

Recovery Strategy for the Willowleaf Aster (*Symphotrichum praealtum*) in Canada

Willowleaf Aster



2015



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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 WILLOWLEAF ASTER (*Symphyotrichum praealtum*) IN CANADA

2015

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

In the spirit of cooperation of the Accord, the Government of Ontario has given permission to the Government of Canada to adopt the *Recovery Strategy for the Willowleaf Aster (Symphyotrichum praealtum) in Ontario* (Part 2) and the *Willowleaf Aster – Ontario Government Response Statement* (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 Willowleaf Aster in Canada consists of three parts:

Part 1 – Federal Addition to the *Recovery Strategy for the Willowleaf Aster (Symphyotrichum praealtum) in Ontario*, prepared by Environment Canada.

Part 2 – *Recovery Strategy for the Willowleaf Aster (Symphyotrichum praealtum) in Ontario*, prepared by Judith Jones for the Ontario Ministry of Natural Resources².

Part 3 – *Willowleaf Aster – Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources and Forestry.

² 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 Willowleaf Aster (Symphyotrichum praealtum) in Ontario*, prepared by Judith Jones for the Ontario Ministry of Natural Resources.

Part 3 – *Willowleaf Aster – Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources and Forestry.

Part 1 – Federal Addition to the *Recovery Strategy for the Willowleaf Aster (Symphyotrichum praealtum) in Ontario*, prepared by Environment Canada

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)³ 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 Willowleaf Aster 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 Willowleaf Aster (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 to its provincial recovery strategy and summarized 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 Willowleaf Aster 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

³ <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 this federal addition was prepared by Holly Bickerton (Consulting Ecologist, Ottawa). A previous draft was prepared by Judith Jones (Winter Spider Eco-consulting), who also provided advice in the development of this addition. Information useful in the development of the provincial recovery strategy (Jones 2013) and this federal addition was provided by Gerry Waldron (Consultant, Amherstberg), Allen Woodliffe (formerly of the Ontario Ministry of Natural Resources and Forestry [OMNRF]), Ron Gould (Ontario Parks), Clint Jacobs (Walpole Island Natural Heritage Centre), Dan Lebedyk (Essex Region Conservation Authority), Paul Pratt (formerly with the City of Windsor), Elizabeth Reimer (formerly of the OMNRF), and Season Snyder (AMEC Environment and Infrastructure). In particular, the efforts of those who have completed fieldwork and/or assisted in the recovery efforts for this species are acknowledged. Kathy St. Laurent, Marie-Claude Archambault, Lauren Strybos (Environment Canada, Canadian Wildlife Service – Ontario), Veronique Brondex (Environment Canada, Canadian Wildlife Service – National Capital Region) and Aileen Wheeldon (OMNRF) reviewed and provided comments and advice during the development of this document.

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 Willowleaf Aster (Symphyotrichum praealtum) in Ontario* (Part 2) and to provide updates or additional information.

Environment Canada is adopting the Ontario recovery strategy (Part 2) with the exception of section 2, Recovery. In place of section 2, Environment Canada has established population and distribution objectives based on the provincial goal and is supporting the government-led and government-supported actions of the *Willowleaf Aster – Ontario Government Response Statement*⁴ (Part 3) as broad strategies and general approaches to meet the population and distribution objectives.

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.

⁴ 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.

1. COSEWIC* Species Assessment Information

Date of Assessment: May 2003

Common name: Willowleaf Aster

Scientific name: *Symphyotrichum praealtum*

COSEWIC Status: Threatened

Reason for designation:

This is a geographically highly restricted species that has undergone range contraction and occurs mainly in fragmented remnant prairie habitats. There are few occurrences and on-going risks from further habitat and population losses due to presence primarily in urbanized centres.

Canadian Occurrence: Ontario

COSEWIC Status history:

Designated Special Concern in April 1999. Status re-examined and designated Threatened in May 2003.

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

2. Species Status Information

Willowleaf Aster (*Symphyotrichum praealtum*) is a late-flowering perennial⁵ aster that occurs throughout the mid-western United States. In Canada, the species is known only from southwestern Ontario where ten⁶ natural and one restored (transplanted) extant populations exist.

In Canada, the Willowleaf Aster is listed as Threatened⁷ on Schedule 1 of the federal *Species at Risk Act* (SARA). In Ontario, it is listed as Threatened⁸ under the *Endangered Species Act, 2007* (ESA 2007).

⁵ A plant having a life cycle lasting more than two years.

⁶ The provincial recovery strategy and Government Response Statement list nine populations for the Willowleaf Aster in Ontario. With the evidence that Willowleaf Aster also occurred naturally in the restoration site named R1 DRIC-WEP: Southeast Windsor, Environment Canada considers the total number of populations to be ten.

⁷ A wildlife species likely to become an Endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

⁸ A species that lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening to lead to its extinction or extirpation.

Willowleaf Aster has a global conservation rank of Secure⁹ (G5) and is also considered Secure (N5) in the United States. The Willowleaf Aster is considered to be of conservation concern (S1-S3, or SX) in at least nine of the 34 states in which it has been ranked (Appendix A); these are found mainly at the northern and eastern periphery of the species' range. In Canada and Ontario, the species is ranked as Imperilled¹⁰ (N2, S2)(NatureServe 2014). Less than one percent of the species' global range occurs in Canada (COSEWIC 2003).

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 Willowleaf Aster. 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. There are eleven element occurrences¹¹ of Willowleaf Aster in Canada. In total, ten natural and one restored (transplanted) populations exist. The entire Canadian population has not been recently censused¹², but recent surveys in the corridor for the Detroit River International Crossing (DRIC) and Herb Gray Parkway (HGP) (formerly known as the Windsor-Essex Parkway (WEP)) found tens of thousands of stems within the study area alone, which more than tripled the previous Canadian population estimate (WEMG 2012). This demonstrates that the species has the ability to grow abundantly in some areas. Flowering plants have been found with seeds, and are therefore known to be reproductive (COSEWIC 2003; Jones 2013).

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

Yes. Prior to European settlement, the Willowleaf Aster probably occurred mainly in tallgrass prairie and open savanna in central North America. In Ontario, it is still found in tallgrass prairies and savannas, which have been reduced to a very small fraction of their former extent (Bakowsky and Riley 1994). However, in Canada and elsewhere in its range, Willowleaf Aster can occur in a variety of other habitats including thickets, meadows, woodland edges, streambanks, as well as in open disturbed areas such as

⁹ Globally and Nationally Secure (G5/N5): 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.

¹⁰ Nationally and provincially Imperilled (N2/S2): At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

¹¹ The term "Element Occurrence" is generally accepted to be synonymous with the term "population" (as described in Jones 2013).

¹² The 2003 COSEWIC status report is based upon fieldwork completed in 1997, which represents the last comprehensive field survey and population assessment of Willowleaf Aster.

railway embankments, roadsides, utility corridors, and vacant lots (Jones 2013). The species' ability to use a wide variety of open habitats suggests that suitable habitats are available.

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 Willowleaf Aster are habitat loss and degradation due to residential, commercial and industrial development, and an altered disturbance regime (i.e., a lack of wildfire) (Jones 2013). Threats posed by development can be avoided through the use of municipal and provincial planning policies and in some cases, land acquisition for protection. Although land trusts prioritize the habitat of species at risk for acquisition or other forms of protection, the open, disturbed areas where the Willowleaf Aster occurs is highly valued for development, and conservation may not be possible through acquisition. Where possible, prescribed burns can be used in prairie and savanna habitats to maintain open areas and reduce encroachment of woody plants, and mitigate a lack of wildfire (Rodger 1998). However, there are many areas where prescribed burning could not be applied safely due to the presence of people, property, assets and infrastructure. Prescribed burns have been undertaken at some sites within Ojibway Prairie Complex and Walpole Island First Nation, although natural succession is still considered a threat to the Willowleaf Aster at these locations (Jones 2013).

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

Yes. As a result of mitigation activities associated with the DRIC and the WEP, restoration (transplanted) populations of the Willowleaf Aster and other prairie plants have been established in the Windsor – LaSalle area and at the St. Clair National Wildlife Area - Bear Creek Unit (Jones 2013; AMEC Environment and Infrastructure 2014). Substantial expertise is now available in the restoration and propagation of the Willowleaf Aster and associated prairie species. Plants have been transplanted using two main techniques; monitoring results to date show strong success with sod¹³ transplants, and more modest success with rhizome¹⁴ transplants. Prescribed burns have also been used within the HGP restoration area, and appear to be contributing to the success of restoration projects (Snyder, pers. comm. 2014). Techniques have been developed to control several of the invasive plants that threaten the Willowleaf Aster (OMNR 2012); several methods of invasive plant control have been successfully used to manage habitat within the HGP restoration site (Snyder, pers. comm. 2014). Any of these techniques could be used at other extant populations if necessary, in order to achieve the population and distribution objectives.

¹³ The plant and the part of the soil beneath it, held together by the roots, or a piece of thin material.

¹⁴ A modified stem of a plant that is usually found underground, often sending out roots and shoots from its nodes.

4. Populations and Distribution

Since the publication of the provincial recovery strategy (Part 2), new evidence indicates that the restoration site, known as R1 DRIC-WEP: Southeast Windsor (population names as used in the provincial recovery strategy), contained naturally-occurring Willowleaf Aster plants prior to the restoration activities. This brings the total number of populations in Canada with naturally-occurring plants to ten (Figure 1). As a result, there is only one restoration site where the population is made up of entirely transplanted individuals: R2 St. Clair NWA (Bear Creek Unit), Chatham-Kent. An additional four populations of the species have been confirmed extirpated and four other populations remain unknown due to the absence of species survey at those sites in recent years.

Information compiled since the publication of the provincial recovery strategy on the status of the transplanted populations resulting from mitigation for the DRIC-HGP is summarized below.

Transplantations for the HGP mitigation sites began in the spring of 2011 and 33 restoration sites covering an area of approximately 25 ha have now been established within the Windsor – LaSalle area. Overall, this species has responded positively to transplanting, with a net increase in the abundance of plants. Clonal growth has been widely observed. These plants will be monitored for ten years according to provincial permit conditions (Snyder pers. comm. 2014).

In the spring of 2013, 492 Willowleaf Aster plants from the DRIC lands were relocated to federal land at the St. Clair NWA - Bear Creek Unit (R2: St. Clair NWA, Chatham-Kent). Monitoring results from July 2014 showed that the transplanted population was generally healthy. Rhizome cuttings continue to be small in size, but the current population is estimated at 474 plants and appears to be stable. Plants will be tended and monitored three times annually for five years as a result of federal permit conditions (AMEC Environment and Infrastructure 2014).

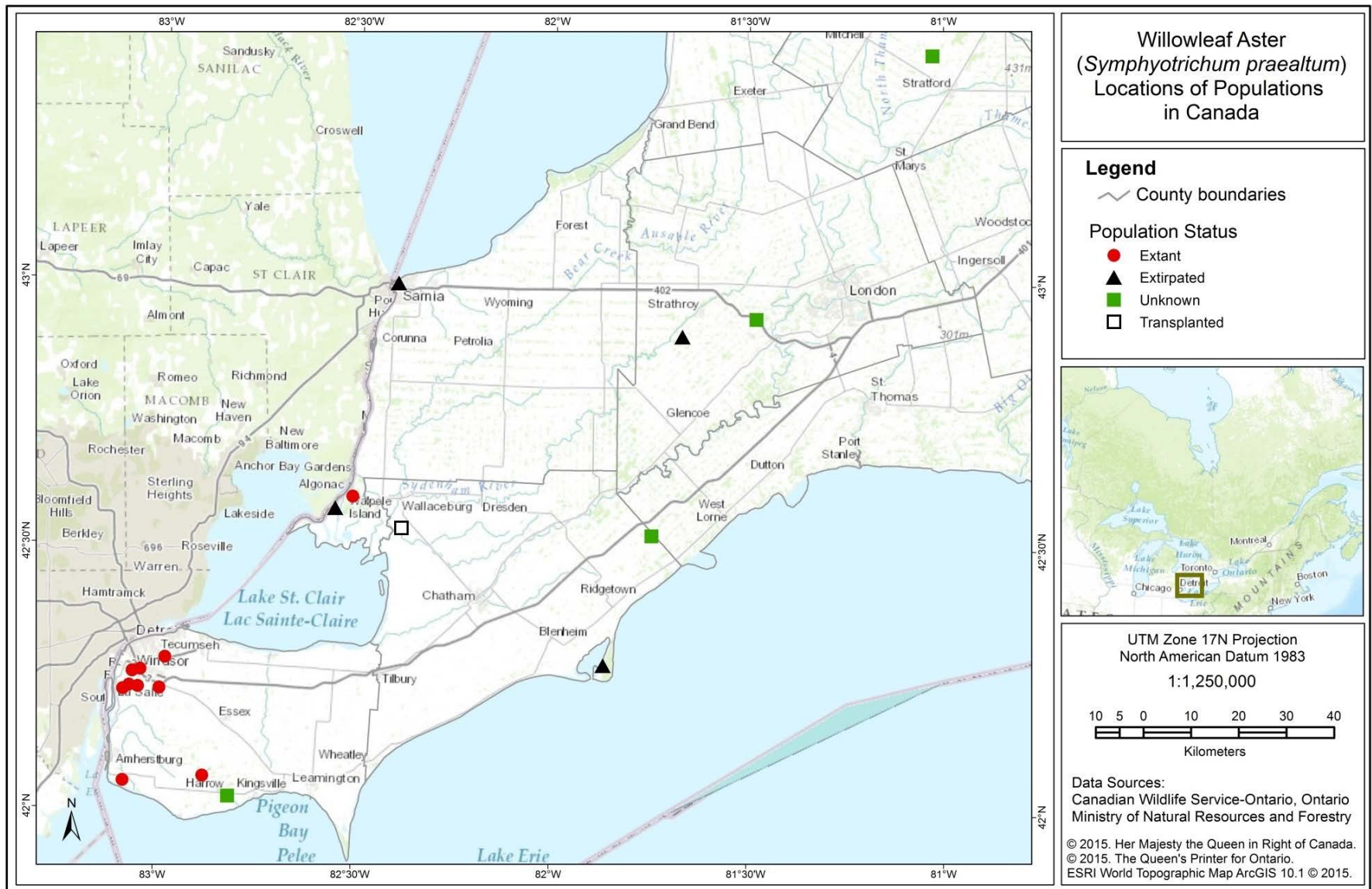


Figure 1. Locations of Willowleaf Aster Populations in Canada.

