

# Recovery Strategy for the Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Canada

## Eastern Prairie Fringed-orchid



2012

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

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# RECOVERY STRATEGY FOR THE EASTERN PRAIRIE FRINGED-ORCHID (*Platanthera leucophaea*) IN CANADA

2012

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 Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Ontario (Appendix 3) under Section 44 of the *Species at Risk Act* (SARA). Environment Canada has included an addition which completes the SARA requirements for this recovery strategy.

2012

The Recovery Strategy for the Eastern Prairie Fringed-orchid in Canada consists of the:

- Addition to the Recovery Strategy for the Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Ontario prepared by Environment Canada (EC) [ii + 11 pp + Appendix 1 + Appendix 2]
- Recovery Strategy for Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Ontario prepared by the Eastern Prairie Fringed-orchid Recovery Team for the Ontario Ministry of Natural Resources [Appendix 3]

**Addition to the Recovery Strategy for the Eastern Prairie  
Fringed-orchid (*Platanthera leucophaea*) in Ontario**

## PREFACE

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

The Minister of the Environment and the Minister responsible for the Parks Canada Agency are the competent ministers for the recovery of the Eastern Prairie Fringed-orchid and have prepared this federal component of the recovery strategy, as per section 37 of SARA. SARA section 44 allows the federal 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 Province of Ontario led the development of the attached recovery strategy for the species (Appendix 3) in cooperation with Environment Canada and the Parks Canada Agency.

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 and Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Eastern Prairie Fringed-orchid 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, the Parks Canada Agency and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

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## COSEWIC SPECIES ASSESSMENT INFORMATION

**Date of Assessment:** May 2003

**Common Name (population):** Eastern Prairie Fringed-orchid

**Scientific Name:** *Platanthera leucophaea*

**COSEWIC Status:** Endangered

**Reason for Designation:** This is a perennial species of scattered remnant wetland habitats and of mesic prairies that has undergone significant declines in population size and is at continued risk from further habitat change due to successional processes, land development, water table impacts and spread of invasive species.

**Canadian Occurrence:** ON

**COSEWIC Status History:** Designated Special Concern in April 1986. Status re-examined and designated Endangered in May 2003.

COSEWIC – Committee on the Status of Endangered Wildlife in Canada

## SPECIES STATUS INFORMATION

The Eastern Prairie Fringed-orchid is listed as Endangered<sup>1</sup> on Schedule 1 of the federal *Species at Risk Act* (SARA). In Ontario, the Eastern Prairie Fringed-orchid is listed as Endangered<sup>2</sup> under the provincial *Endangered Species Act, 2007* (ESA 2007).

The Eastern Prairie Fringed-orchid's rounded global status is Imperilled<sup>3</sup> (G2) (NatureServe 2009). It is considered Vulnerable<sup>4</sup> to Imperilled in the United States (N2N3) and Imperilled in Canada (N2) (NatureServe 2009). It is either Extirpated (SX) or Historically Documented (SH) from four of thirteen states and provinces in its range, and is ranked as S1 or S2 in the remainder (NatureServe 2009). Table 1 lists the sub-national ranks for the species at the state/province level.

Approximately 28% of the global population occurs in Ontario (Brownell & Catling 2000). Ontario has some of the largest global populations of the Eastern Prairie Fringed-orchid (Oldham 2000), with 16 extant populations (Figure 1).

<sup>1</sup> a wildlife species facing imminent extirpation or extinction

<sup>2</sup> species that lives in the wild in Ontario but is facing imminent extinction or extirpation

<sup>3</sup> at high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors

<sup>4</sup> at moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors

**Table 1. Sub-national ranking for the Eastern Prairie Fringed-orchid in North America.**

S-Rank	State/Province
S1 (Critically Imperilled)	Illinois, Indiana, Iowa, Maine, Michigan, Virginia
S2 (Imperilled)	Ohio, Wisconsin, Ontario
SH (Historical)	Missouri, New York, Oklahoma
SX (Extirpated)	Pennsylvania

## **SPECIES AT RISK ACT REQUIREMENTS**

The following sections address specific requirements of SARA that are not addressed in the Recovery Strategy for the Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Ontario (Appendix 3), or augment, highlight or provide clarification. Together, the addition and the provincial strategy (Appendix 3) apply to the Canadian population of the Eastern Prairie Fringed-orchid.

### **1. Consultation**

The Ontario Ministry of Natural Resources posted the provincial recovery strategy for this species on the Environmental Bill of Rights (EBR) website in 2009 for review and input by the general public. In addition to this, several public consultation events were held regarding the proposed provincial Government Response Statement (GRS) in the spring of 2010 and the proposed GRS was posted for review and input on the EBR website in September, 2010.

### **2. Recovery Feasibility**

Based on the following four criteria outlined by Government of Canada (2009), there are unknowns regarding the feasibility of recovery of the Eastern Prairie Fringed-orchid. Therefore, in keeping with the precautionary principle, a full recovery strategy has been prepared as would be done when recovery is determined to be feasible. It may not be possible to mitigate various threats to the species. Furthermore, availability of habitat of sufficient quality requires further investigation.

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. Monitoring has demonstrated that there are individuals remaining at many known locations and these are assumed to be reproductive (Eastern Prairie Fringed-orchid Recovery Team 2010).

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

Unknown. Suitable habitat for the Eastern Prairie Fringed-orchid in Ontario is rare and has likely never been abundant; habitat is probably limiting for this species due to its very narrow habitat preference (COSEWIC 2003). The majority of extant populations occur

in fen habitat; additional habitat of this type would be difficult to make available using habitat management and restoration techniques. Additional habitat could be made available through restoration work for prairie and old field habitat types. Both prairie and fen habitat continue to be lost in Ontario, mostly due to indirect and direct human impacts (COSEWIC 2003). The quantity of habitat required for the long-term persistence of the Eastern Prairie Fringed-orchid is unknown (Eastern Prairie Fringed-orchid Recovery Team 2010).

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

Unknown. It is likely possible to mitigate or avoid some threats to this species, including significant threats such as: further conversion to agriculture, trampling, collection and recreational vehicle damage. It may not be possible to mitigate other threats such as: invasive species, changes to drainage patterns, successional changes, hybridization, grazing, long-term drought or flooding and threats to pollinators. The severity and impact of most of these threats is largely unknown (Eastern Prairie Fringed-orchid Recovery Team 2010).

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

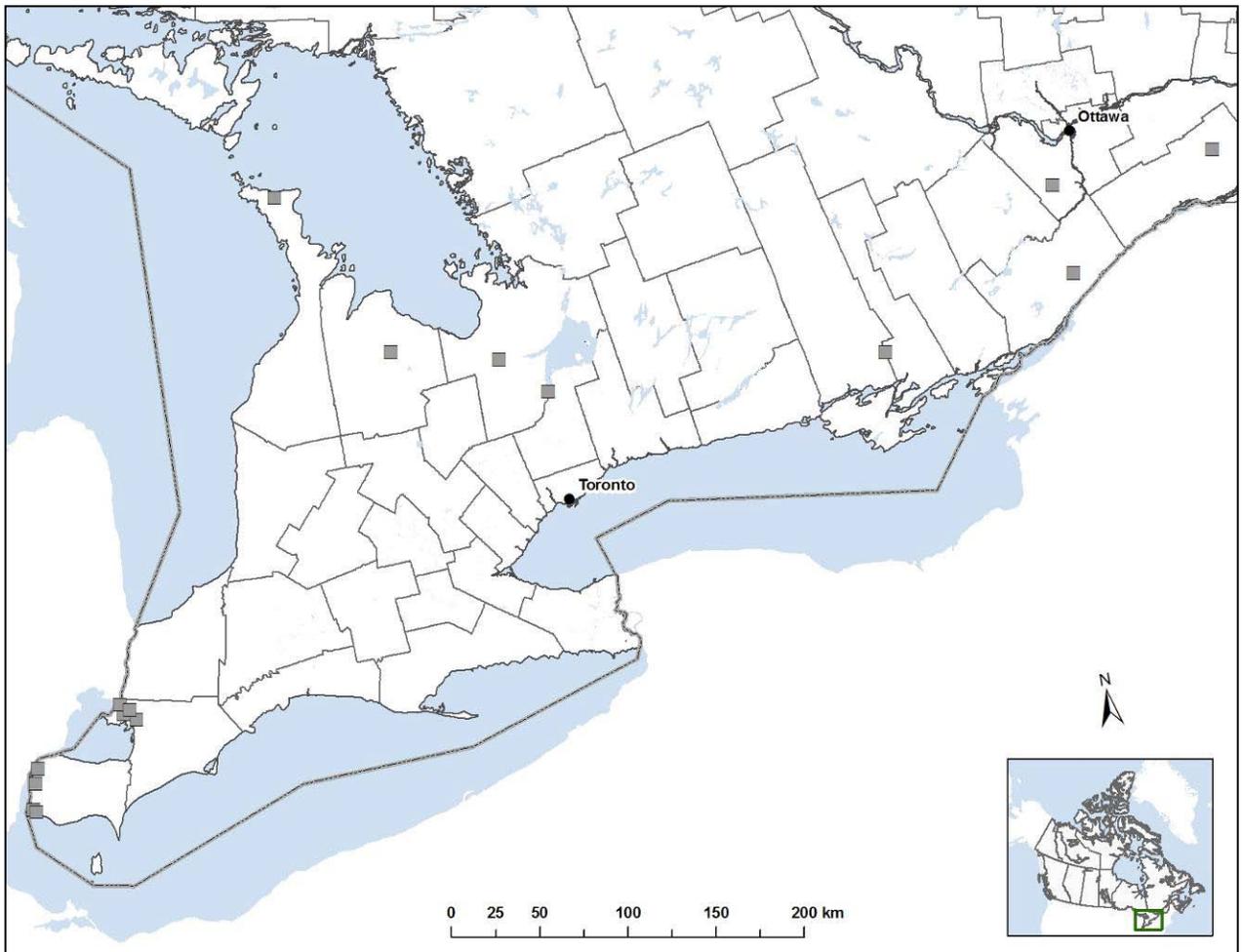
Yes. Several recovery techniques are being successfully applied to the Eastern Prairie Fringed-orchid populations in Canada and the United States, or, in some cases, to other closely-related species in the same genus. These techniques include habitat restoration, carefully planned prescribed burns, invasive species control, and seed germination techniques (Zambrana Engineering Inc. 1998, Vitt 2000, Zettler et al. 2001, Sharma et al. 2003, Haggeman 2004).

