oak Heritage Park and Tallgrass Heritage Park, as appropriate, using genetic material that originated within the Ojibway Prairie Complex or that genetic research has determined to be of appropriate origin.
3. Conserve Slender Bush-clover by cultivating and maintaining plants at off-site locations, such as botanical gardens, for the purposes of supporting research and efforts to establish or re-establish the species within Ojibway Park, Black Oak Heritage Park and Tallgrass Heritage Park. Plantations must comprise genetic material that originated within the Ojibway Prairie Complex or that genetic research has determined to be of appropriate origin.

Focus Area: Research
Objective: Assess the population of Slender Bush-clover in the Ojibway Prairie Complex and undertake research to inform recovery approaches for the species.

Actions:

4. (HIGH) Assess the condition and viability of the population, as well as habitat conditions, within the Ojibway Prairie Complex. This work may include:
 - determination of whether viable Slender Bush-clover seed remains within Tallgrass Heritage Park and Black Oak Heritage Park; and
 - evaluation of the severity of the threat of invasive and native species to Slender Bush-clover.

5. Undertake research necessary to inform recovery approaches for Slender Bush-clover in Ontario. Research may include investigation of:
 - habitat management techniques (e.g., optimal frequency and intensity of prescribed burns);
 - genetic diversity of the species in Ontario compared to populations in other parts of its range;
 - seed and pollen dispersal rates and distances;
 - approaches to enable germination and recruitment; and,
 - reproductive biology of the species (e.g., modes of pollination).

IMPLEMENTING ACTIONS

Financial support for the implementation of actions may be available through the Species at Risk Stewardship Fund, Species at Risk Research Fund for Ontario, or the Species at Risk Farm Incentive Program. Conservation partners are encouraged to discuss project proposals related to the actions in this response statement with the Ministry. The Ministry can also advise if any authorizations under the ESA or other legislation may be required to undertake 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 if adjustments are needed to achieve the protection and recovery of Slender Bush-clover.

ACKNOWLEDGEMENT

We would like to thank all those who participated in the development of the Recovery Strategy for the Slender Bush-clover (*Lespedeza virginica*) 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 MNRF district office

Contact the Natural Resources Information Centre

1-800-667-1940

TTY 1-866-686-6072

mnr.nric.mnr@ontario.ca

ontario.ca/mnr