5. Threats

In addition to the threats outlined in Part 2 - *Recovery Strategy for the Willowleaf Aster (Symphyotrichum praealtum) in Ontario*, a potential threat to the Willowleaf Aster is a decline in pollinator populations. The Willowleaf Aster requires cross-pollination from another genetically-distinct individual to ensure successful seed set; self-fertilization results in highly reduced seed set (less than 0.1%) (Jones 2013). The Willowleaf Aster is pollinated primarily by insects including butterflies and moths (Lepidoptera), bees and flies (Zhang et al. 1999; Jones 2013). 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 in pollinator populations may impact the Willowleaf Aster is not known.

6. Population and Distribution Objectives

The provincial recovery strategy contains the following recovery goal for the recovery of the Willowleaf Aster in Ontario:

- The recovery goal is to maintain the current distribution, number and viability of all extant populations and corresponding sub-populations of Willowleaf Aster by maintaining, improving, and protecting habitat and reducing other threats.

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

- The government's goal for the recovery of the Willowleaf Aster is to maintain populations and sub-populations at, or enable them to increase to, sustainable levels at sites where the species occurs in Ontario.

Under SARA, a population and distribution objective for the species must be established. Environment Canada's population and distribution objective for the Willowleaf Aster in Canada is to:

- Maintain the current distribution and abundance of the ten existing populations and corresponding sub-populations of Willowleaf Aster, and where necessary, increase population abundance.

Because of the rarity of this species within Canada, maintaining all sub-populations¹⁵ is considered important to ensure that the Canadian distribution is not further reduced. It is possible that populations of Willowleaf Aster contain few genetically unique individuals, which are required in cross-pollination for successful seed set to maintain genetic diversity. Thus, some populations may need to be increased by transplanting individuals from other populations to allow for proper seed set and long-term viability. Regular monitoring using standard methods should indicate that these sub-populations are persisting, and that estimates of abundance meet or exceed previous reports.

Population viability (probability of persistence) in Willowleaf Aster remains very difficult to assess. These indicators may be more accurately assessed once more information is available on the life history and demographics of this species. Currently, no population viability assessment has been conducted for any populations of Willowleaf Aster. Population viability is estimated by Conservation Data Centres using qualitative NatureServe criteria that are based on size, abiotic and biotic conditions, and landscape context (NatureServe 2014). However, the minimum viable population required for a Willowleaf Aster population to be sustained over the long-term is not known.

The maintenance of extant populations is expected to require not only habitat protection but also active, long-term management to prevent the establishment of trees and shrubs. Habitat management techniques can also be used to increase the abundance of Willowleaf Aster. Given recent success with rhizomes and sod transplants of the Willowleaf Aster, these techniques could be used to increase population abundance at existing sites, where biologically and technically feasible. Due to the recent discovery of several thousand new stems of Willowleaf Aster in the Windsor - LaSalle area, the restoration of populations where Willowleaf Aster formerly existed is not currently considered to be a priority. However, there are four locations where the population status is unknown; should naturally-occurring plants be found at these locations, they will be considered part of the objective above.

Restoration sites where transplanted Willowleaf Aster plants were found with no evidence of naturally-occurring plants are not currently being considered as existing populations (or portions thereof) in the above objective (i.e., R2 St. Clair NWA, Chatham-Kent). Continued monitoring to determine restoration success, viability and probability of persistence must precede their inclusion. These plants may be considered as part of the objective in the future following a better understanding of their ability to support and contribute to long-term recovery. Plants within the restoration sites where Willowleaf Aster was known to occur prior to the transplantation activities are considered extant populations as there is no way to distinguish the original plants from the transplanted ones within these sites.

¹⁵ “Sub-populations” refer all sites that would be included within an Element Occurrence, as defined by NatureServe (2014) and used by the NHIC. For example, a single Element Occurrence (or “population” as described in Jones 2013) of Willowleaf Aster in Windsor-LaSalle includes at least 13 sub-populations (Jones 2013).

7. Broad Strategies and General Approaches to Meet Objectives

The government-led and government-supported actions tables from the *Willowleaf Aster – 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 Willowleaf Aster (Symphyotrichum praealtum) in Ontario* (Part 2).

7.1 Actions Already Completed or Currently Underway

Since the publication of the Ontario recovery strategy (Part 2), additional mitigation activities (e.g., transplantsations) have been undertaken for the populations found within and transplanted from the footprint of the DRIC-HGP. In both the Windsor - LaSalle area and the St. Clair NWA - Bear Creek Unit, monitoring has been regularly undertaken since transplanting occurred. Monitoring transplanted populations consists of population sampling, photo monitoring, and analysis of vegetation structure and composition. Habitat is also being managed at these sites through prescribed burning, buffer seeding and control of invasive species (AMEC Environment and Infrastructure 2014; Snyder pers. comm. 2014).

8. Critical Habitat

8.1 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 example of activities that are likely to result in its destruction. Under section 2(1) of SARA, critical habitat is "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, when a species becomes listed as endangered or threatened on the Species at Risk in Ontario List, it automatically receives general habitat protection. Willowleaf Aster currently receives general habitat protection under the ESA; however, a description of the general habitat has not yet been developed. In some cases, a habitat regulation may be developed that replaces the general habitat protection. A habitat regulation is a legal instrument that prescribes an area that will be protected¹⁶ as the habitat of the species by the Province of Ontario. A habitat regulation has not been developed for the Willowleaf Aster under the ESA; however, the provincial

¹⁶ 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.

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 Willowleaf Aster in Canada to the extent possible, based on this recommendation and on the best available information as of December 2014.

Critical habitat for the Willowleaf Aster in Canada is identified for nine of the ten existing populations in southwestern Ontario (see Figure 2, and also Table 1). It is recognized that the critical habitat identified below is insufficient to achieve the population and distribution objectives for the species. A Schedule of Studies (section 8.2; Table 2) has been developed and outlines the activities required for identification of additional critical habitat necessary to support the population and distribution objectives. Additional critical habitat may be added in the future, as new information becomes available.

Critical habitat is not identified for horticultural specimens and plants that did not originate from Willowleaf Aster plants native to Ontario, such as in landscaped settings and urban gardens. In addition, former habitat within the development footprint of the DRIC and HGP where Willowleaf Aster previously occurred prior to transplantations is not identified as critical habitat. All plants previously occurring inside the DRIC and HGP footprint have been transplanted into existing or restored suitable habitat. Sites where Willowleaf Aster has been transplanted are being considered for critical habitat identification where it can be determined that naturally-occurring Willowleaf Aster previously occupied the site prior to transplantation. Sites where Willowleaf Aster have been transplanted where there is no evidence of previous presence of Willowleaf Aster (i.e., R2: St. Clair NWA, Chatham-Kent) are not being considered for critical habitat identification until it can be determined that the plantings are successful. Determination of restoration success and viability, as measured through plant vigour and fitness, must precede identification of critical habitat at restoration sites at this time. Critical habitat may be identified at restoration sites following long-term monitoring to determine success, extent of suitable habitat and site occupancy.

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

8.1.1 Habitat Occupancy

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

Habitat is considered occupied when:

- at least one native Willowleaf Aster individual has been observed since 1995.

Habitat occupancy is based on a timeframe that is consistent with NatureServe's (2002) and Ontario's Natural Heritage Information Centre's (NHIC) threshold for considering populations to be existing versus historic, and allows for inclusion of a number of native

sub-populations that likely persist but which have not been recently surveyed. Willowleaf Aster is a late-flowering species and, due to this, is likely under-reported. When not in flower the species is difficult to identify and easily overlooked. There are four locations where the Willowleaf Aster has not been observed in over 20 years for which confirmation of current status is required.

8.1.2 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, the extant populations of the Willowleaf Aster are generally found in tallgrass prairies, oak savanna, thickets and meadows where the habitat is open and unshaded (Jones 2013). The species may also occur at the edges of woods, in woodland openings and in human-made habitats created from human disturbance (e.g., railway embankments, roadsides, abandoned agricultural fields) (Jones 2013). Moist soils are preferred and several populations are found along streams, drains, ditches and dykes (Jones 2013).

The biophysical attributes of suitable habitat for the Willowleaf Aster include the characteristics described below:

- Open habitat with little woody growth (<50% shrub component)
- Presence of other forb¹⁷ species are the same height or shorter than Willowleaf Aster
- Where tall forbs (i.e., taller than Willowleaf Aster) are present (e.g., sunflowers (*Helianthus* spp.), Tall Tickseed (*Coreopsis tripteris*), Dense Blazing Star (*Liatris spicata*), Big Bluestem (*Andropogon gerardii*) or Indian Grass (*Sorghastrum nutans*)), they are not dominant and do not create dense shade
- Moist or damp soils

When the species occurs within a non-linear habitat, such as tallgrass prairie or in an old field, suitable habitat for the Willowleaf Aster is defined as the extent of the biophysical attributes where the Willowleaf Aster exists in Ontario. In addition, a critical function zone of 50 m (radial distance) is applied when the biophysical attributes around a plant extend for less than 50 m.

When the species occurs within a linear habitat, such as a railway embankment, road-side ditch or utility corridor (i.e., where there is no limit to the immediate extent of suitable habitat), suitable habitat is defined as the extent of the biophysical attributes within 100 m from a Willowleaf Aster in both directions parallel to the linear feature. 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.

¹⁷ Any herbaceous plant that is not a grass

In Ontario, suitable habitat for the Willowleaf Aster may be described using the Ecological Land Classification (ELC) framework for 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 hydrology and topography, and as such encompasses the biophysical attributes of the habitat for the Willowleaf Aster. In Ontario, ELC terminology and methods are familiar to many land managers and conservation practitioners who have adopted this tool as the standard approach for Ontario.

Within the ELC system in Ontario, the ecosite boundary best captures the extent of biophysical attributes required by the species. The ecosite includes the areas occupied by Willowleaf Aster and the surrounding areas that provide suitable habitat conditions (e.g., open, periodically disturbed, moist or damp areas) 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. The occupied ELC ecosite should provide sufficient opportunity for the expansion of populations, thus supporting the component of the population and distribution objective related to increasing the abundance of extant populations where necessary. In linear habitats, the suitable ELC ecosite will typically be a human modified habitat type and the 100 m parallel distance should also allow for natural processes (increases to abundance, dispersal and pollination) to occur. Ecosites containing Willowleaf Aster have been described in Ontario as Fresh – Moist Tallgrass Prairie, Fresh - Moist Tallgrass Savannah, edges and openings in Fresh – Moist Tallgrass Woodland, Mineral Cultural Meadow, Mineral Cultural Thicket, Mineral Cultural Savannah and Mineral Cultural Woodland.