### 3. Species Information

#### 3.1 Population and Distribution

The Eastern Prairie Fringed-orchid once occurred from Maine west to southern and eastern Ontario and Michigan, southern Wisconsin, southeastern Iowa and south to Oklahoma, Louisiana and Arkansas (Sheviak 1987), east to central Virginia and Pennsylvania with a higher concentration of occurrences (many extirpated) in the area of the southern Great Lakes (particularly the prairie peninsula) (COSEWIC 2003). In Canada, the Eastern Prairie Fringed-orchid occurs only in southern and eastern Ontario.

The Recovery Strategy for the Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Ontario (Eastern Prairie Fringed-orchid Recovery Team 2010) indicates there are 21 current or extant populations in Ontario. However, the Ontario Natural Heritage Information Centre now lists 16 current or extant populations (ONHIC 2010). As such, Environment Canada identifies 16 extant populations (Figure 1).



**Figure 1. Location of the 16 extant populations of the Eastern Prairie Fringed-orchid in Ontario.**

#### **4. Population and Distribution Objectives**

The provincial recovery strategy contains the following recovery goal:

- The recovery goal for the Eastern Prairie Fringed-orchid is to prevent any further loss of populations and habitat and habitat functionality, to reverse the declining population trends at extant locations and to restore occurrences at historic sites, where appropriate, within the species' Canadian range.

The following information is also included in the provincial recovery strategy:

- The recovery goal requires that populations of the Eastern Prairie Fringed-orchid be maintained throughout the species' currently known Canadian range – that is, at all 21 sites where it is believed to be extant. Since stem counts of this orchid may vary

widely between years, even at the same site, specific numerical population objectives have not been suggested. Insufficient data exists to suggest total population numbers that would be meaningful or reliable.

The provincial recovery strategy states there are 21 extant populations; Environment Canada is considering there to be 16 extant populations (see Section 3.1).

Under SARA, population and distribution objectives for the species must be established. The population and distribution objectives established by Environment Canada for the Eastern Prairie Fringed-orchid in Canada are to maintain the 16 populations that are believed to be extant, to reverse the declining population trends at extant locations and to restore occurrences at historic sites, if biologically and technically feasible, within the species' Canadian range.

## **5. Critical Habitat**

### **5.1 Identification of the Species' Critical Habitat**

Critical habitat for the Eastern Prairie Fringed-orchid in Canada is partially identified in this recovery strategy to the extent possible based on available data. It is recognized that the critical habitat identified below is insufficient to achieve the population and distribution objectives for the species. The Schedule of Studies (Section 5.2) outlines the activities required to identify additional critical habitat necessary to support the population and distribution objectives of this species.

Critical habitat for the Eastern Prairie Fringed-orchid consists of the extent of contiguous suitable habitat surrounding known occurrences of the Eastern Prairie Fringed-orchid observed between 1990 and 2009 as per Appendix 2.

#### **5.1.1. Site Occupancy**

The Eastern Prairie Fringed-orchid populations are sensitive to hydrological and successional changes. Catastrophic events such as prolonged flooding or drought may induce extended periods (one or more years) in a subterranean, dormant or mycotrophic state<sup>5</sup> for entire populations (COSEWIC 2003). Habitats that require recurrent disturbances (e.g., fire) to arrest succession and maintain vegetation communities, such as prairie habitats, may cease to meet the habitat needs of the Eastern Prairie Fringed-orchid and other species if disturbances are suppressed. However, when disturbance events occur, germination of dormant seeds may result. As such, site occupancy based solely on the presence of an above-ground plant is insufficient to indicate the occupancy of the species at a site as seeds and subterranean plants may be present. As a precautionary measure, a twenty year time period has been selected to ensure all possible extant populations are considered. Therefore, the site occupancy criterion is defined as sites where the Eastern Prairie Fringed-orchid has been observed between 1990 and 2009.

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<sup>5</sup> persistence as an underground plant that relies on root fungi for nourishment

The best available data were used in the identification of sites meeting these criteria, including information compiled by the Ontario Natural Heritage Information Centre, Environment Canada's Canadian Wildlife Service, and the Parks Canada Agency.

### 5.1.2. Suitable Habitat

In Canada, populations of the Eastern Prairie Fringed-orchid occur only in southern and eastern Ontario and are found in three main habitat types in Ontario, which comprise the definition of suitable habitat:

1. Fens (peat-forming wetlands fed by groundwater)
  - Fens dominated by Wire Sedge (*Carex lasiocarpa*)
  - Fens dominated by Common Reed (*Phragmites australis* ssp. *americanus*) and sedges (*Carex* spp.)
  - Poor fen mats around lakes dominated by sphagnum moss (*Sphagnum* spp.) and ericaceous<sup>6</sup> shrubs. Mats may contain marl<sup>7</sup> below the raised acidic hummocks
  - Cobble limestone shore<sup>8</sup>
2. Tallgrass Prairie
  - Highly diverse wet mesic<sup>9</sup> prairie with Big Bluestem (*Andropogon geraldii*), Little Bluestem (*Schizachyrium scoparium*) and other grasses
3. Moist old fields
  - Old fields with Canada Bluegrass (*Poa compressa*), Woolly Sedge (*Carex pellita*), rushes (*Juncus* spp.) and early development of dogwood (*Cornus* spp.) shrubs (COSEWIC 2003)

The vegetation communities and soil conditions characteristic of these habitat types are detailed in Appendix 1, and are consistent with the description of habitat characteristics for the Eastern Prairie Fringed-orchid as found in the Recovery Strategy for the Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Ontario (Eastern Prairie Fringed-orchid Recovery Team 2010).

Though these habitats are diverse and seemingly unrelated, they share similar dynamics and/or characteristics that enable populations of the Eastern Prairie Fringed-orchid to persist. Competition from woody vegetation is minimised in all habitats, either through periodic disturbance (fire, drought, flooding, and ice scour) or nutrient paucity. Lack of competition from trees and shrubs allows for open conditions with full sunlight, which the Eastern Prairie Fringed-orchid requires for optimal growth and flowering (Bowles 1993).

<sup>6</sup> plants in the family Ericaceae, the heath family

<sup>7</sup> a calcium carbonate-rich clay soil

<sup>8</sup> Eastern Fringed Prairie-orchid is also found on limestone cobble shores in Bruce Peninsula National Park. The vegetation communities on these cobble shores conform to the descriptions of fen vegetation in Appendix 1 (J. Haselmayer, pers. comm.); therefore, limestone cobble shoreline has been grouped with fen habitat type.

<sup>9</sup> with a moderate amount of water

Although the Eastern Prairie Fringed-orchid may occupy only a small portion of suitable habitat at a site, the entire extent of contiguous suitable habitat surrounding currently known occurrences is identified as critical habitat. The Eastern Prairie Fringed-orchid is noted for dramatic, mass flowerings following several-year periods of apparent absence (COSEWIC 2003); accordingly, numbers of flowering plants can fluctuate annually by thousands. It is therefore possible that suitable habitat contains additional plants not observed during monitoring years and young plants that may take years to emerge above ground. In addition, the surrounding area may support the night-flying hawk moths (Sphingidae) required for pollination and seed inoculation (Bowles 1983, Crosson et al. 1999, Cuthrell et al. 1999). These large moths require large tracts of land and a diversity of nectar sources (Brownell and Catling 2000). The identified suitable habitat will also provide areas for the expansion of current extant populations to meet the population and distribution objective to reverse declining population trends. Population maintenance is dependent on long-term survival of adults and reproduction by seeds (COSEWIC 2003).