The 50 m radial distance used in both the linear and non-linear habitats is considered a minimum 'critical function zone', or the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g. essential light, moisture, humidity levels necessary for survival). At present, it is not clear at what distance physical and/or biological processes begin to negatively affect Willowleaf Aster. Studies on micro-environmental gradients at habitat edges, i.e., light, temperature, litter moisture (Matlack 1993), and of edge effects on plants in mixed hardwood forests, as evidenced by changes in plant community structure and 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 Willowleaf Aster plant is deemed an appropriate minimum distance to ensure microhabitat properties for rare plant species occurrences are incorporated in the identification of critical habitat. The area within the critical function zone may include both suitable and unsuitable habitat as Willowleaf Aster may be found near the transition area/zone between suitable and unsuitable habitat (e.g. within small forest openings, or along woodland edges). As new information on species' habitat requirements and site-specific characteristics, such as hydrology, become available, these distances may be refined.

8.1.3 Application of the Criteria to Identify Critical Habitat for the Willowleaf Aster

In non-linear habitat, critical habitat for the Willowleaf Aster is identified as the extent of suitable habitat (section 8.1.2) where the occupancy criterion (section 8.1.1) is met. In linear habitat, critical habitat is identified as the suitable habitat within a 50 m radial distance of a plant and the 100 m distance parallel in both directions along a linear feature (section 8.1.2) that meet the habitat occupancy criteria (section 8.1.1). In cases where the suitable habitat extends for less than 50 m around a Willowleaf Aster, 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 Willowleaf Aster is most appropriately identified at the ELC ecosite level. At the present time, ecosite descriptions are only available for some populations and boundaries are not available to support the identification of critical habitat for all populations in Ontario. In the interim, where ELC ecosite boundaries are not available, the 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 8.1.2 are found and where the occupancy criterion is met (section 8.1.1). When ecosite boundaries are determined, the identification of critical habitat will be updated.

In applying the critical habitat criteria above to the best available data as of December 2014, critical habitat is described for nine existing populations of the Willowleaf Aster in Canada (Figure 2; see also Table 1) totaling up to 593 ha. The critical habitat identified is considered a partial identification of critical habitat and is insufficient to meet the population and distribution objectives. Available information on the species and population status at a number of locations is outdated, lacking detailed spatial references or unavailable to Environment Canada. Specifically, critical habitat could not be identified for the Walpole Island First Nation population (Population #1), a number of sub-populations of the Windsor - LaSalle population and the four populations listed with an unknown population status (see Part 2). A schedule of studies (section 8.2) has been developed to provide the information necessary to complete the identification of critical habitat that will be sufficient to meet the population and distribution objectives.

Critical habitat for the Willowleaf Aster is presented using a 1 x 1 km Standardized UTM grid squares (Table 1). The UTM grid squares presented in Figure 2. 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 Standardized UTM grid respects data-sharing agreements with the province of Ontario. Critical habitat within each grid square occurs where the description of habitat occupancy (section 8.1.1) and habitat suitability (section 8.1.2) are met. Any human-made structures and any areas outside the critical function zone that do not correspond to the biophysical attributes of suitable habitat for the Willowleaf Aster (see section 8.1.2) are not considered critical habitat. More detailed information on critical habitat may be requested on a need-to-know

basis by contacting Environment Canada – Canadian Wildlife Service at ec.planificationduretablissement-recoveryplanning.ec@canada.ca.

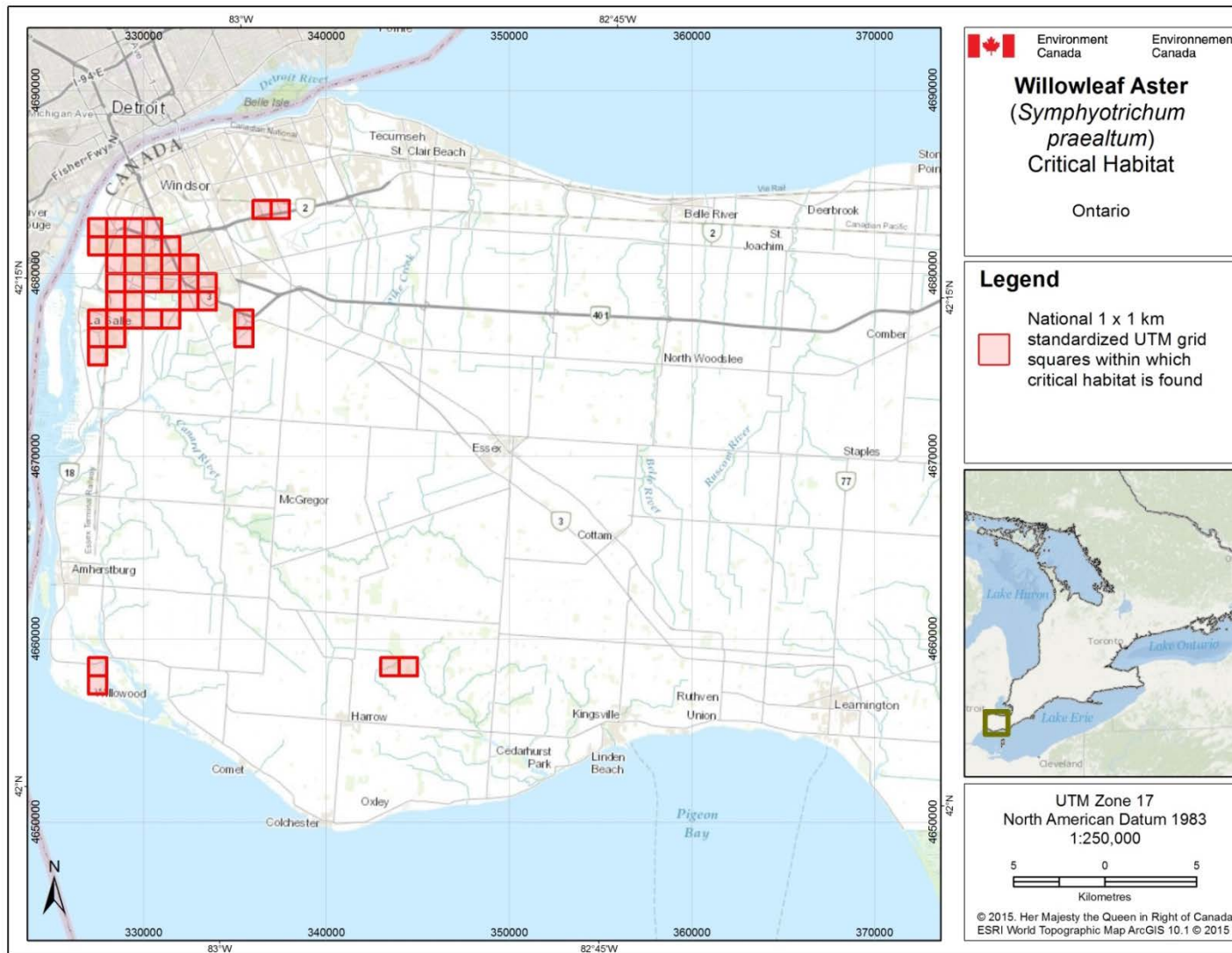


Figure 2. Grid squares that contain critical habitat for the Willowleaf Aster in Canada. Critical habitat for the Willowleaf Aster occurs within these 1 x 1 km standardized UTM grid squares (red shaded outline), where the description of habitat occupancy (section 8.1.1) and habitat suitability (section 8.1.2) are met.

Table 1. Grid squares that contain critical habitat for the Willowleaf Aster in Canada. Critical habitat for the Willowleaf Aster occurs within these 1 x 1 km standardized UTM grid squares where the description of habitat occupancy (section 8.1.1) and habitat suitability (section 8.1.2) are met.

Population	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		
2. Windsor-LaSalle North	17LG2789	Ontario	328000	4679000	457	Non-federal Land
	17LG2798		329000	4678000		
	17LG2799		329000	4679000		
	17LG2871		327000	4681000		
	17LG2872		327000	4682000		
	17LG2880		328000	4680000		
	17LG2881		328000	4681000		
	17LG2882		328000	4682000		
	17LG2890		329000	4679000		
	17LG2891		329000	4679000		
	17LG2892		329000	4678000		
	17LG3709		330000	4679000		
	17LG3719		331000	4679000		
	17LG3728		332000	4678000		
	17LG3729		332000	4679000		
	17LG3738		333000	4678000		
	17LG3739		333000	4679000		
	17LG3800		330000	4680000		
	17LG3801		330000	4681000		
	17LG3802		330000	4682000		
3. East of Huron Church Road, Windsor	17LG3810	Ontario	331000	4680000	2	Non-federal Land
	17LG3811		331000	4681000		
4. Windsor East Side Railway Corridor	17LG3863	Ontario	336000	4683000	3	Non-federal Land
	17LG3873		337000	4683000		
5. LaSalle West	17LG2775	Ontario	327000	4675000	53	Non-federal Land
	17LG2776		327000	4676000		
	17LG2777		327000	4677000		
	17LG2786		328000	4676000		
	17LG2787		328000	4677000		
6. LaSalle Centre	17LG2787	Ontario	328000	4677000	25	Non-federal Land
	17LG2788		328000	4678000		
	17LG2797		329000	4677000		
7. LaSalle East	17LG3707	Ontario	330000	4677000	32	Non-federal Land
	17LG3717		331000	4677000		
8. Big Creek Conservation Area, Amherstberg	17LG2577	Ontario	327000	4657000	4	Non-federal Land
	17LG2578		327000	4658000		

9. Colchester South, Essex Co.	17LG4538	Ontario	343000	4658000	2	Non-federal Land
	17LG4548		344000	4658000		
R1. DRIC-WEP: Southeast Windsor	17LG3856	Ontario	335000	4676000	15	Non-federal Land
	17LG3857		335000	4677000		
Total = ~ 593 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 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 are provided as a general location only.

^c The area presented is that of the unit(s) containing critical habitat (rounded to the nearest 1ha); therefore, the actual area of critical habitat may be significantly less. Refer to Section 7.1 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.

8.2 Schedule of Studies to Identify Critical Habitat

Table 2. Schedule of Studies

Description of Activity	Rationale	Timeline
Undertake field visits to confirm the status of populations and/or sub-populations not visited since 1995. If present, determine extent of suitable habitat at these locations.	Some populations and/or sub-populations have not been visited recently or have an unknown population status. If found to exist, identify critical habitat.	2015-2022
Confirm/obtain population information and determine extent of suitable habitat for any populations and/or sub-populations known to be existing but where precise spatial information is not currently available to Environment Canada.	Spatial information is either lacking or not available to Environment Canada. Obtaining or confirming this information is required to identify additional critical habitat.	2015-2022

8.3 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 3 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 3. Activities Likely to Destroy Critical Habitat

Description of Activity	Descriptions of Effect in Relation to Function Loss	Details of Effect
Residential, commercial, industrial or agricultural development (e.g., construction of houses, other structures or roads, including removal of soils)	Construction converts habitat and results in the direct loss of critical habitat upon which the species relies for basic survival, successful seed germination and seedling establishment. Direct removal of soil/substrate would render the habitat unsuitable for Willowleaf Aster by removing the biophysical attributes required by the species. Agricultural and other development can result in changes to soil moisture levels such that habitat becomes unsuitable for Willowleaf Aster.	When this activity occurs within the bounds of critical habitat, at any time of year, the effects will be direct, and is certain to result in the permanent destruction of critical habitat.
Activities that introduce invasive species, especially vascular plants (e.g., introduction of non-native plant seeds, plants, foreign soil or gravel, composting or dumping of garden waste, ATV use, livestock grazing)	Introducing invasive species can result in Willowleaf Aster being outcompeted by the invasive species, and/or can result in physical and chemical changes to habitat such that it is no longer suitable for the Willowleaf Aster.	When this activity occurs within or adjacent to critical habitat at any time of year can result in introduction of an invasive species that can lead to gradual destruction of critical habitat over time.
Habitat degradation (e.g., operation of motorized vehicles, such as ATVs and dirt bikes, trucks, heavy equipment; dumping of garbage)	Operation of motorized vehicles results in soil compaction, which has the potential to alter the physical environment of Willowleaf Aster. Garbage dumping physically covers the substrate required by Willowleaf Aster for its growth and development, and/or alter the chemical or physical properties of the soil.	When these activities occur within critical habitat, the effects would be direct. Negative effects of operation of motorized vehicles would occur if the activity were undertaken in any season except when the ground is frozen. Garbage dumping would have damaging effects at any time of year. These activities are likely to result in destruction of critical habitat in that they would alter the physical and possibly chemical environment upon which the species depends.
Application of herbicides or fungicides	Herbicides and fungicides may temporarily or permanently persist in soils, altering the biophysical environment depends upon for germination and growth throughout its life cycle. However, some benefit may be obtained by the	When this activity occurs within critical habitat during Willowleaf Aster's active growing season, the effects may be direct and/or cumulative. However, if applied according to best practices for the purposes of invasive species control, at the right time of year and

Description of Activity	Descriptions of Effect in Relation to Function Loss	Details of Effect
	application of herbicides if used to control invasive plant species (see above).	by qualified individuals, this activity has the potential to provide benefit to Willowleaf Aster and its critical habitat by controlling other threats.
Mowing and/or cutting of vegetation	Although Willowleaf Aster prefers open habitats, frequent mowing of vegetation may not necessarily result in suitable habitat conditions (Jones 2013). Frequent and uncontrolled mowing has the potential to alter the native species composition of Willowleaf Aster habitat by advantaging plant species that can tolerate repeated disturbance. However, mowing and cutting of vegetation can be used as a management technique instead of prescribed burning, and is likely to keep habitat open, providing benefit to critical habitat.	When this activity occurs too frequently within critical habitat or at inappropriate times, the effects on critical habitat may be direct. However, if undertaken for the purposes of habitat restoration, with the correct frequency and timing, and by qualified individuals, this activity has the potential to provide benefit to critical habitat

9. Measuring Progress

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

- The current distribution and abundance has been maintained for all existing populations and sub-populations.
- The abundance of Willowleaf Aster, where necessary, has been increased.

10. Statement on Action Plans

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

11. 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](#)¹⁸. 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](#)'s¹⁹ (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.

In general, protecting the open prairie habitat of this species in Canada will benefit other species and ecosystem functions within the heavily altered Carolinian life zone. Willowleaf Aster shares the same habitat type as other plant species at risk such as Dense Blazing Star (*Liatris spicata*) and Colicroot (*Aletris farinosa*), and in the Windsor - LaSalle area, it frequently occurs together with these species (Jones 2013). Other plant species at risk noted within the footprint of the Detroit River International Crossing and the Windsor-Essex Parkway include Kentucky Coffee-tree (*Gymnocladus dioicus*), American Chestnut (*Castanea dentata*), Common Hoptree (*Ptelea trifoliata*), Shumard Oak (*Quercus shumardii*), Climbing Prairie Rose (*Rosa setigera*), and Riddell's Goldenrod (*Solidago riddellii*) (CEAA 2009). Willowleaf Aster may occur with or near these species as well. At-risk fauna that can occur within the prairie habitat and range of Willowleaf Aster include the Butler's Gartersnake (*Thamnophis butleri*) and the Eastern Hog-nose Snake (*Heterodon platyrhinos*).

The potential for this recovery strategy to inadvertently lead to adverse effects on other species was considered. Some management activities, including prescribed burns and control of invasive species using herbicides, have the potential to harm certain other species, at least in the short term. The ecological risks of such activities must be considered individually before undertaking them, in order to reduce possible negative effects. For example, the timing of management activities can be controlled (e.g., prescribed burning in the early spring or other suitable time periods) to minimize effects on amphibians, reptiles and/or insects.

¹⁸ <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

¹⁹ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1

Because of the potential benefit of prairie conservation and management to several other species at risk, 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 Willowleaf Aster (*Symphotrichum Praealtum*) in Canada and the United States

Willowleaf Aster (<i>Symphotrichum praealtum</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	N2	Ontario (S2)	NNR	Alabama (SNR), Arkansas (SNR), Connecticut (SU), District of Columbia (SX), Florida (SNR), Georgia (S1?), Illinois (SNR), Indiana (SNR), Iowa (S4), Kansas (SNR), Kentucky (S2), Louisiana (SNR), Maine (SNR), Maryland (S1), Massachusetts (SH), Michigan (S3), Minnesota (SNR), Mississippi (SNR), Missouri (SNR), Nebraska (SNR), New Hampshire (SNR), New Jersey (SNR), New York (SNR), Ohio (SNR), Oklahoma (SNR), Pennsylvania (S3), Rhode Island (SNR), South Dakota (SNR), Tennessee (S1), Texas (SNR), Vermont (SNR), Virginia (S1), West Virginia (S3), Wisconsin (SNR)

Rank Definitions (NatureServe 2014)

S1: Critically Imperilled (State) - 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.

N2/S2: Imperilled (National/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/S5: Secure (Global/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.

SU: Unrankable (State) - An occurrence rank cannot be assigned due to lack of sufficient information on the occurrence.

SH: Historical (State) - Recent field information verifying the continued occurrence is lacking.

SX: Extirpated (State) - Adequate surveys by one or more experienced observers at times and under conditions appropriate for the species at the occurrence location, or other persuasive evidence, indicate that the species no longer exists there or that the habitat or environment of the occurrence has been destroyed to such an extent that it can no longer support the species.

NNR/SNR: Unranked - National or subnational conservation status not yet assessed.

?: Used to indicate uncertainty in any of the above ranks, usually because data is lacking.

**Part 2 – *Recovery Strategy for the Willowleaf Aster*
(*Symphotrichum praealtum*) in Ontario, prepared by
Judith Jones for the Ontario Ministry of Natural Resources**

Photo: Allan Woodrille

Willowleaf Aster

(*Symphotrichum praealtum*) in Ontario

Ontario Recovery Strategy Series

Recovery strategy prepared under the Endangered Species Act, 2007

2013

Natural. Valued. Protected.

Ministry of Natural Resources



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: Willowleaf Aster at Ojibway Park by P. Allen Woodliffe. *This photo may not be used separately from this recovery strategy without permission of the photographer.*

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DECLARATION

The recovery strategy for the Willowleaf Aster 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

Willowleaf Aster (*Symphotrichum praealtum*) is listed as threatened under Ontario's *Endangered Species Act, 2007* and on Schedule 1 of the federal *Species at Risk Act* (SARA). It is a herbaceous, perennial plant that spreads vegetatively from rhizomes, forming colonies. The species is fall-flowering with pale lavender flowers. Willowleaf Aster requires cross-pollination from a genetically different individual for seed set. A recent genetic study found considerable genetic variability both among and within Willowleaf Aster populations in Windsor.

In Canada, Willowleaf Aster occurs only in southwestern Ontario. At least nine natural and two restoration populations are known to be extant. Most individuals of Willowleaf Aster are found in the City of Windsor and Town of LaSalle within an area of approximately 20 km². In this strategy, this area is treated as a single population. Outside this area, there are five other populations in Windsor – LaSalle, two elsewhere in Essex County, and one on the Walpole Island First Nation. In addition, there are four populations with unknown status and four considered historical or extirpated. Tens of thousands of stems of Willowleaf Aster were found during preparations for the Detroit River International Crossing and Windsor Essex (Rt. Hon. Herb Gray) Parkway and are being transplanted into 34 restoration sites in Windsor.

In Canada, Willowleaf Aster is found in tallgrass prairies, oak savannas, meadows and woodland openings as well as open anthropogenic habitats such as abandoned fields, along railways and roadsides, and on the banks of streams, drains and ditches. The habitat must have disturbance, such as fire or human-made clearing, to remain open and suitable. The species prefers moist soils.

Threats to Willowleaf Aster include development, an altered disturbance regime, invasive species, conversion of habitat to agricultural use, mowing, herbicide use, habitat degradation and deer browsing.

The recovery goal is to maintain the current distribution, number and viability of all extant populations and corresponding subpopulations of Willowleaf Aster by maintaining, improving, and protecting habitat and reducing other threats. The protection and recovery objectives are to:

1. assess threats and plan measures for mitigation and reduction;
2. maintain or improve habitat suitability at all existing sites;
3. ensure adequate habitat and species protection by monitoring and initiating recovery actions when necessary; and
4. fill knowledge gaps.

It is recommended that the area to be prescribed for a habitat regulation include all sites where Willowleaf Aster has been reported unless the species is proven extirpated. In natural tallgrass prairie and oak savanna vegetation, it is recommended that the entire Ecological Land Classification (ELC) polygon in which Willowleaf Aster is present plus a protective zone of 50 m around the outside of the polygon boundary be prescribed. In

anthropogenic habitat and in natural tallgrass woodland vegetation it is recommended the entire continuous open area be prescribed, as well as a 50 m protective zone beyond the outside boundary, with a minimum 50 m radial distance around patches of Willowleaf Aster. In linear habitats, such as railway embankments, it is recommended that the prescribed area have a maximum length of 100 m. It is recommended that restoration sites be included in the habitat regulation.

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1. BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Willowleaf Aster
SCIENTIFIC NAME: <i>Symphyotrichum praealtum</i> var. <i>praealtum</i>
SARO List Classification: Threatened
SARO List History: Threatened (2004)
COSEWIC Assessment History: Threatened (2003), Special Concern (1999)
SARA Schedule 1: Threatened
CONSERVATION STATUS RANKINGS: GRANK: G5 NRANK: N2 SRANK: S2

The glossary provides definitions for the abbreviations above and for technical terms used in this document.

1.2 Species Description and Biology

Species Description

Willowleaf Aster, also called Willow Aster [*Symphyotrichum praealtum* (Poir.) Nesom; formerly *Aster praealtus* Poir.] is a herbaceous perennial plant that spreads vegetatively from rhizomes. The upright stems are smooth, waxy and usually 50 to 150 cm tall, with alternate, narrow leaves that attach directly to the stem with no stalk or only a short taper from the leaf. Leaves on the lower part of the plant may grow up to 14 cm long and 1 cm wide, while leaves on the upper and middle branches are shorter (Semple et al. 2002).

Willowleaf Aster flowers from late September through October and sometimes into November. It produces a tall, pyramidal cluster of pale lavender composite flowers. Individual flower heads have 20 to 35 ray flowers that are 5 to 9 mm long and 1.7 mm wide, and a yellow central disk that becomes purple. The seed-like fruit is compressed and sparsely hairy, with a whorl of bristles about 5.5 mm long at the top. For further description and illustrations, see Semple et al. (2002).

Identifying asters can sometimes be difficult. Willowleaf Aster can be differentiated from other asters that have pale purple flowers by the smooth, waxy (glaucous) stems and pronounced veins on the undersides of the stiff leaves. Willowleaf Aster somewhat resembles the very common Panicked Aster (*S. lanceolatum*), but the latter lacks the

pronounced leaf veins and has longer bristles on the fruits, which may give the disc a whitish to pale yellow tone (Semple et al. 2002).

Species Biology

Due to its growth from rhizomes, Willowleaf Aster forms clusters or colonies of many stems (also called clones), all of which belong to a single plant and are thus genetically identical. For successful fertilization and seed set, Willowleaf Aster must cross-pollinate with a genetically different individual (Jones 1978). Self-fertilization is possible but does not usually occur (Zhang 1999). In a study of 10 species of perennial asters including Willowleaf Aster, Jones (1978) found that self-fertilization produced an average of less than 0.1% of potential achenes. As a result, in large colonies thousands of heads may bloom but produce only a few seeds because flowers must receive pollen from a different colony to set seed.

For cross-pollination to be possible, individuals from different colonies must grow in close enough proximity that insect pollinators can travel among them. If colonies of Willowleaf Aster are too far apart, it may result in reduced seed set. However, in the course of several seasons Willowleaf Aster clones may expand by vegetative reproduction from a shady spot into a more favourable position and subsequently flower. In this way, the species may bridge a gap with adjacent populations in order to accomplish pollen transfer and seed production (Jones 1978). Willowleaf Aster is also able to spread from fragmentation of the rhizomes (WEMG 2012).

Willowleaf Aster is insect pollinated. Asters are pollinated by a large variety of insect species, with butterflies and moths favouring the purple-flowered species (Jones 1978). No information was available on pollinators specific to Willowleaf Aster. Flowering in asters is triggered by an interaction between day length and temperature (Jones 1978). Willowleaf Aster is a very late-flowering species. Fruits of Willowleaf Aster may disperse either by falling from the plants by gravity or by being blown from the plant when the wind catches in the bristles on the fruits.

The distance that wind-blown aster fruits can travel is unknown but may be less than theorized. It is hard to predict dispersal distance because it is related to a number of changeable factors, including wind speed, weather conditions and humidity, release height, plume-loading and the height of the surrounding vegetation (Soons et al. 2004). Dispersal in the Aster Family is most favourable in fair weather with low humidity, which opens and stiffens the bristles on the fruits. In such conditions, wind speed is usually low (Sheldon and Burrows 1973). Tackenberg et al. (2003) studied the wind dispersal potential of 335 grassland species with a variety of adaptations presumed to aid in wind dispersal. They found that none of the species studied reached dispersal distances of 100 m. They found that some long-distance dispersal does occur in extreme weather conditions but that in open, flat landscapes this happens only rarely. Sheldon and Burrows (1973) conclude that in most cases, long distance dispersal in the Aster Family is prevented unless convection currents can carry fruits high up in the air.