If future surveys uncover other populations that occupy different habitat types, the description of suitable habitat would be updated to include these habitat types and critical habitat identification would be modified accordingly.

### **5.1.3. Application of the Eastern Prairie Fringed-orchid Critical Habitat Criteria**

Critical habitat for the Eastern Prairie Fringed-orchid is identified as the extent of contiguous suitable habitat (as described in Appendix 1) surrounding known occurrences of the Eastern Prairie Fringed-orchid between 1990 and 2009. Existing anthropogenic features are excluded from critical habitat. These features include, but are not limited to, existing infrastructure, including road surfaces, railways, parking lots, trails, buildings, and septic beds.

Application of the critical habitat criteria to available information identified 26 sites containing critical habitat for 13 populations in Canada (Appendix 2). It is important to note that the centroids represent the site polygon that contains critical habitat, and not boundaries of critical habitat itself. The extent and boundaries of the critical habitat within each location are defined by the extent of contiguous suitable habitat as described in Section 5.1.2, and will vary by location.

Sixteen extant populations of Eastern Prairie Fringed-orchid exist in the province of Ontario. The 26 sites described as critical habitat represents 13 of the 16 extant populations. Information concerning the location and extent of the remaining three populations is not well known and requires clarification in advance of critical habitat identification. The activities to obtain this information are outlined in the schedule of studies (Table 2). Critical habitat for the three remaining populations in Ontario will be identified and may be described within a multi-species at risk action plan developed with the Walpole Island First Nation.

Appendix 2, giving the coordinates of the centroids of critical habitat for Eastern Prairie Fringed-orchid, has been removed from the public document to protect the species and its habitat. Disclosing the location not only puts the plant at considerable risk from inadvertent trampling by visitors wishing to view the rare plant, but also increases the potential for collection.

## 5.2 Schedule of Studies

**Table 2. Schedule of Studies to Identify Critical Habitat**

Description of Activity	Rationale	Timeline
Conduct population surveys and habitat assessment at extant and historical sites.	Confirm location and extent of populations. Confirm habitat associations and habitat attributes Determine extent of suitable habitat and possible locations to restore historical occurrences.	2012-2017
Apply criteria to identify additional critical habitat.	Identify additional critical habitat.	2016

## 5.3 Examples of Activities Likely to Result in Destruction of Critical Habitat

Activities that are likely to result in the destruction of critical habitat include, but are not limited to:

- Activities that result in alterations to the hydrological regime (e.g., dams, dykes, road development) may impact prairie and fen habitat characteristics required by the Eastern Prairie Fringed-orchid thereby reducing or eliminating critical habitat
- Activities that result in loss (i.e., conversion) or degradation (i.e., fragmentation) to the habitat (e.g., agricultural intensification, residential development, road development) may reduce or eliminate critical habitat
- Activities that promote the expansion of exotic, invasive or introduced species/genome into the Eastern Prairie Fringed-orchid critical habitat (e.g., introduction of seeds and/or plants) may increase resource competition and rates of hybridization and habitat succession
- Activities that compact and/or erode the soil (e.g., ATV use, heavy recreational use, etc.) may prevent plant establishment and destroy mycorrhizal associations
- Activities that pollute water (e.g., application of agricultural chemicals) may promote habitat succession by allowing species that have higher nutrient requirements to encroach the Eastern Prairie Fringed-orchid critical habitat thereby reducing or eliminating critical habitat and reducing the chances of pollination by hawk moths.

## 6. Statement on Action Plans

One or more action plans for the Eastern Prairie Fringed-orchid will be posted on the Species at Risk Public Registry by December 2017.

## 7. 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*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

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

This recovery strategy will clearly benefit the environment by promoting the recovery of the Eastern Prairie Fringed-orchid; particularly species associated with open prairie tallgrass habitat which includes other species at risk, such as: Pink Milkwort (*Polygala incarnata*), Dense Blazing Star (*Liatris spicata*), Colicroot (*Aletris farinosa*) and Small White Lady's-slipper (*Cypripedium candidum*) among several others. The potential for the 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 some 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. The SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects.

## REFERENCES

- Bowles, M.L. 1983. The tallgrass prairie orchids *Platanthera leucophaea* (Nutt.) Lindl. and *Cypripedium candidum* Muhl. ex Wild.: some aspects of their status, biology, and ecology and implications toward management. *Natural Areas Journal* 3(4):14-37.
- Bowles, M.L. 1993. Recovery plan for the eastern prairie white fringed orchid *Platanthera leucophaea* (Nuttall) Lindley. Recovery Plan prepared for the U.S. Fish and Wildlife Service, Region 3, Minneapolis, Minnesota. 53 pp + appendices.
- Brownell, V.R. and P.M. Catling. 2000. Update status report on eastern prairie fringed-orchid (*Platanthera leucophaea*). Funded by the Ontario Ministry of Natural Resources. 32 pp.
- COSEWIC. 2003. COSEWIC assessment and update status report on the eastern prairie fringed-orchid *Platanthera leucophaea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa.
- Crosson, A.E., J.C. Dunford, and D.K. Young. 1999. Pollination and other insect interactions of the eastern prairie fringed orchid (*Platanthera leucophaea*) (Nuttall) Lindl. in Wisconsin. Report to the U.S. Fish and Wildlife Service.
- Cuthrell, D.L., P.J. Higman, and M.R. Penskar. 1999. The pollinators of Ohio and Michigan populations of eastern prairie fringed orchid (*Platanthera leucophaea*). Michigan Natural Features Inventory, Lansing, Michigan. 20 pp.
- Eastern Prairie Fringed-orchid Recovery Team. 2010. Recovery strategy for the eastern prairie fringed-orchid (*Platanthera leucophaea*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vi + 30 pp.
- Government of Canada. 2009. *Species at Risk Act Policies, Overarching Policy Framework [Draft]*. *Species at Risk Act Policy and Guidelines Series*. Environment Canada, Ottawa. 38 pp.
- Haggeman, J. 2004. Notes on eastern prairie fringed-orchid: biology and response to management. St. Clair National Wildlife Area.
- NatureServe. 2009. NatureServe Explorer: an online encyclopedia of life [web application]. Version 1.8. NatureServe, Arlington, Virginia. Web site: <http://www.natureserve.org/explorer> [accessed: September 9, 2009]
- Oldham, M. 2000. COSSARO candidate VTE species evaluation form for eastern prairie fringed orchid (*Platanthera leucophaea*). Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough.

- Ontario Natural Heritage Information Centre (ONHIC). 2010. Natural Heritage Information Centre Biodiversity Explorer Species Report for *Platanthera leucophaea* (Eastern Prairie Fringed-orchid). Web site: <https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/speciesDetailReport.do?elID=39106> [accessed: December 15, 2010]
- Sharma, J., L.W. Zettler, J.W. Van Sambeek, M. Ellersieck, and C. J. Starbuck. 2003. Symbiotic seed germination and mycorrhizae of federally threatened *Platanthera praeclara*. *American Midland Naturalist*. 149:104-120.
- Sheviak, C.J. 1987. On the occurrence of *Platanthera leucophaea* in Louisiana and Arkansas. *Rhodora* 89(890): 347-350.
- Vitt, P. 2000. Effects of hand pollination on reproduction and survival of the eastern prairie fringed-orchid. Chicago Botanic Garden. Unpublished report.
- Zambrana Engineering Inc. 1998. Assessment of the reintroduction potential of five federally threatened and endangered plant species in Midewin National Tallgrass Prairie. Midewin National Tallgrass Prairie. Web site: <http://www.fs.fed.us/mntp/speciesreintro/index.htm>
- Zettler, L.W., S.L. Stewart, M.L. Bowles, and K.A. Jacobs. 2001. Mycorrhizal fungi and cold assisted symbiotic germination of the federally threatened eastern prairie fringed orchid, *Platanthera leucophaea* (Nuttall) Lindley. *American Midland Naturalist*. 145:168-175.