Newmaster et al. (2012) investigated the genetic variability of nine populations of

Willowleaf Aster in the City of Windsor. Each population was genetically fairly unique with a high genetic distance among populations. Considerable diversity was shown at several scales in genomic variation, from whole genome size to sequence variation in the nuclear and chloroplasts to that of variation in alleles, clones and genetic distance. Clonal diversity within populations was considerable and no genotypes were shared between any of the sampled populations. The size of the genome was found to be comparable to that of other aster species. The authors concluded that the combination of clonal and sexual reproduction is responsible for the high level of genetic diversity.

Little is known about the ecological role of Willowleaf Aster, but asters and goldenrods (*Solidago* spp.) flower late in the summer and are likely an important source of nectar and pollen for a wide variety of invertebrates at that time of year.

1.3 Distribution, Abundance and Population Trends

The global range of Willowleaf Aster extends from the northeastern United States, west to Nebraska and south to Texas and adjacent northern Mexico. Several varieties have been recognized, but the validity of some still need confirmation (Brouillet et al. 2006). The main variety of the species, *S. praealtum* var. *praealtum*, extends into Canada.

In the United States, Willowleaf Aster is found in 32 states. It occurs in northern Mexico, in the states of Nuevo Leon, Chihuahua and Coahuila (Brouillet et al. 2006). In all but two jurisdictions, it has not been given any conservation ranking. However, in New York it is ranked S5 or Secure, and in New Jersey it is ranked S1 and legally listed as endangered. Globally, the species is considered secure and ranked G5 (NatureServe 2012). In Ontario, Willowleaf Aster is ranked S2 or imperilled¹ (NHIC 2012).

In Canada, Willowleaf Aster is only found in southwestern Ontario. At least nine natural populations and two restoration populations from mitigation work are known to be extant (Figure 1; Table 1). Most individuals of Willowleaf Aster are found in the City of Windsor and the Town of LaSalle (just to the south) in an area of roughly 20 km², straddling the line between the two municipalities. Within this area, there are numerous patches of Willowleaf Aster, most of which are within 1 km of one another and thus would be considered subpopulations of a single population or occurrence². There has been a lot of recent field work (2009–2012) in this area, and many new patches of Willowleaf Aster have been discovered. These have connected many patches that were previously treated as separate populations by COSEWIC (2003) and NHIC (2012). Some patches may or may not be considered part of this large population, depending on whether or not there is suitable habitat present between patches or if there are barriers to dispersal. As well, some new patches are being established as mitigation for highway construction (see below), and these may or may not be treated the same as natural patches when evaluating which patches belong to this large population. However, for the purpose of

¹ See glossary on page 19 for an explanation of G- and S-ranks.

² Populations are groups of plants separated from each other by more than 1 km. Patches that are in closer proximity to each other are considered subpopulations of a single population (NHIC 2012).

discussion in this recovery strategy, most of the Windsor - LaSalle subpopulations will be treated as a single, large population.

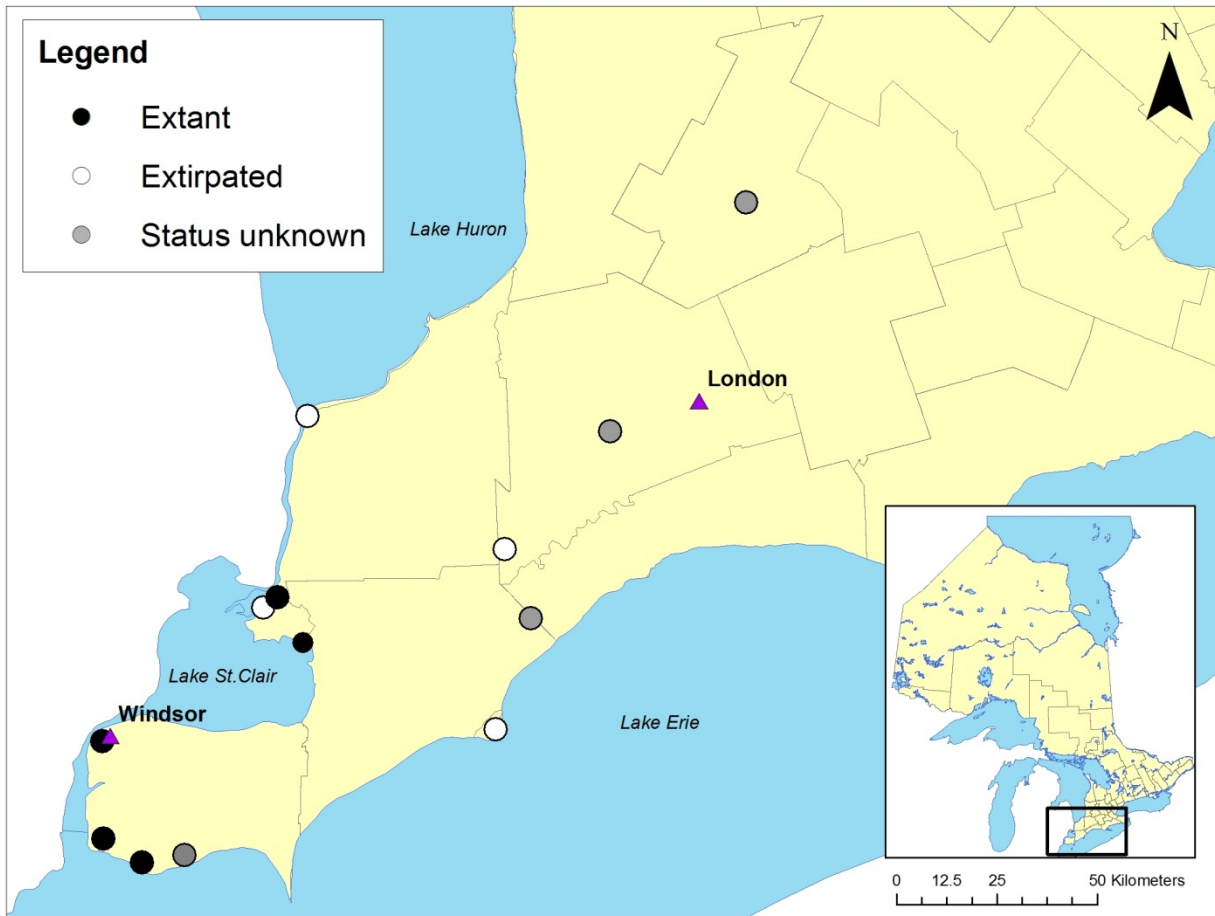


Figure 1. Historical and current distribution of Willowleaf Aster in its Canadian range in southwestern Ontario. Note: black dot at Windsor represents several extant populations.

Table 1. Populations of Willowleaf Aster in Canada showing current status (extant, unknown, or extirpated) and abundance if known. Extant populations are numbered and shown in bold type. An R denotes a restoration site that could be considered a stand-alone population based on distance from other subpopulations. Sources: Bkejwanong Natural Heritage Centre 2006; P.D. Pratt, pers. comm. 2010; Town of LaSalle 2010; P.A. Woodliffe, pers. comm. 2011-2012; R. Gould, pers. comm. 2012; D. Lebedyk, pers. comm. 2012; NHIC 2012; G.E. Waldron, pers. comm. 2012; WEMG 2012.

POPULATION Subpopulation (indented)	Current Status	Last Obs.	Abundance at last observation
1. WALPOLE ISLAND FIRST NATION	Extant	Post-2000	No data
2. WINDSOR-LASALLE NORTH including:	Extant		
Ojibway Prairie Provincial Nature Reserve	Extant	2009	Dozens of stems
West of Matchette Rd near Raceway	Extant	2011	Hundreds of stems
Spring Garden Natural Area	Extant	2011	"very large population"
Tallgrass Prairie Heritage Park	Extant	2007	Locally common
Ojibway Park	Extant	2007	>100 stems
Black Oak Heritage Park	Unknown*	1994	~50 plants
DRIC-WEP**: 29 restoration sites	Extant	2011	>120,000 stems
Between Matchette and Malden Roads	Unknown	2004	One plant
St. Clair College SCC Prairie and several other sites	Extant	2010	>50 plants
DRIC-WEP: 3 restoration sites	Extant	2011	Present
LaSalle North	Extant	2010	Present
LaSalle Northwest	Extant	2010	Present
LaSalle-Windsor Railway Corridor	Extant	2012	Present
3. EAST OF HURON CHURCH ROAD, WINDSOR	Extant	2010	Hundreds of stems
4. WINDSOR EAST SIDE RAILWAY COORIDOR	Extant	2009	"large population"
5. LASALLE WEST	Extant	2010	Present
6. LASALLE CENTRE	Extant	2010	Present
7. LASALLE EAST	Extant	2010	Present
8. BIG CREEK CONSERVATION AREA, AMHERSTBERG	Extant	2012	At least 10 flowering stems
9. COLCHESTER SOUTH, ESSEX CO.	Extant	2010	Present
R1.DRIC-WEP: SOUTHEAST WINDSOR 2 restoration sites	Extant	2011	Present
R2. ST. CLAIR NATIONAL WILDLIFE AREA, CHATHAM-KENT	Extant	2013	180 stems to be transplanted in 2013
Cedar Creek Conservation Area, Essex County	Unknown* but likely extant	1984	Small clump
Near Mt. Brydges, Caradoc Township, Middlesex County	Unknown* but likely extirpated	1992	"Rare" Not found in 1998
North of Highgate, Orford Township, Chatham-Kent	Unknown*	1991	"Common"

Recovery Strategy for the Willowleaf Aster in Ontario

POPULATION Subpopulation (indented)	Current Status	Last Obs.	Abundance at last observation
Ellice Township, Perth County	Unknown*	1983	Small clump
Cairngorm intersection Middlesex County	Extirpated	1960	
Rondeau Provincial Park Chatham-Kent	Extirpated	1956	Not found in life science inventory of 2011–2012
Pt. Edward (Sarnia) Lambton County	Extirpated	1958	
Squirrel Island	Extirpated	1916	

The NHIC currently lists these locations as historic because they have not been visited in more than 20 years. It does not mean the species is not extant at these locations. For the purposes of the recovery strategy the status of these sites at these locations is considered 'unknown'.

** DRIC-WEP: corridor of the Detroit River International Crossing and Windsor Essex Parkway, discussed next page.

In addition to the large Windsor-LaSalle population discussed above, there are at least five other populations in the City of Windsor or Town of LaSalle, two elsewhere in Essex County (R. Gould, pers. comm. 2012, D. Lebedyk, pers. comm. 2012, G.E. Waldron, pers. comm. 2012, P.A. Woodliffe, pers. comm. 2010), and at least one on the Walpole Island First Nation in the St. Clair River delta. In addition, there are four populations that have not been visited since the early-1990s (or earlier), and it is unknown if any of these are still extant. An additional four populations are considered extirpated (NHIC 2012).

A patch of Willowleaf Aster may contain one or many individuals, and it is usually difficult to tell how many true genetic individuals are present at a given location. Therefore, in this document, the number of stems is used for the purposes of making comparisons in population size or extent.

Willowleaf Aster may be easily overlooked and is probably under-reported. In southwestern Ontario, the species flowers from late September through October, sometimes continuing as late as mid-November (P.A. Woodliffe, pers. comm. 2010, E. Reimer, pers. comm. 2012). However, very little biological field work is done this late in the fall because most other species have already completed their growing season. During summer field work Willowleaf Aster would not be in flower, and sterile aster plants are difficult to identify. In addition, Willowleaf Aster is known to colonize some disturbed areas and abandoned agricultural fields (G.E. Waldron, pers. comm. 2012), places not often explored by botanists. New discoveries of the species in the City of Windsor (WEMG 2012) and the Town of LaSalle (2010) seem to indicate that the species may be more abundant and widespread than had been previously reported although it is still restricted to a very small range in southwestern Ontario.

There are no accurate trend data available for Willowleaf Aster populations in Canada. The most recent COSEWIC status report (COSEWIC 2003) was based on field work done in 1997. That report listed 12 populations as extant, including one on Walpole

Island First Nation and seven that are now considered part of the large Windsor-LaSalle population. The remaining four populations are those with unknown status in Table 1. Therefore, there is very little current or past abundance data available for use in comparisons. It is unknown whether any subpopulations have been lost, but it can be inferred that some patches may have been lost due to development in Windsor. However, many other new subpopulations have been discovered recently, making it difficult to detect a trend. Furthermore, in the last 20 years the number of abandoned agricultural fields has increased, some of which may provide suitable habitat. It is reported that Willowleaf Aster has moved into some of these types of places recently (G.E. Waldron, pers. comm. 2012), but whether this constitutes an increase in population size or not is unknown.

The Detroit River International Crossing and the Windsor-Essex (Rt. Hon. Herb Gray) Parkway

Willowleaf Aster is present in the corridor being developed for the Detroit River International Crossing (DRIC), the expansion of the Windsor-Essex (Rt. Hon. Herb Gray) Parkway (WEP), and the area that will become the federal customs plaza (Canada-U.S.-Ontario-Michigan Border Transportation Partnership 2009). A summary of work being done to mitigate impacts to the species is presented here because this work affects a large number of stems and thus a great proportion of the total Canadian population. As well, the results of mitigation and the success of the methods being used may provide guidance on how to do recovery work for Willowleaf Aster elsewhere.

During initial study work in the DRIC-WEP corridor, tens of thousands of stems of Willowleaf Aster were found (WEMG 2012). In February 2010, a permit was issued under the *Endangered Species Act, 2007* to the Ontario Ministry of Transportation (MTO) for the construction of the WEP. Activities authorized by the permit and related to Willowleaf Aster include tallgrass prairie creation, enhancement and restoration, as well as removing and transplanting Willowleaf Aster to approved restoration sites. In addition, monitoring the transplanted individuals will be required for five years after completion of the WEP, and long-term habitat protection must be ensured (WEMG 2012).

More than 30,000 stems of Willowleaf Aster are being removed from construction areas in the WEP corridor and transplanted to 34 approved restoration sites, most of which are just outside of the WEP corridor. Many sites already have Willowleaf Aster present (WEMG 2012). This work is expected to finish in the fall of 2013. Willowleaf Aster is being transplanted either as stems within intact sod clusters (1 m² soil sections), as rhizome cuttings, or as individual root masses. The methods used to remove plants, process rhizomes, and replant are described in WEMG (2012). At the end of 2011, roughly 17,600 root masses, 25,000 rhizome cuttings and 33,000 stems in sod clusters had been transplanted. Rhizome cuttings will augment the number of stems available for transplantation.

In addition, in June 2012 a permit was issued under the federal *Species at Risk Act (SARA)* for mitigation work on the land that will become the federal customs plaza for

the DRIC (Permit SARA-OR-2012-0197). This work will include transplanting 180 Willowleaf Aster stems and approximately 3804 m² of associated tallgrass prairie vegetation to the St. Clair National Wildlife Area (southern dot on Lake St. Clair in Figure 1, above).

It is expected that at the end of mitigation work, more than 120,000 stems will have been transplanted, which will represent a four-fold increase from the original number of stems removed from the corridor. It will also create an increase of at least an order of magnitude in the estimated number of stems of Willowleaf Aster in the entire Canadian population compared to the estimate given in the COSEWIC Assessment and Status Report (COSEWIC 2003). Furthermore, mitigation work will result in the creation of two new populations (shown as R1 and R2 in Table 1).

1.4 Habitat Needs

Prior to European settlement, Willowleaf Aster probably grew in tallgrass prairies that occurred east of the Great Plains and extended over large areas of the American mid-west and into southwestern Ontario. Prairies are believed to have developed during a warm, dry period about 5,000 years ago (Szeicz and MacDonald 1991). It is likely that the use of fire by First Nations as well as lightning strikes were key factors in the persistence of tallgrass prairies in Ontario, since fire is a factor that can limit the establishment and growth of woody plants in grasslands (Reichman 1987)

In Canada, Willowleaf Aster is mainly found in tallgrass prairies, oak savannas, thickets and meadows but may also occasionally be found at the edges of woods or in woodland openings. Willowleaf Aster also occurs in open, unshaded, anthropogenic habitats (open ground that is the result of human disturbance) where suitable soil, light and moisture conditions are present. Anthropogenic habitats used by Willowleaf Aster include railway embankments, roadsides, abandoned agricultural fields, utility corridors, vacant city lots and other areas (NHIC 2012, G. Waldron, pers. comm. 2012; P.A. Woodliffe, pers. comm. 2012). The species shows a preference for moist soils (Gleason and Cronquist 1991, Brouillet et al. 2006). Several populations are found along the banks of streams, drains, ditches and dikes. Within the Ojibway Prairie Complex³, Willowleaf Aster occurs in damp prairies and old fields (Pratt 2007). In Michigan, Willowleaf Aster habitat is reported as moist fields (including recent clearings) and prairies (Voss 1996, Reznicek et al. 2011). G.E. Waldron (pers. comm. 2012) has observed that the species does better in lighter, sandy soil.

A detailed description of the habitat conditions in which Willowleaf Aster has been found was made by P.A. Woodliffe (pers. comm. 2011). The sites where he observed Willowleaf Aster included very good quality tallgrass prairie and oak savanna communities but also disturbed sites, usually those that had been left alone for awhile and were moving towards an old field or early re-developing prairie. Most sites were

³ The Ojibway Prairie Complex is a conglomerate of parks and protected areas in the City of Windsor. It is part of the Windsor-LaSalle North population.

quite open, with relatively little woody growth, but the species was also seen doing fairly well even with a shrubby component of probably up to 50%. As well, the species was seen at the edges of woodlands with a young tree canopy with a south-facing aspect that provided a lot of sunlight. In a mostly herbaceous setting, most of the forb species were the same height or lower than Willowleaf Aster although some taller prairie species were usually present, such as sunflowers (*Helianthus* spp.), Tall Tickseed (*Coreopsis tripteris*), Dense Blazing Star (*Liatris spicata*), Big Bluestem (*Andropogon gerardii*) or Indian Grass (*Sorghastrum nutans*). However, the tall forbs were seldom dominant and the tall grasses generally did not create dense shade. Willowleaf Aster was also occasionally found under dogwoods (*Cornus* spp.) and sumac (*Rhus* spp.), as long as the area was still fairly open and filtered sunlight was still able to reach the plants.

The natural habitat of Willowleaf Aster has not been documented according to the Ecological Land Classification (ELC) (Lee et al. 1998). However, based on descriptive reports of community structure and composition around extant populations (P.A. Woodliffe, pers. comm. 2011, G. Waldron, pers. comm. 2012), Fresh-moist Tallgrass Prairie (TPO2-1), Fresh-moist Pin Oak – Bur Oak Tallgrass Savanna (TPS2-1) and edges and openings on Fresh-moist Tallgrass Prairie Woodland (TPW2) will provide suitable habitat. However, other suitable habitats, such as utility corridors, abandoned fields and the banks of drains and ditches are not well characterized by ELC vegetation types. In addition, COSEWIC (2003) reports the species from thickets, which also have not been characterized to a specific ELC vegetation type.

To remain open, the habitat of Willowleaf Aster must have periodic disturbance, such as fire, drought or human clearing, to prevent trees and shrubs from becoming established. Without disturbance, natural succession will lead to increasingly dense vegetation and shading, causing habitat to close in and become unsuitable. In anthropogenic habitats, disturbance from past human activities mimics, at least on a short-term basis, the natural disturbance required by the species and creates land that is sufficiently open to provide suitable habitat. Once the species is established in these habitats, repeated disturbance such as mowing, ploughing or All Terrain Vehicle (ATV) use may harm Willowleaf Aster plants. However, some level or type of periodic disturbance is required, and even mowing and ploughing may be useful if done as part of management practices to keep habitat open.

Willowleaf Aster appears to tolerate a broad range in the frequency and intensity of disturbance required. For example, the species is reported from highly disturbed areas, including urban land that was in the process of being developed into a parking lot (G.E. Waldron, pers. comm. 2012). On the other end of the spectrum, the species is also reported from areas with vegetation that has grown in to the point of having young tree cover (P.A. Woodliffe, pers. comm. 2011). Although fire and drought historically provided natural forms of required disturbance, today the activities of humans in utility corridors, along railway embankments and in other disturbed places also appear to provide adequate disturbance, at least over some time frames.

1.5 Limiting Factors

Willowleaf Aster is affected by biological limitations in its Canadian range. The species flowers very late in the fall and is often the last thing flowering in the Windsor area (E. Reimer, pers. comm. 2012). It sometimes flowers as late as mid-November, a time at which very few insects are present to serve as pollinators. Thus, it can be speculated that pollination may be a limitation in the late part of the season. Even if pollination is successful, the plants still have to set seed before extended frost or snowfall occurs, and the time span between flowering and the onset of winter conditions is probably shorter in Ontario than in portions of the species' range further south. It is possible that the species frequently experiences low or lost seed set in years when hard frost or snowfall arrives early. Southwestern Ontario has the longest growing season in the province, so the earlier arrival of winter in the rest of Ontario may be a natural limitation to the expansion of this species beyond its current range. Whether climate change may reduce limitations for Willowleaf Aster is unknown but may be a possibility if increased temperature increases the number of frost-free days.

Willowleaf Aster also is limited by a lack of suitable habitat. Of the hundreds of square kilometres of tallgrass prairie and savanna documented in early settlement times, only about 2100 ha or 0.5% remains, with the majority lost to agricultural and residential development (Bakowsky and Riley 1994). Today, apart from areas on the Walpole Island First Nation and in the Ojibway Prairie Complex, most remnant patches are small (<2 ha) and isolated. The natural ecological processes that would create and maintain habitat for Willowleaf Aster, such as wildfire, are compromised in such small patches.

1.6 Threats to Survival and Recovery

Residential, Commercial and Industrial Development

Habitat loss due to development is a significant threat, especially where prairie remnants are within urban areas (P.A. Woodliffe, pers. comm. 2011, R. Gould, pers. comm. 2012). These lands can be perceived as vacant and may be valuable to developers (see for example, City of Windsor 2002). As well, on Walpole Island First Nation, the needs of a rapidly growing community with a small land base continue to put pressure on tallgrass prairie habitat (Bkejwanong Natural Heritage Program 2006, Walpole Island Land Trust 2012).

Development may change soil moisture levels, and Willowleaf Aster prefers moist soils. Development may also replace natural vegetation with lawns which dry out more quickly. In addition, construction of new roads and ditches may re-route surface water flow and cause adjacent land to dry out. Seasonal fluctuation of soil moisture levels is also one of the natural processes that curtail the growth of woody species (Ambrose and Waldron 2005). Changes in soil moisture may cause habitat to become unsuitable.

Altered Disturbance Regime

Habitat degradation and loss from natural succession is a threat to Willowleaf Aster in many locations. Without fire or some other type of disturbance, natural succession proceeds, resulting in a dense growth of shrubs and trees that shade habitat and make it unsuitable for Willowleaf Aster. Where Willowleaf Aster occurs in an urban landscape, and where habitat patches are small and isolated, restoring the natural wildfire regime is not practical because there are people and infrastructure close by. Even the opportunities to use controlled burning may be limited. However, periodic burning is conducted in some parts of the Ojibway Prairie Complex and Walpole Island First Nation to deter the growth of trees and shrubs, but in other parts of these two areas, Willowleaf Aster is still threatened by succession from lack of natural disturbance (C. Jacobs, pers. comm. 2012, G.E. Waldron, pers. comm. 2012).

Invasive Species

Competition from invasive species is a threat. These non-native species have the capacity to spread quickly, take over open ground and eliminate most other surrounding plants by out-competing them for resources, shading them or harming them by secreting toxins into the soil. Invasive species present in prairie habitats include Black Locust (*Robinia pseudoacacia*), Common Buckthorn (*Rhamnus cathartica*), Sweet Clover (*Melilotus alba*) and, in moist areas, Common Reed (*Phragmites australis* ssp. *australis*) (Ambrose and Waldron 2005, WEMG 2012).

Invasive species are a threat even in protected areas. In a 2011 survey for another prairie species, Slender Bush-Clover (*Lespedeza virginica*), in a savanna in Ojibway Park (COSEWIC 2012) Crown Vetch (*Securigera varia*), Autumn Olive (*Elaeagnus umbellata*) and Spotted Knapweed (*Centaurea stoebe* ssp. *micranthos*) were present, yet none were listed in earlier studies of the same opening (Pratt 1986, COSEWIC 2000). This shows invasive species to be a recent and increasing threat. However, some hand-removal of invasive species has been done in selected areas of the Ojibway Prairie Complex (P.D. Pratt, pers. comm. 2012). Common Reed is present within 10 m of Willowleaf Aster in many of the restoration areas along the DRIC-WEP, and work is being done to control this invasive species (WEMG 2012).

Conversion to Agricultural Use

Historically, most tallgrass prairie habitat was lost when the land was converted to agricultural use in early settlement times. Conversion to agriculture continues to be a current, modern threat at Walpole Island First Nation because prairie land there has never been sprayed with chemicals and can thus be used for certified organic crops. In addition, “virgin” or little-used prairie is more fertile than land that has already been utilized for crops. Agricultural producers are willing to pay higher than normal rental fees for such land (C. Jacobs, pers. comm. 2012).