## APPENDIX 1

Habitat characteristics within major habitat types for Eastern Prairie Fringed-orchid

### 1. Fens

• Fens dominated by Wire Sedge (*Carex lasiocarpa*):

- Open Northern White Cedar (*Thuja occidentalis*) - Tamarack (*Larix laricina*) peatland fens with sedges (*Carex* spp.), particularly Wire Sedge (*C. lasiocarpa*), and Livid Sedge (*C. livida*), sphagnum mosses (*Sphagnum* spp.), low ericaceous shrubs, and willows (*Salix* spp.).
- Deep peat based organic soils in open graminoid fens with the following associated species: Wire Sedge, Yellow Sedge (*Carex flava*), Common Reed (*Phragmites australis* subsp. *americanus*), sphagnum mosses, Sweet Gale (*Myrica gale*), Small Purple-fringe Orchid (*Platanthera psycodes*), the hybrid fringed-orchid (*Platanthera* x. *reznicekii*), Northern Pitcher-plant (*Sarracenia purpurea*), Bog Buckbean (*Menyanthes trifoliata*), Royal Fern (*Osmunda regalis*), Twigrush (*Cladium mariscoides*), cottongrass (*Eriophorum* sp.), Dragon's Mouth (*Arethusa bulbosa*), Rose Pogonia (*Pogonia ophioglossoides*), Spotted Joe-pye Weed (*Eupatorium maculatum*), Boneset (*Eupatorium perfoliatum*), Labrador Tea (*Ledum groenlandicum*), Leatherleaf (*Chamaedaphne calyculata*), Narrow-leaved Meadow-sweet (*Spiraea alba*), Bog Goldenrod (*Solidago uliginosa*), Rough Goldenrod (*Solidago rugosa*), Red-osier Dogwood (*Cornus stolonifera*), Bog Rosemary (*Andromeda polifolia*), Marsh Bellflower (*Campanula aparinoides*), Tamarack and Northern White Cedar.
- Open Wire Sedge fen dominated by Sweet Gale and Marsh Fern (*Thelypteris palustris*), with the following associates: Bog Willow (*Salix pedicellaris*), Red-osier Dogwood, Narrow-leaved Meadow-sweet, Swamp Birch (*Betula pumila*), Royal Fern, Bog Goldenrod, Marsh St. John's-wort (*Triadenum fraseri*), Marsh Cinquefoil (*Potentilla palustris*), Blue-joint Reedgrass (*Calamagrostis canadensis*), Water Sedge (*Carex aquatilis*), Water Horsetail (*Equisetum fluviatile*), Northern Reedgrass (*Calamagrostis stricta* ssp. *inexpansa*), Blueflag (*Iris versicolor*), Rough Bentgrass (*Agrostis scabra*), Marsh Bellflower and Marsh Vetchling (*Lathyrus palustris*).

• Fens dominated by Common Reed (*Phragmites australis*) and sedges (*Carex* spp.):

- Open graminoid fen dominated by Common Reed with sedges and other vegetation such as Marsh Fern, Marsh Marigold (*Caltha palustris*), Bog Buckbean, Water Horsetail, Swamp Milkweed (*Asclepias incarnata*), Spotted Joe-pye Weed, Hooded Skullcap (*Scutellaria galericulata*), Northern Bugleweed (*Lycopus uniflorus*), Marsh Bedstraw (*Galium palustre*), Royal Fern, Swamp Rose (*Rosa palustris*) and Blueflag.

• Poor fen mats around lakes dominated by sphagnum moss and ericaceous shrubs. Mats may contain marl below the raised acidic hummocks:

- Deep peat based organic soils in open graminoid fen dominated by sphagnum mosses, Wire Sedge, Coast Sedge (*Carex exilis*), Swamp Birch, Leatherleaf, and Tamarack. Other less common associates include Sweet Gale, Northern Pitcher-plant, Bog Buckbean, Bog

Rosemary, Sheep-laurel (*Kalmia polifolia*), Royal Fern, Twigrush, cottongrass, Dragon's Mouth, Rose Pogonia, Spotted Joe-pye Weed, Boneset, Labrador Tea, Narrow-leaved Meadow-sweet, Bog Goldenrod, Rough Goldenrod, Red-osier Dogwood, Marsh Bellflower, blueberry (*Vaccinium* sp.), Hoary Willow (*Salix candida*), and Grass-pink (*Calopogon tuberosus*).

- Shallow peat and marl deposits over bedrock in open graminoid fen dominated by Fresh Water Cordgrass (*Spartina pectinata*), Twigrush, Switch Grass (*Panicum virgatum*), Tufted Hairgrass (*Deschampsia cespitosa*), Little Green Sedge (*Carex viridula*), Bald Spikerush (*Eleocharis erythropoda*), Common Sneezeweed (*Helenium autumnale*), Silverweed (*Potentilla anserina*), Four-flowered Loosestrife (*Lysimachia quadriflora*), Rush Aster (*Symphotrichum boreale*), Hooded Ladies'-tresses (*Spiranthes romanzoffiana*) and Blueflag.

• Cobble limestone shore:

- Open bedrock mineral shoreline fen dominated by Fresh Water Cordgrass, Twig Rush, Switch Grass, Kalm St. John's-wort (*Hypericum kalmianum*), Shrubby Cinquefoil (*Potentilla fruticosa*), Tufted Hairgrass, Little Green Sedge, Lindheimer's Panic Grass (*Panicum acuminatum* var. *lindheimeri*), Richardson Rush (*Juncus alpinoarticulatus*), Swamp Birch, Kalm's Lobelia (*Lobelia kalmii*), Four-flowered Loosestrife, Bird's-eye Primrose (*Primula mistassinica*), Balsam Ragweed (*Senecio pauperculus*), Common Sneezeweed, Prairie Goldenrod (*Solidago ptarmicoides*), and Northern Bugleweed (*Lycopus uniflorus*).

## 2. Tallgrass Prairie

• Moist to wet tallgrass prairie dominated by Big Bluestem (*Andropogon gerardii*) and Little Bluestem (*Schizachyrium scoparium*).

• Fresh-moist tallgrass prairie with combinations of the following species: Big Bluestem, Little Bluestem, Indian Grass (*Sorghastrum nutans*), Fresh Water Cordgrass, Stiff Goldenrod (*Solidago rigida*), Riddell's Goldenrod (*S. riddellii*), other goldenrods (*Solidago* spp.), asters (*Aster* spp.), panic grasses (*Panicum* spp.), Sweet Grass (*Hierochloe odorata*), Whorled Loosestrife (*Lysimachia quadrifolia*), Culver's-root (*Veronicastrum virginicum*), Ironweed (*Vernonia missurica*), Eastern Yellow Star Grass (*Hypoxis hirsuta*), Slender-leaved Agalinis (*Agalinis tenuifolia*), Skinner's Purple False Foxglove (*A. skinneriana*), Gattinger's False Foxglove (*A. gattingeri*), Sullivant's Milkweed (*Asclepias sullivantii*), Small White Lady's-slipper (*Cypripedium candidum*), Small Yellow Lady's-slipper (*C. calceolus* var. *parviflorum*), blue-eyed-grasses (*Sisyrinchium* spp.), Ohio Spiderwort (*Tradescantia ohioensis*), Low Nutrush (*Scleria verticillata*), Great Plains Ladies'-tresses (*Spiranthes magnicamporum*), Colicroot (*Aletris farinosa*), Showy Tick-trefoil (*Desmodium canadense*), Winged Loosestrife (*Lythrum alatum*), Spiked Blazing Star (*Liatris spicata*), Black-eyed Susan (*Rudbeckia hirta*), Wild Bergamot (*Monarda fistulosa*) and Blue-joint Reedgrass (*Calamagrostis canadensis*)

• Fresh-moist tallgrass prairie dominated by Fresh Water Cordgrass, Indian Grass, Big Bluestem, mountain-mints (*Pycnanthemum* spp.) and goldenrods, along with the following secondary species: Sullivant's Milkweed, Bushy Aster (*Symphotrichum dumosum*), Field Thistle (*Cirsium*

*discolour*), Eastern Yellow Star Grass, Four-flowered Loosestrife, Riddell's Goldenrod, Stiff Goldenrod and numerous other prairie indicator species.

- Fresh-moist tallgrass prairie/cattail organic shallow marsh dominated by goldenrods, cattails, bulrushes (*Scirpus* spp.), Reed Canary Grass (*Phalaris arundinacea*) and goldenrod (*Euthamia* spp.).
- Mesic tallgrass prairie over fine or loamy sand with a combination of species such as Prairie Dock (*Silphium terebinthinaceum*), bentgrass (*Agrostis* spp.), Stiff Goldenrod and other more common goldenrods, Blue-joint Reedgrass, Big Bluestem, Bottle Gentian (*Gentiana andrewsii*), Eastern Yellow Star Grass, loosestrife (*Lysimachia* spp.), Sullivant's Milkweed, Field Thistle, Spreading Dogbane (*Apocynum androsaemifolium*), panic grasses, Fresh Water Cordgrass, asters, Common Sneezeweed and mountain-mints.

### **3. Moist Old Field**

- Dominated by Canada Bluegrass (*Poa compressa*), Woolly Sedge (*Carex pellita*), rushes (*Juncus* spp.) and scattered shrubs.
- Cultural dry-mesic old field meadow or cultural thicket with the following species: goldenrods, asters and exotic graminoids with Gray Dogwood (*Cornus foemina*) and Staghorn Sumac (*Rhus typhina*).
- Cultural dry-moist old field meadow with species including various exotic graminoids, goldenrods, dogwoods (*Cornus* spp.), and willows.
- Bedrock cultural thicket/swamp over sedimentary limestone with willows and dogwoods as dominants including Meadow Willow (*Salix petiolaris*), Pussy Willow (*Salix discolor*), Red-osier Dogwood, Narrow-leaved Meadow-sweet, Purple Loosestrife (*Lythrum salicaria*), goldenrods, Common Yarrow (*Achillea millefolium*), Swamp Milkweed, St. John's-wort, (*Hypericum perforatum*), Foxglove Beardtongue (*Penstemon digitalis*), Marsh Bedstraw (*Galium palustre*), Queen Anne's Lace (*Daucus carota*), Yellow Sedge, Inland Sedge (*Carex interior*), Timothy (*Phleum pratense*), spikerush (*Eleocharis* sp.), and Field Horsetail (*Equisetum arvense*).

(modified from Eastern Prairie Fringed-orchid Recovery Team 2010)

## **APPENDIX 2**

### **Sites in Ontario Containing Critical Habitat for the Eastern Prairie Fringed-orchid.**

*Appendix 2 has been removed from the public document to protect the species and its habitat.*

## **APPENDIX 3**

### Recovery Strategy for the Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Ontario

## RECOMMENDED CITATION

Eastern Prairie Fringed-orchid Recovery Team. 2010. Recovery strategy for the Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vi + 30 pp.

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## **AUTHORS**

This recovery strategy was developed by the Eastern Prairie Fringed-orchid Recovery Team.

## **ACKNOWLEDGMENTS**

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## **DECLARATION**

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

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

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

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy.

## **RESPONSIBLE JURISDICTIONS**

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

## EXECUTIVE SUMMARY

The Eastern Prairie Fringed-orchid (*Platanthera leucophaea*) is a tall perennial orchid that has been documented in Canada at only 32 sites in Ontario, of which only 21 are believed to be extant. Many of these extant populations, however, are very small, and only a few are believed to be large enough to be viable. The Eastern Prairie Fringed-orchid is considered to be globally imperiled; it is rare and declining throughout its range in eastern North America. It is also listed as endangered on the Species at Risk in Ontario (SARO) List, as federally endangered in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and as federally threatened in the United States. Some of the largest global populations of this plant are found in Ontario.

The Eastern Prairie Fringed-orchid requires full sunlight and little competition from surrounding vegetation, circumneutral soils and moist conditions. At known sites in Ontario, it grows in a variety of microhabitats in three general areas: fens, tallgrass prairie and moist old fields.

The main threats to this species are habitat loss due to development and agriculture, competition from invasive species, modifications to drainage for agriculture or development, changes to nutrient regimes, damage by recreational vehicles, trampling by humans, successional change and herbivory (grazing by animals). Additional possible threats are hybridization and inbreeding due to small population sizes.

This orchid has always been relatively rare throughout its range and has highly specific habitat preferences. Therefore, the recovery goal for the Eastern Prairie Fringed-orchid is to prevent any loss of populations and habitat, to reverse the declining population trend at extant locations, to restore occurrences at historic sites where appropriate and to manage habitats for this species. The recovery objectives outlined to achieve this goal are as follows:

1. Protect Eastern Prairie Fringed-orchid populations, habitat and habitat functionality at all extant locations.
2. Report regularly on the status of this species, using the best available scientific information.
3. Reduce or eliminate threats at extant sites.
4. Conduct research on Canadian populations of this species to address knowledge gaps.
5. Restore habitat and reintroduce the Eastern Prairie Fringed-orchid where appropriate and feasible.

The report contains a table outlining the specific actions and performance measures needed to reach these goals and objectives.

It is recommended that areas with current or verified historic occurrences of the Eastern Prairie Fringed-orchid be considered in the development of a habitat regulation, that the habitat boundaries be delineated at a site-specific level on the basis of habitat descriptions provided in this strategy, and that the habitat regulation be written such that

it is flexible enough to immediately protect newly discovered occurrences, using a similar, site-specific approach.

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## 1.0 BACKGROUND INFORMATION

### 1.1 Species Assessment and Classification

COMMON NAME: Eastern Prairie Fringed-orchid

SCIENTIFIC NAME: *Platanthera leucophaea*

SARO List Classification: Endangered

SARO List History: Endangered (2008), Endangered – Not Regulated (2004)

COSEWIC Assessment History: Endangered (2003), Special Concern (1986)

SARA Schedule 1: Endangered (June 5, 2003)

CONSERVATION STATUS RANKINGS:

GRANK: G3

NRANK: N2

SRANK: S2

The glossary provides definitions for the abbreviations above.

### 1.2 Species Description

The Eastern Prairie Fringed-orchid (*Platanthera leucophaea*), a perennial species of wetland and prairie habitats (COSEWIC 2003), belongs to the genus *Platanthera*, which comprises approximately 200 species that are restricted to North America (COSEWIC 2003). Typically reaching a height of 50 to 100 centimetres, this orchid is characterized by a single terminal flowering spike consisting of 10 to 40 creamy white, showy flowers. Flowers range from 1.8 to 2.5 centimetres in width and have a prominent lip (lower petal) consisting of three notably fringed segments. Leaves are long, usually 8 to 20 centimetres, and oval or spear-shaped, and they occur alternately along the stem. Flowering occurs from late June to late July and proceeds sequentially along the flowering stalk, beginning at the base. In late July, locating flowers or identifying the species in areas where hybrids are present is challenging. The plant produces seed capsules containing thousands of tiny seeds in late August and early September (Environment Canada 2006, COSEWIC 2003, U.S. Fish and Wildlife Service 1999).

### 1.3 Distribution, Abundance and Population Trends

Globally, the Eastern Prairie Fringed-orchid has been recorded in only one Canadian province and 13 American states (figure 1). The range of this orchid is centred in the Great Lakes region and extends west to Iowa, south to Illinois, Indiana and Ohio, east to

Virginia and north to Ontario. A disjunct population occurs in Maine (COSEWIC 2003, U.S. Fish and Wildlife Service 1999).



Figure 1. Current global distribution of the Eastern Prairie Fringed-orchid (Source: Flora of North America 2008)

The Eastern Prairie Fringed-orchid is ranked globally as imperilled (G2) (NatureServe 2009). It is either extirpated (SX) or historically documented (SH) from 4 of 13 states

where it is found and is ranked as S1, S2, or S2S3 in the remainder (NatureServe 2009). In Ontario it is listed as imperilled (S2). The species has been listed as federally threatened in the United States since 1989 (Oldham 2000).

In Canada, the Eastern Prairie Fringed-orchid is restricted to southern and eastern Ontario (NHIC 2007). Today, 21 populations of a total of 32 reported occurrences are believed to be current or extant in Ontario (figure 2), and the remaining 11 are considered historic (not confirmed for 20 years) or extirpated (COSEWIC 2003). Despite the apparently large number of occurrences, however, many of these populations are extremely small and may not be viable (Brownell & Catling 2000).

The four largest populations are very widely separated. The largest population in Ontario (and Canada) is located in Kent County, along the Chenal Ecarte. Other large populations are found in Bruce Peninsula National Park, Marlborough Forest (near Ottawa) and Minesing Swamp (Simcoe County).