Mowing and Herbicide Use

Mowing of habitat is done at some sites around Windsor, usually in some of the anthropogenic habitats (e.g., roadsides, railway embankments, old fields, etc) (P.A. Woodliffe, pers. comm. 2010). Although Willowleaf Aster does not grow well with encroaching vegetation, mowing does not necessarily result in suitable habitat conditions, and it may harm Willowleaf Aster plants. In one area in Windsor, the number of Willowleaf Aster stems doubled when mowing was discontinued (E. Reimer, pers. comm. 2012). Herbicide is also used occasionally in anthropogenic habitats. In addition to damaging Willowleaf Aster plants directly, indiscriminate herbicide use can degrade habitat by preventing future germination and growth of other prairie-associated plants. Herbicide treatment is sometimes used to control invasive species, but careful planning of the timing and method of application is required when used in the habitat of Willowleaf Aster. Timing of mowing may also be an important consideration as mowing in early spring may reduce woody growth without harming later blooming prairie species.

Habitat Degradation

Many of the patches of open land where Willowleaf Aster occurs in the City of Windsor are perceived as vacant land that no one cares about. In some of these areas people dump refuse, walk dogs and drive ATVs and dirt bikes (WEMG 2012). A lack of knowledge or understanding of the habitat may result in people trampling Willowleaf Aster and degrading the habitat.

Deer Browsing

Monitoring of Willowleaf Aster in restoration sites along the DRIC-WEP corridor found evidence of deer browse and deer preferentially eating Willowleaf Aster over other species-at-risk plants (WEMG 2012). The restoration sites are within 1 km of other Willowleaf Aster subpopulations in the Ojibway Prairie Complex, so deer may be browsing Willowleaf Aster in those areas as well as other sites.

1.7 Knowledge Gaps

Several natural limitations for Willowleaf Aster have been hypothesized but have not been studied. These include productivity (i.e., amount of seed set in relation to weather and flowering time), seed germination rates, availability of pollinators, current rates and distances of seed dispersal. In addition, the mechanisms causing microsatellite DNA variability among sites and the viability of extant occurrences (especially small ones) are knowledge gaps. Furthermore, greater knowledge of the severity of threats posed by white-tailed deer and by invasive species, as well as understanding the mechanism by which invasive species cause harm (e.g., shading, allelopathy, etc.) would be beneficial to focus threat reduction activities. Finally, the soil moisture levels required by the species and the relationship of moisture to groundwater is not known.

Some Willowleaf Aster populations or subpopulations have not been visited since the 1990s, and it is unknown whether they are still extant. It would be useful to know the

status of these populations in order to see the full geographic range of the species and to be able to include those populations in recovery efforts if necessary. In addition, Willowleaf Aster is probably under-reported due to its late flowering date.

Traditional ecological knowledge (TEK) has not been sought and is a knowledge gap. TEK could be useful for the recovery of Willowleaf Aster if it provides information on historical populations, the past extent of habitat or the occurrence and frequency of wildfire, all of which would be useful in trying to recover and maintain suitable habitat.

1.8 Recovery Actions Completed or Underway

On Walpole Island First Nation, many recovery actions have begun, including: raising awareness in the community about species at risk; distributing outreach materials such as newsletters and educational materials; mapping and monitoring of species at risk; and removal of invasive species. The First Nation is also currently developing an ecosystem protection plan based on the community's TEK (C. Jacobs, pers. comm. 2012). In addition, Walpole Island Land Trust (2012) was formed in 2008 with the goal to conserve land in the Walpole Island First Nation/Bkejwanong Territory. The land trust has already secured more than 300 acres of prairie and wetland habitat for conservation (Jacobs 2011). As well, approximately 70% of the prairie and savanna habitat on Walpole Island First Nation is burned annually (C. Jacobs, pers. comm. 2012).

Several populations of Willowleaf Aster are protected within the Ojibway Prairie Complex and already have protective management to conserve tallgrass prairie plants and habitat. Ojibway Park, Tallgrass Heritage Park, Ojibway Prairie Provincial Nature Reserve and Spring Garden Natural Area have active burn programs (P.D. Pratt, pers. comm. 2012).

Mitigation measures for the DRIC-WEP, according to the ESA permit, include transplanting individuals as well as transplanting rhizome cuttings. This is intended to increase the overall number of stems and mitigate any losses due to the transplant process. Initial monitoring of Willowleaf Aster at restoration sites and at a handful of natural monitoring sites in the corridor has begun. Monitoring includes stem counts and assessments of overall plant health, flowering and reproductive success. In addition, habitat management is already underway to control invasive species, especially Common Reed (WEMG 2012), at all sites. Control methods include a combination of herbicide application and cutting and rolling of dead stalks. These methods are part of accepted best management practices (BMPs) for Common Reed control (OMNR 2011). Initial assessments showed the treatments were beginning to be effective. The use of controlled burning and manual removal of woody species to maintain suitable conditions are also planned.

2. RECOVERY

2.1 Recovery Goal

The recovery goal is to maintain the current distribution, number and viability of all extant populations and corresponding subpopulations of Willowleaf Aster by maintaining, improving, and protecting habitat and reducing other threats.

Rationale for Recovery Goal

Willowleaf Aster was designated threatened by COSEWIC (2003) and COSSARO (2003) based on a restricted geographic range and a fragmented habitat of remnant prairie patches. The species has few occurrences and ongoing risks from habitat loss in urban areas (COSEWIC 2003, COSSARO 2003). The geographic range of the species is unlikely to expand much due to the lack of tallgrass prairie habitat and probably due to climatic factors. Therefore, recovery will focus on halting habitat loss and declines to existing populations and on reducing other threats. There is good potential for an increase in population size from restoration work in the City of Windsor, and most populations are already within protected or managed areas. Even without increasing the size of the geographic range, if habitat declines are halted and the number of individuals is increased, the species could become eligible for downlisting with the existence of a stable, viable population.

Note that part of the Windsor-LaSalle North population will not be maintained *in situ* since restoration work in the DRIC-WEP corridor will result in relocation of some parts of this population. However, most of the transported plants still end up within the limits of the original population. As well, after mitigation the overall distribution of the species in Ontario is somewhat augmented and can still be maintained.

2.2 Protection and Recovery Objectives

Table 2. Protection and recovery objectives

No.	Protection or Recovery Objective
1	Assess threats and plan measures for mitigation and reduction.
2	Maintain or improve habitat suitability at all existing sites.
3	Ensure adequate habitat and species protection by monitoring and initiating recovery actions when necessary.
4	Fill knowledge gaps.

2.3 Approaches to Recovery

Table 3. Approaches to recovery of the Willowleaf Aster in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1. Assess threats and plan measures for mitigation and reduction.				
Critical	Short-term	Monitoring and Assessment	1.1 Assess status of habitat and current threats at all sites. <ul style="list-style-type: none"> – Assess openness and degree of active disturbance, both natural and human-made. – Assess types of improvement needed. 	<ul style="list-style-type: none"> • Natural succession • Invasive species • Deer browse • Mowing and herbicide use • Indiscriminate land use
Critical	Short-term	Management	1.2 Assess threat from invasive species. <ul style="list-style-type: none"> – Consider BMPs for individual invasives. – Plan control work for appropriate time of year. 	<ul style="list-style-type: none"> • Invasive Species
Critical	Short-term	Outreach	1.3 Seek partners and volunteers, and secure funding for habitat improvement actions.	<ul style="list-style-type: none"> • Any and all threats
Critical	On-going	Management	1.4 Assess feasibility of controlled burning at sites where it is not yet occurring. <ul style="list-style-type: none"> – Plan and schedule burns where possible. 	<ul style="list-style-type: none"> • Natural succession • Invasive species
Critical	Short-term	Management	1.5 Based on 1.1 – 1.4, plan required actions to improve habitat and reduce threats, such as cutting of shrubs, fencing out deer, erecting signage, etc. Prepare site-specific management plans to guide actions.	<ul style="list-style-type: none"> • Natural succession • Invasive species • Deer browse • Mowing and herbicide use • Indiscriminate land use
Necessary	Short-term	Outreach	1.6 Contact corporate owners to discuss Willowleaf Aster and its habitat. <ul style="list-style-type: none"> – Assist owners with planning other methods of habitat maintenance or appropriate timing of actions. 	<ul style="list-style-type: none"> • Mowing and herbicide use • Indiscriminate land use • Invasive species

Recovery Strategy for the Willowleaf Aster in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
2. Maintain or improve habitat suitability at all existing sites.				
Critical	On-going	Management and Outreach	<p>2.1 After assessment and planning (steps 1.1 to 1.6 above) begin work to improve habitat and reduce threats with the following, as appropriate:</p> <ul style="list-style-type: none"> - controlled burning; - cutting or clipping of shrubs; - control of invasive species; - fencing to keep out deer; - signage to inform habitat users; - designation of trails to eliminate trampling; and - assisting with actions on Walpole Island First Nation if requested. 	<ul style="list-style-type: none"> • Natural succession • Invasive species • Deer browse • Indiscriminate land use • Mowing and herbicide use
Critical	On-going	Outreach	<p>2.2 Liaise with and support Walpole Island First Nation in recovery actions developed by the community.</p> <ul style="list-style-type: none"> - Assist with threats reduction and mitigation work as requested by the community. - Support the community in efforts to secure funding for ongoing work. 	<ul style="list-style-type: none"> • Conversion to agriculture • Development • Invasive species • Natural succession • Indiscriminate land use
Necessary	On-going	Outreach	<p>2.3 Liaise with municipal planners to discuss ways to protect Willowleaf Aster during development and to ensure protection of habitat patches.</p>	<ul style="list-style-type: none"> • Development
Necessary	On-going	Outreach	<p>2.4 Assist with leasing of land for conservation on Walpole Island First Nation if requested.</p>	<ul style="list-style-type: none"> • Conversion to agriculture
Necessary	On-going	Outreach	<p>2.5 Liaise and develop partnerships with agricultural operators on Walpole Island.</p>	<ul style="list-style-type: none"> • Conversion to agriculture

Recovery Strategy for the Willowleaf Aster in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
3. Ensure adequate habitat and species protection by monitoring and initiating recovery actions when necessary.				
Necessary	On-going	Monitoring and assessment	3.1 Set up monitoring at sites where it is not yet in place. <ul style="list-style-type: none"> – Work with different jurisdictions: municipalities, conservation authorities, private and corporate landowners, etc. – Develop protocol and appropriate time intervals between assessments. 	<ul style="list-style-type: none"> • Any or all threats
Necessary	On-going	Outreach	3.2 Partner with landowners in and around Willowleaf Aster patches to help with monitoring and reducing threats. <ul style="list-style-type: none"> – Undertake outreach to help landowners identify and understand Willowleaf Aster and its needs. 	<ul style="list-style-type: none"> • Any or all threats
Critical	On-going	Outreach	3.3 Liaise with and support Walpole Island First Nation in recovery actions developed by the community. <ul style="list-style-type: none"> – Assist with threats reduction and mitigation work as requested by the community. – Support the community in efforts to secure funding for ongoing work. 	<ul style="list-style-type: none"> • Conversion to agriculture • Development • Invasive species • Natural succession • Indiscriminate land use
4. Fill knowledge gaps.				
Beneficial	Long-term	Assessment; Research	4.1 Survey and monitor sites where population status is unknown. <ul style="list-style-type: none"> – Ensure work is done in fall when Willowleaf Aster is in flower. 	<ul style="list-style-type: none"> • Unknown population status
Beneficial	Long-term	Research	4.2 Survey other known prairie and savanna sites for Willowleaf Aster in late fall.	<ul style="list-style-type: none"> • Species range
Beneficial	Long-term	Research	4.3 Conduct research on pollination, seed set, and other natural limitations, as well as on threat mechanisms from invasive species and White-tailed Deer.	<ul style="list-style-type: none"> • Natural limitations • Threat mechanisms

Recovery Strategy for the Willowleaf Aster in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
Beneficial	Long-term	Research	<p>4.4 Gather TEK whenever possible.</p> <ul style="list-style-type: none"> - Potential informants may be Aboriginal elders, Windsor homeowners, farmers, etc. 	<ul style="list-style-type: none"> • Better understanding of species movements • Biological needs • Threats

Narrative to Support Approaches to Recovery

Many populations already have some degree of protective management, either through being within a park, conservation area or restoration site or by having a land use designation, such as an environmentally sensitive area or candidate natural heritage site. Still, despite some type of protection, many sites continue to be threatened by a lack of disturbance (leading to closing in of the vegetation) and by invasive species. Therefore, all sites should have a detailed threats assessment (as per steps 1.1 and 1.2) and planning for appropriate actions to reduce threats (as per steps 1.4 and 1.5), and then actions should be undertaken (as per step 2.1 and other steps).