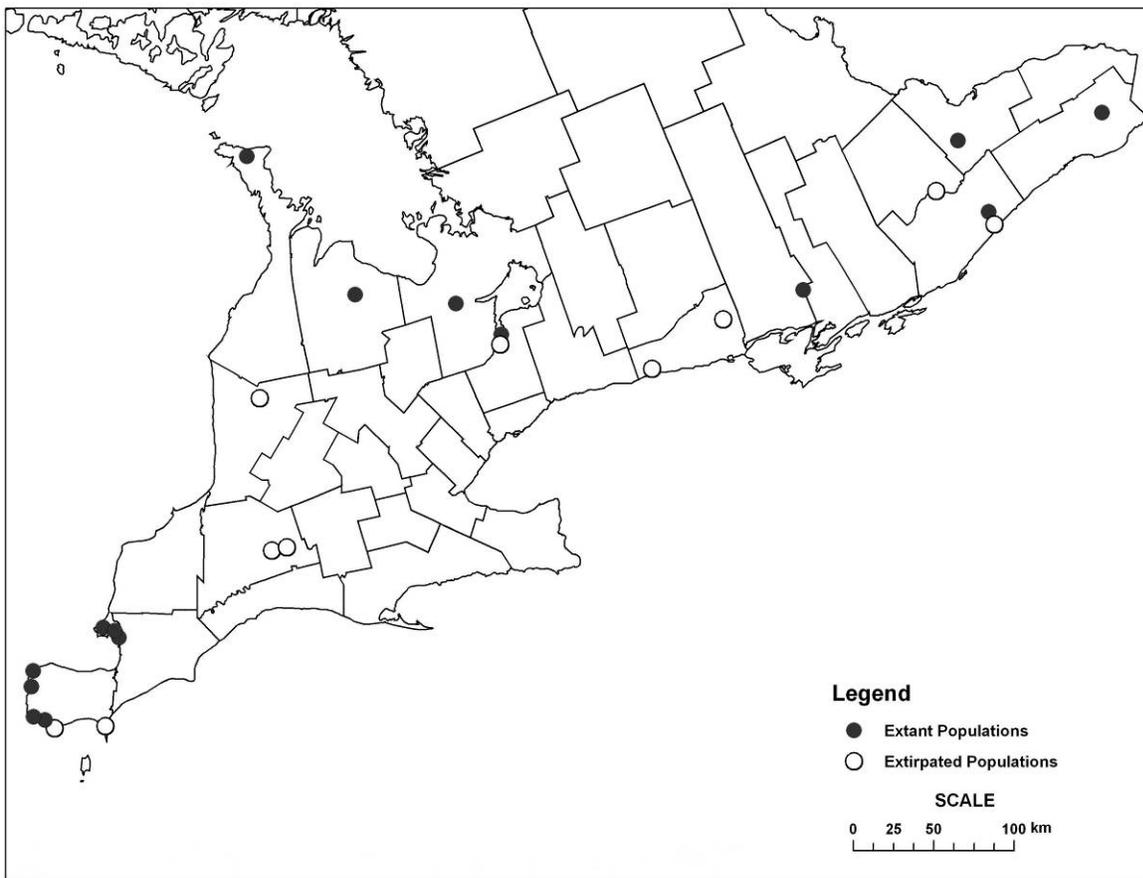


Figure 2. Historical and current distribution of the Eastern Prairie Fringed-orchid in Ontario

## 1.4 Habitat and Biological Needs

### 1.4.1 Habitat needs

The Eastern Prairie Fringed-orchid requires open conditions with full sunlight for optimal growth and flowering, which restrict it to graminoid-dominated vegetation communities (Bowles 1993). The soils present in the locations it inhabits range from neutral to slightly calcareous (Bowles et al. 2005, Case 1987, Bowles 1983); the Eastern Prairie Fringed-orchid can tolerate pHs of between 5.3 and 7.5 (Zambrana Engineering Inc. 1998). This orchid is also found in a range of soil types, including deep, black calcareous silt loams, organic silty clay loams, and muck soils (Zambrana Engineering Inc. 1998).

The Eastern Prairie Fringed-orchid is currently found in fens, along fluctuating limestone shoreline and in wet mesic prairie and old field habitat. In Ontario, this orchid occurs in six specific types of habitat (COSEWIC 2003):

1. Fens dominated by Wire Sedge (*Carex lasiocarpa*)
2. Fens dominated by Common Reed (*Phragmites australis*) and sedges (*Carex* spp.)
3. Poor fen mats around lakes dominated by sphagnum moss and ericaceous shrubs. Mats may contain marl below the raised acidic hummocks
4. Cobble limestone shore
5. Highly diverse wet mesic prairie with bluestem (*Andropogon* spp.) and other grasses
6. Old fields with Canada Bluegrass (*Poa compressa*), Woolly Sedge (*Carex pellita*), rushes (*Juncus* spp.) and early development of dogwood (*Cornus* spp.) shrubs

This orchid is infrequently found in old field situations. These habitats are not stable and tend to support short-lived populations that decline rapidly as succession by woody vegetation occurs. These habitats require management to maintain conditions favourable to the Eastern Prairie Fringed-orchid (Brownell 2002).

The Eastern Prairie Fringed-orchid is adapted to fluctuations in water level, and it appears that the species can move back and forth along a gradient with fluctuating water levels. Studies of Ontario populations of this plant indicate that those found in fens and around lake margins can fluctuate annually by thousands of plants (COSEWIC 2003).

### 1.4.2 Biological needs

The pollination requirements of the Eastern Prairie Fringed-orchid are extremely specific. For viable seed development to occur, this orchid depends on night-flying hawkmoths (Sphingidae) to pollinate its nocturnally fragrant flowers (Crosson et al. 1999, Cuthrell et al. 1999, Bowles 1983). Consequently, the Eastern Prairie Fringed-orchid's survival is vulnerable to population changes in these insects, which require

large tracts of land where they can obtain nectar from a variety of sources (Brownell & Catling 2000). The status of most hawkmoth species in Ontario has not been evaluated. Pollinator populations may be adversely affected by pesticides and loss of habitat (Bowles 1993).

As is the case for many orchids, seed germination in this species is contingent on the establishment of a mutually beneficial relationship between the roots of the orchid and a soil-inhabiting fungus, known as a mycorrhizal association (Chang et al. 2005, Bowles et al. 1992). Seedling survival is dependent on nutrients that mycorrhizal fungi supply (Zettler et al. 2001, Bowles et al. 2000). Since seedlings may not emerge above the soil for many years, this association is important in sustaining the plant before leaves develop and photosynthesis begins. The most common mycorrhizal associates for the Eastern Prairie Fringed-orchid belong to the genus *Ceratophora* (Zettler et al. 2001). Although germination and mycorrhizal associations for this species have been studied in the United States, specific requirements in Canada are not well known.

### **1.4.3 Ecological role**

Specific details about the ecological role of the Eastern Prairie Fringed-orchid have not been described. Its foliage and nectar are probably a source of food for herbivores and pollinators such as the species of hawkmoth that pollinates it. The fen and prairie habitats where this orchid is found are often habitats for other species at risk, and the protection of such habitats also benefits these other species.

### **1.4.4 Limiting factors**

The extremely narrow habitat preference of this orchid means that the quantity of suitable habitat available to it is very low. Almost all of the established populations are found in fen and prairie habitats. Fens comprise less than a fraction of 1 percent of the total wetland area south of the Canadian Shield in Ontario (Riley 1989), and suitable community types of sufficient size are found in only a portion of these. The mesic to wet-mesic prairie habitat the species prefers is even further restricted in distribution, representing less than 0.1 percent of the landscape (COSEWIC 2003).

As previously mentioned, pollination of the Eastern Prairie Fringed-orchid depends on night-flying hawkmoths, which require large tracts of land containing a high diversity of sources of nectar (COSEWIC 2003). The status of hawkmoth populations is largely unknown, but it is plausible that the availability of pollinators may limit the Eastern Prairie Fringed-orchid.

Certain life history characteristics may also limit this orchid's recovery. The plant does not reach reproductive maturity until it is approximately three to seven years old (Keibler et al. 1993). It may also undergo periods of dormancy (COSEWIC 2003), and some evidence suggests that this may have an effect on the number of flowering plants and even survival of the populations in subsequent years (Sieg and King 1995, Bowles et al. 1992, Bowles 1983).

Drought, can have drastic effects on population demography, which may limit the species. Extensive drying of soils at extant sites can result in dormancy of plants and, in some cases, mortality. This could result in population extinctions at some sites, especially those that are more upland in character.

## 1.5 Threats to Survival and Recovery

Table 1. Threat classification for Eastern Prairie Fringed-orchid in Ontario

1 Habitat Loss		Threat Attributes		
<b>Threat Category</b>	Habitat loss or degradation	<b>Extent</b>	Localized	
			<b>Local</b>	<b>Range-wide</b>
<b>General Threat</b>	Agricultural intensification; housing development; road development or widening; changes in drainage patterns (drought and flooding threats)	<b>Occurrence</b>	Historic and anticipated	Unknown
		<b>Frequency</b>	One-time	
<b>Specific Threat</b>	Conversion of habitat to other use; fragmentation; modification of hydrological regimes	<b>Causal Certainty</b>	High	
		<b>Severity</b>	High	
<b>Stress</b>	Local extinctions; reduced habitat availability (which may already be limiting); loss of genetic diversity	<b>Level of Concern</b>	High	
2 Invasive Species		Threat Attributes		
<b>Threat Category</b>	Exotic or invasive species	<b>Extent</b>	Widespread	
			<b>Local</b>	<b>Range-wide</b>
<b>General Threat</b>	Common Reed ( <i>Phragmites australis</i> ); Glossy Buckthorn ( <i>Rhamnus frangula</i> ); Purple Loosestrife ( <i>Lythrum salicaria</i> ); Cattail ( <i>Typha</i> spp.)	<b>Occurrence</b>	Current	
		<b>Frequency</b>	Recurrent	
<b>Specific Threat</b>	Alteration of open habitat the Eastern Prairie Fringed-orchid requires	<b>Causal Certainty</b>	High	
		<b>Severity</b>	High	
<b>Stress</b>	Reduced population size; local extinctions	<b>Level of Concern</b>	High	
3 Recreation		Threat Attributes		