In addition, ensuring adequate habitat protection for some Willowleaf Aster sites may be challenging because many are small patches of open ground in residential areas between or behind housing blocks. On-going monitoring is already in place for the patches that are DRIC-WEP restoration sites, but a protocol should be standardized and put in place for as many other subpopulations as possible to allow timely responses to threats and to ensure no patches are lost.

Furthermore, Willowleaf Aster habitat must have disturbance because without it, the habitat will eventually disappear. Unless there is a way for some type of disturbance (either natural or human-made) to occur, the habitat is probably not adequately protected. In anthropogenic habitats, to ensure habitat is maintained it is likely that most human activities will need to continue. Outreach and monitoring will be needed to ensure the right levels of disturbance are maintained without damaging Willowleaf Aster plants. As well, outreach will be important to keep adjacent landowners informed and included in the recovery process.

It may be possible to combine recovery work with actions required for other species at risk, especially other prairie-associated plants such as Colicroot (*Aletris farinosa*) and Dense Blazing Star (*Liatris spicata*) which may share the same habitat patches as Willowleaf Aster.

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.

Willowleaf Aster grows in a variety of habitats, including tallgrass prairie and oak savanna communities, as well as anthropogenic habitats such as abandoned agricultural lands, railway embankments, roadsides, ditches, woodland edges and other open disturbed grounds (COSEWIC 2003). Habitat for Willowleaf Aster may be found as a large open

area or as a smaller opening within another vegetation type. It may also be found as a small patch of open ground surrounded by developed land such as lawns and houses.

The vegetation community types of the natural habitat of Willowleaf Aster according to the ELC (Lee et al. 1998) have not been documented, but Fresh-Moist Tallgrass Prairie (TPO2-1), Fresh-Moist Pin Oak – Bur Oak Tallgrass Savanna (TPS2-1), and parts of Fresh-Moist Tallgrass Woodland (TPW2) communities are likely the types that provide suitable habitat. Other suitable habitats, such as damp meadows, utility corridors and woodland edges, have not been characterized although they may fit into a cultural meadow, thicket, savannah or woodland vegetation type (CUM1, CUT1, CUS1, or CUW1). However, suitable growing conditions have been described in detail. As such, it is recommended that suitable habitat for Willowleaf Aster be characterized as:

- Fresh-moist Tallgrass Prairie (TPO2-1);
- Fresh-Moist Pin Oak – Bur Oak Tallgrass Savanna (TPS2-1);
- edges and openings of Fresh-moist Tallgrass Woodland (TPW2);
- an anthropogenic habitat, such as an old field, wet meadow, roadside, railway embankment, utility corridor, drainage ditch, dike, thicket, vacant city lot or other area where:
 - the habitat is open (< 50% tree or shrub cover) and not shaded in the growing season;
 - the habitat is predominantly (>50 %) covered with herbaceous plants or unvegetated, and;
 - most of the vegetation (>50%) is the same height or shorter than Willowleaf Aster plants that are in flower.

It is recommended that the area to be prescribed for a habitat regulation include all sites where Willowleaf Aster has been reported, unless the species has been documented to be extirpated from the site. There is a lack of recent field work at some sites and the species is easily overlooked. As well, the ability of this species to colonize some types of disturbed lands, such as old fields, shows that it may tolerate fairly high levels of disturbance. Thus, it should not be assumed that the species has disappeared unless it is confirmed to be absent from reported sites.

Therefore, it is recommended that the habitat to be considered for regulation be prescribed as follows:

- 1) In natural tallgrass prairie and oak savanna vegetation, it is recommended that the entire ELC vegetation type polygon in which Willowleaf Aster is present be prescribed, as well as a protective zone of 50 m around the outside of the polygon boundary, excluding situations listed in #4 below, such as active agricultural areas, lawns, and gardens. The entire ELC polygon should be protected to allow dispersal and establishment of the species and to allow space for burning (or other disturbance that maintains suitability of habitat) to take place. As well, the natural habitat is needed to support the biological requirements of pollinators. Finally,

suitable natural habitat is extremely limited. Therefore, it is recommended that where the species occurs all known existing habitat be protected.

A distance of 50 m has been shown to provide a minimum critical function zone to ensure microhabitat properties 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.

- 2) In anthropogenic habitats and in natural tallgrass woodland vegetation, it is recommended that all of the continuously open area around Willowleaf Aster that meets the above criteria be prescribed, as well as a protective zone of 50 m around the outside of the open area, excluding the situations listed in #4 below. This is recommended to protect the plants, to ensure suitable moisture conditions can be maintained and to allow space for disturbance and dispersal to occur. If the continuously open area is small, it is recommended that a minimum radial distance of 50 m around patches of Willowleaf Aster be prescribed even if some of the vegetation inside the circle does not meet the habitat criteria listed above. Again, situations listed in #4 should be excluded from the prescription. It is not recommended that the entire polygon of tallgrass woodland be prescribed (as per #1) because the majority of the vegetation polygon would likely not be suitable habitat. Willowleaf Aster occupies the edges and openings of woodlands, so it is recommended that the criteria for prescribing open area will be a more precise method to prescribe habitat in tallgrass woodland vegetation.
- 3) In linear habitats such as railway embankments, utility corridors, ditch banks, etc., where there may be no limit to the continuously open area, it is recommended that habitat be prescribed to a maximum distance of 100 m from the edge of the Willowleaf Aster patch running in the same direction as the rest of the embankment or corridor. This distance is recommended to allow adequate space for dispersal of seeds. A 50 m minimum protective zone is recommended in the direction perpendicular to the patches of Willowleaf Aster plants in these habitats, but with situations listed in #4 excluded.
- 4) It is recommended that the active, driveable surface of existing roads, railway tracks, driveways and parking lots, as well as trails, buildings, septic beds, dikes, active agricultural areas (e.g., crops or pasture) and manicured vegetation (e.g., lawns and gardens) not be prescribed as habitat. However, roadsides, roadside ditches, railway embankments and the edges of lawns and trails may still be prescribed to ensure that human actions continue to maintain the disturbance regime without harming the plants.
- 5) Should any new patches of Willowleaf Aster be discovered, it is recommended that the above criteria should apply to the habitat as applicable.

It is recommended that restoration sites for mitigation work in the DRIC-WEP and federal plaza area receive a habitat regulation based on #1, #2, or #3 as appropriate. One objective of mitigation is long-term habitat protection (WEMG 2012), so it is assumed that the intent is to manage these sites either to remain or to eventually become natural habitat with self-sustaining patches of Willowleaf Aster.

GLOSSARY

Allelopathy: The suppression of growth of one plant by another due to the release of toxic chemicals.

Clone: A cluster of stems deriving from the same rhizome and thus belonging to the same parent plant. All stems have the same genetic make-up.

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 established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community 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

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.

Extirpated: When a species is no longer present in an area where it once occurred.

Glaucous: Having a waxy or powdery coating that gives a whitish or bluish cast, such as on a plum.

Rhizome: A horizontal stem that grows along the ground.

***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.

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**Part 3 – *Willowleaf Aster* – Ontario Government Response
Statement, prepared by the Ontario Ministry of Natural
Resources and Forestry**

Willowleaf Aster

Ontario Government Response Statement



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 the Willowleaf Aster (*Symphotrichum praecaltum*) in Ontario was completed on November 22, 2013 (http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_rs_wlhwf_astr_on.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.

Willowleaf Aster is an herbaceous, perennial plant with smooth, waxy stems, reaching 50 to 150 cm in height. Clusters of pale lavender daisy-like flowers are produced in the fall. In Canada, Willowleaf Aster occurs only in southwestern Ontario.

MOVING FORWARD TO PROTECT AND RECOVER WILLOWLEAF ASTER

Willowleaf Aster is listed as a threatened 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 its habitat without authorization. Such authorization would require that conditions established by the Ministry be met.

The distribution of Willowleaf Aster ranges from southwestern Ontario and the northeastern United States to northern Mexico. In Canada, the species occurs only in southwestern Ontario. Within the province, there are nine natural populations confirmed to be in existence. The largest of these populations, known as the Windsor-LaSalle North population, is made up of 13 separate sub-populations. An additional two restoration populations were recently established in the Windsor and Chatham-Kent areas in accordance with an authorization under the ESA. An additional four populations of the species have been confirmed extirpated, and the status of another four populations remains unknown due to the absence of species survey work at these sites in recent years.

Willowleaf Aster reproduces sexually through cross-pollination, which generates seeds that are genetically distinct from parent plants. The species also reproduces vegetatively from rhizomes, which generates multiple flowering stems that are genetically identical to the parent plant (i.e., clones). Given the two ways in which this species reproduces, it is difficult to determine how many genetically distinct individuals are present within each population.

Willowleaf Aster occurs in tallgrass prairie, oak savannah, thickets, meadows, and woodland clearings and edges. Where site conditions are suitable, this species is also known to occur in open habitats created by human activities, such as railway embankments, roadsides, utility corridors, abandoned agricultural fields, and vacant city lots. To remain suitable for the species, the habitats of Willowleaf Aster depend on periodic disturbance such as fire, drought, or even vegetation clearing, provided it is undertaken in a manner that is compatible with the species.

The primary threats to Willowleaf Aster are habitat loss and degradation resulting from development, agricultural conversion and natural succession. Other important threats include invasive species, mowing, herbicide use, and deer browsing. Activities such as refuse dumping, dog walking, and all-terrain vehicle or dirt-bike use may also threaten the species.

As suitable habitat for Willowleaf Aster is limited and fragmented in Ontario, and the species' range is situated in some of the most developed parts of the province, the distribution of the species in Ontario is unlikely to expand significantly. Recovery efforts for this species will focus on improving habitat and reducing threats at sites currently occupied by the species.

The government's goal for the recovery of the Willowleaf Aster is to maintain populations and sub-populations at, or enable them to increase to, sustainable levels at sites where the species occurs in Ontario.

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 Willowleaf Aster, the government will directly undertake the following actions:

- Continue to implement the Ontario Invasive Species Strategic Plan to address the invasive species (e.g., Black Locust (*Robinia pseudoacacia*), Common Buckthorn (*Rhamnus cathartica*), etc.) that threaten Willowleaf Aster.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Willowleaf Aster 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 Willowleaf Aster 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 Willowleaf Aster. 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 Willowleaf Aster. 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 and reduce threats at sites where Willowleaf Aster occurs in Ontario.

Actions:

1. **(HIGH)** Develop and implement site-specific management strategies to manage and improve Willowleaf Aster habitat and reduce threats at sites where the species occurs, with consideration for other rare species and invasive species present on site. Monitor the effectiveness of actions taken and revise strategies, as appropriate, based on the best available information. This action includes providing support to Walpole Island First Nation in efforts to manage or improve habitat and reduce threats where the species occurs on the First Nation's land.
 - Management strategies may include: controlled burning, removal of woody vegetation and invasive species, use of signage to discourage trampling by humans, dogs, and all-terrain vehicles, and other actions as appropriate.

Focus Area: Research and Monitoring
Objective: Increase knowledge about Willowleaf Aster populations, successful reproduction, and historical occurrence in Ontario.

Actions:

2. **(HIGH)** Conduct surveys at all sites where the species is known to occur, suspected to occur, and at other sites with suitable habitat within the species' distribution, to determine population status and assess threats. Surveys should be undertaken in the fall, when the species is in flower.
3. Conduct research on factors influencing successful reproduction and dispersal of the species (e.g., pollination, seed set, seed germination rates, climate).
4. Gather Aboriginal traditional knowledge and community knowledge about Willowleaf Aster, including historical populations, the past extent of the species' habitat in Ontario, and the historical frequency of wildfire within the species' habitat to inform habitat management best practices. Sources of information may include Aboriginal elders, Windsor homeowners, and farmers.

Focus Area:	Awareness and Stewardship
Objective:	Increase awareness and stewardship of Willowleaf Aster and its habitat.
	Actions:
	5. Promote awareness among landowners, land managers and land users, including Aboriginal communities and organizations, about Willowleaf Aster, including:
	<ul style="list-style-type: none"> ■ identification of the species; ■ the species' habitat requirements; ■ protection afforded to the species and its habitat under the ESA; and, ■ actions they can take to help protect and recover the species.

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 Willowleaf Aster.

ACKNOWLEDGEMENT

We would like to thank all those who participated in the development of the Recovery strategy for the Willowleaf Aster (*Symphoricarpos praecox*) in Ontario for their dedication to protecting and recovering species at risk.

For additional information:

Visit the species at risk website at ontario.ca/speciesatrisk

Contact your MNR district office

Contact the Natural Resources Information Centre

1-800-667-1940

TTY 1-866-686-6072

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ontario.ca/mnr