Recovery Strategy for the Eastern Prairie Fringed-orchid in Ontario

<b>Threat Category</b>	Disturbance or persecution	<b>Extent</b>	Localized	
			<b>Local</b>	<b>Range-wide</b>
<b>General Threat</b>	Recreational activity	<b>Occurrence</b>	Current	Anticipated
		<b>Frequency</b>	Recurrent	Unknown
<b>Specific Threat</b>	ATV use; ATV trails; trampling by naturalists or photographers	<b>Causal Certainty</b>	High	
		<b>Severity</b>	Moderate	
<b>Stress</b>	Physical damage to plants; reduced population size; local extirpation	<b>Level of Concern</b>	Medium	
<b>4</b>	<b>Succession</b>	<b>Threat Attributes</b>		
<b>Threat Category</b>	Natural processes or activities	<b>Extent</b>	Localized	
			<b>Local</b>	<b>Range-wide</b>
<b>General Threat</b>	Natural succession	<b>Occurrence</b>	Current	Current
		<b>Frequency</b>	Recurrent	Recurrent
<b>Specific Threat</b>	Alteration of open habitat the Eastern Prairie Fringed-orchid requires	<b>Causal Certainty</b>	High	
		<b>Severity</b>	High	
<b>Stress</b>	Reduced population size; local extinctions	<b>Level of Concern</b>	Medium	
<b>5</b>	<b>Herbivory</b>	<b>Threat Attributes</b>		
<b>Threat Category</b>	Natural processes or activities	<b>Extent</b>	Localized	
			<b>Local</b>	<b>Range-wide</b>
<b>General Threat</b>	Grazing by deer and possibly rabbits and insects	<b>Occurrence</b>	Current	Unknown
		<b>Frequency</b>	Recurrent	Unknown
<b>Specific Threat</b>	Loss of flowers and seeds	<b>Causal Certainty</b>	Medium	
		<b>Severity</b>	Moderate	
<b>Stress</b>	Reduced reproductive success; reduced fitness	<b>Level of Concern</b>	Medium	
<b>6</b>	<b>Small Population Sizes</b>	<b>Threat Attributes</b>		
<b>Threat Category</b>	Natural processes or activities	<b>Extent</b>	Unknown	
			<b>Local</b>	<b>Range-wide</b>
<b>General Threat</b>	Naturally small populations	<b>Occurrence</b>	Unknown	
		<b>Frequency</b>	Unknown	
<b>Specific Threat</b>	Inability to attract pollinators; reduced fertilization	<b>Causal Certainty</b>	Low	
		<b>Severity</b>	Unknown	
<b>Stress</b>	Reduced fitness; loss of genetic diversity	<b>Level of Concern</b>	Low	

<b>7 Changes to Nutrient Regimes</b>		<b>Threat Attributes</b>		
<b>Threat Category</b>	Pollution	<b>Extent</b>	Localized	
			<b>Local</b>	<b>Range-wide</b>
<b>General Threat</b>	Agricultural runoff	<b>Occurrence</b>	Anticipated	Unknown
		<b>Frequency</b>	Unknown	Unknown
<b>Specific Threat</b>	Increase in available nutrients (especially nitrogen and phosphorus) in otherwise nutrient-poor habitat	<b>Causal Certainty</b>	Low	
		<b>Severity</b>	Unknown – potentially high	
<b>Stress</b>	Increased resource competition by shrubs and other plants (e.g., <i>Typha</i> spp.); reduced population viability	<b>Level of Concern</b>	Medium	
<b>8 Hybridization</b>		<b>Threat Attributes</b>		
<b>Threat Category</b>	Changes in ecological dynamics or natural processes	<b>Extent</b>	Localized	
			<b>Local</b>	<b>Range-wide</b>
<b>General Threat</b>	Interspecific cross-pollination	<b>Occurrence</b>	Current	Unknown
		<b>Frequency</b>	Re-current	Unknown
<b>Specific Threat</b>	Hybridization	<b>Causal Certainty</b>	Medium	
		<b>Severity</b>	Moderate	
<b>Stress</b>	Dilution of gene pool; poor reproductive success; reduced fitness	<b>Level of Concern</b>	Low	

### Habitat loss to agriculture or development

Much of the habitat suitable for the Eastern Prairie Fringed-orchid has been lost through conversion to cropland and pasture, resulting in a severe reduction in population numbers (Bowles 1993). Drainage and development pose a threat to the habitat of this species in both Canada and the United States (Bowles 1993), unless used as part of a restoration or recovery program for Eastern Prairie Fringed-orchid habitat. Loss of mesic and wet-mesic prairies to agriculture has continued since the species was first assessed (Brownell & Catling 2000).

While drainage has been the greatest threat historically, flooding can also alter habitat and in some cases destroy it. Intentional flooding (dams) and unintentional flooding (roads and railway beds) have both been documented as altering or potentially altering natural water-level dynamics in Eastern Prairie Fringed-orchid habitat in eastern Ontario.

Much, if not all, of the fen-based habitat is intimately linked to groundwater, and anything that affects the quantity or quality of groundwater can, over time, alter the habitat so that it may no longer be suitable for the Eastern Prairie Fringed-orchid. Pumping of groundwater (for residential, industrial or agricultural use) or altering groundwater in association with mineral aggregate extraction are potential concerns.

#### Invasive species

The preferred habitat of the Eastern Prairie Fringed-orchid is very susceptible to invasion by several species. The most severely threatening invasive species is the non-native subspecies of Common Reed (*Phragmites australis* ssp. *australis*). Invasion by Common Reed results in dense monospecific stands that outcompete and displace almost all native vegetation (Marks et al. 2004). Common Reed is known to be severely threatening populations of this orchid species in Kent County and is encroaching on the population at Minesing Swamp (Haggeman 2004, S. Robinson pers. comm. 2007). Common Reed has historically been present at the *Phragmites* fen in the Marlborough Forest and is not believed to present a threat at this location. Conversely, the native variant of Common Reed was documented in the Minesing Swamp in the 1960s (P. Catling, pers. comm.), but increased numbers that have been observed, especially in the non-native variant, are believed to be a threat to the orchid population at this swamp. Common Reed can be very aggressive and may be present at other sites that have not been monitored recently.

Glossy Buckthorn (*Rhamnus frangula*), threatens some eastern Ontario populations of the Eastern Prairie Fringed-orchid, as confirmed by the change to fen communities at several sites, and by Purple Loosestrife (*Lythrum salicaria*), which is present in most fen complexes (COSEWIC 2003).

#### Recreational vehicles

Damage by recreational vehicles is known to have occurred at two sites at least. Currently, a snowmobile trail bisects one of the populations in eastern Ontario. Although this trail is used mainly in the winter when orchids are dormant, people have also been observed using ATVs on this trail (S. Thompson pers. comm. 2007). ATV use has also been documented as a threat to orchid populations in Bruce Peninsula National Park. It is not known whether the increased depth of freezing that occurs when snow is compacted (e.g., by snowmobiles) has any impact on the species.

#### Trampling

The Eastern Prairie Fringed-orchid is very inconspicuous, and trampling by humans is probably a threat to several populations. If populations are monitored regularly, monitoring itself could cause physical damage to plants or to the habitat unless proper care is taken. At least two populations are well known locally and accessible to naturalists and photographers, although trampling has not been directly observed. Collection of plants by orchid enthusiasts or wildflower gardeners is a potential concern

but has not been documented in Ontario. In the past, scientific collecting may have been a concern, but as known sites are well documented and the species is easily identified from photographs, there is no valid scientific reason to collect plants.

### Successional Change

Successional change represents a threat to populations of the Eastern Prairie Fringed-orchid, as alterations to the community type and species composition make formerly suitable habitat less favourable. As woody vegetation invades the open habitat where the orchid grows, competition for space and light increases. The presence of woody vegetation in these habitats also presents a threat, as the increased cover reduces the chances of pollination by hawkmoths (Bowles 1993). In Ohio, Michigan and Ontario, open, abandoned fields where the Eastern Prairie Fringed-orchids previously grew have been lost to successional changes (COSEWIC 2003). Management, such as prescribed burning, is required in late-successional prairie habitats to control the amount of encroaching woody vegetation (Bowles 1991).

Flooding caused by American Beaver (*Castor canadensis*) has been documented in the decline (at least in the short term) of a large population of the Eastern Prairie Fringed-orchid in Bruce County and is suspected in the loss of lakeside fen habitat in eastern Ontario. It appears that plants can withstand at least short-term flooding (1+ years), but the length of time they can survive prolonged flooding is not known.

### Herbivory

White-tailed deer (*Odocoileus virginianus*) have been observed grazing on flowering stems of the Eastern Prairie Fringed-orchid, and deer are abundant or increasing in population at some sites that the Eastern Prairie Fringed-orchid occupies (COSEWIC 2003, J. Haggeman pers. comm. 2007). Grazing by Eastern Cottontails (*Sylvilagus floridanus*) may also be occurring, and extensive insect damage to stems of the Eastern Prairie Fringed-orchid has also been reported (Haggeman 2004).

The effects of herbivory on populations of this orchid in Ontario are not known (COSEWIC 2003), although cropping of plants early in the growing season may prevent budding and induce dormancy or death (Brownell & Catling 2000). While long-term grazing may inhibit plants from completing their life cycle, it has also been suggested that moderate grazing may encourage flowering while reducing competition (Zambrana Engineering Inc. 1998).

### Small population sizes

Several populations of the Eastern Prairie Fringed-orchid in Ontario have been consistently smaller than 10 flowering plants annually. Isolation and small population sizes may have a strong influence on reproduction of this species (Bowles et al. 2000). This is because smaller populations may not attract the appropriate pollinators, thus preventing fertilization. Inbreeding depression has also been shown to decrease seed

viability (Wallace 2003). Despite being adapted for long-distance dispersal, it is doubtful that much genetic interaction between populations is occurring.

### Hybridization

Hybridization between the Eastern Prairie Fringed-orchid and other species of the *Platanthera* genus may be a threat, as the hybrids may compete with parent plants for pollinators and lead to an increasingly diluted genome. Hybrids have been documented between Eastern Prairie Fringed-orchid and Small Purple Fringed-orchid (*Platanthera psycodes*) which results in *Platanthera x reznicekii* and between Eastern Prairie Fringed-orchid and Green Fringed-orchid (*Platanthera lacera*) which results in *Platanthera x hollandiae*. Hybrids have been documented at two sites in Ontario (Catling & Brownell 1999, Catling et al. 1999).

### Water Pollution

Increases in the availability of nutrients (nitrogen, phosphorus) resulting from nutrient-rich agricultural runoff may be causing habitat change, especially at poor fen sites (Marlborough Forest, Minesing Swamp and Holland Marsh) where nutrient levels are naturally low. The spread of species requiring more nutrient-rich conditions (e.g., *Typha* spp., shrubs and a variety of herbaceous marsh species) has been observed, although increases in nutrient availability to plants has not been confirmed (S. Thompson pers. comm. 2007). Eventually, increased nutrient loads could transform these open fen habitats into closed cattail marshes, shrub fens or thicket swamps, excluding the Eastern Prairie Fringed-orchid. Maintenance of roads and rights-of-way through Eastern Prairie Fringed-orchid habitat results in salt and other inputs (herbicides), the impacts of which are unknown.

## **1.6 Recovery Actions Completed or Under Way**

An evaluation and prioritization of populations of the Eastern Prairie Fringed-orchid has been undertaken to inform recovery actions (Brownell 2002). Five populations ranked as high priority, 10 populations ranked as moderate priority and 14 ranked as low priority. Since this ranking study was completed, however, new sites have been discovered and the status of other sites has changed. A monitoring protocol has been developed for the Eastern Prairie Fringed-orchid in Ontario to assist monitoring of populations by using criteria that will allow trend-through-time and comparison analysis (Hunt 2003). A number of site-specific monitoring, management and planning initiatives have been undertaken across Ontario, although the monitoring protocol mentioned above has not necessarily been used for all projects since 2003.

### St. Clair National Wildlife Area

At the St. Clair National Wildlife Area (NWA), Eastern Prairie Fringed-orchid populations have been monitored most years since 1991. Field work in 2003 revealed that the Griffore Prairie site and the St. Clair NWA are in fact one continuous population, which is now collectively referred to as the Kent County site, although they remain two

separate element occurrences in the Natural Heritage Information Centre (NHIC) database (J. Haggeman pers. comm. 2007).

Since the mid-1990s, habitat has been actively managed, with significant response. Burning at the Griffore Prairie on an almost annual basis seems to have helped maintain a large population of the Eastern Prairie Fringed-orchid. Prescribed burning at the St. Clair NWA portion of the Kent County site has also resulted in a population increase – over 200 plants appeared after burning in an area where none had been observed for at least 12 years. Other management at the St. Clair NWA site, particularly spraying of the invasive variety of Common Reed with glyphosate, has also resulted in a positive response from the Eastern Prairie Fringed-orchid. Spraying of Common Reed followed by burning results in an even greater positive response. A burn plan established for the entire known area of the Kent County site was initiated due to the presence of the Eastern Prairie Fringed-orchid.

#### Walpole Island

Recovery of the Eastern Prairie Fringed-orchid on Walpole Island is guided by the Walpole Island Ecosystem Recovery Strategy, which provides direction for the recovery and protection of prairie, savannah, forest wetland and open-water ecosystems and their associated species (Bowles 2005). Monitoring of the Eastern Prairie Fringed-orchid (as well as many other plant species at risk) has also occurred there in the past several years.

#### Ojibway Prairie

Prescribed burning at Ojibway Prairie Provincial Nature Reserve has been carried out several times since 1982, and “wildfires” occurred regularly before then. It is unknown whether the timing, frequency or intensity of the fire has had any impact on the apparent decline of the Eastern Prairie Fringed-orchid at Ojibway Prairie. In 2007, this orchid was discovered at a new location in the Windsor area.

#### Bruce Peninsula National Park

The population of the Eastern Prairie Fringed-orchid at George Lake in Bruce Peninsula National Park is used as an indicator of species diversity as part of the Ecological Integrity Monitoring Program that the Parks Canada Agency established. The monitoring protocol establishes methods to monitor population size, human disturbance, presence of invasive species, lake levels and ecological data on the Eastern Prairie Fringed-orchid with the goal of maintaining a viable population in the greater park ecosystem (Haselmayer 2005). Plant numbers in a fixed-area plot are monitored annually, and a partnership with local First Nations has resulted in stem counts for the orchid around George Lake. The George Lake population borders land managed by the Chippewas of Nawash and the Chippewas of Saugeen, and both of these groups have become respected partners in local conservation.

A rare plant management plan has also been completed for the park. The orchid population at Bruce Peninsula National Park is managed in compliance with Parks Canada Agency policy, as well as the *Canada National Parks Act*.

### Central Ontario

Populations of the Eastern Prairie Fringed-orchid at Minesing Swamp were monitored almost annually between 2000 and 2006. An occurrence of this orchid at Beaverdale Bog that had not been observed since the 1980s was found there in 2005. Two plants were located at sites on the Crown land portion in the Holland Marsh in 2005.

### Eastern Ontario

In the Kemptville District of the Ontario Ministry of Natural Resources (OMNR), populations of the Eastern Prairie Fringed-orchid (Long Swamp Fen, Marlborough Forest – Phragmites Fen, and Marlborough Forest – Richmond Fen) have been monitored as resources permit (Thompson 2005, MacDonald 2004). Searches were undertaken to locate the orchid at a site near Smith's Falls where it was documented historically. Although suitable habitat was found, no orchids were observed. Six additional sites with suitable habitat were also visited, but no plants were observed.

### Province-wide

Through the work of organizations such as Tallgrass Ontario and the Rural Lambton Stewardship Network, a variety of prairie species, including the Eastern Prairie Fringed-orchid, have been planted in an effort to restore communities (Hunt 2003). A recovery plan for tallgrass prairie communities in southern Ontario was prepared in 1998 to coordinate recovery efforts, share information, and encourage and expand the network of tallgrass prairies in southern Ontario (Rodger 1998).

## **1.7 Knowledge Gaps**

### Survey and monitoring requirements

At present, accurate census information on populations of the Eastern Prairie Fringed-orchid in Canada is incomplete. Preliminary monitoring guidelines have been developed (Hunt 2003) but have not been consistently implemented across all populations. This is partly because the guidelines are based on counting all flowering plants in a population, which is impractical for large populations. Existing protocols should be modified as follows to capture the information needed and improve data consistency:

- Determine more accurately the actual population at each site, including both the number(s) of plants and the geographic extent of the population(s). Although conducting two surveys per season, rather than one, would determine populations more accurately, that would entail an intensive workload and is probably unrealistic, given human resource requirements, the difficulty in accessing some sites and the size of a few of the populations.
- Develop a scientifically defensible protocol for sampling, over several years, large populations and/or sparse populations that are spread over large areas.

- At each site, monitor active threats, land ownership, and habitat status and size (Brownell 2002).
- Survey areas of suitable habitat, since discovering new populations is still possible.
- Address inconsistencies in naming and geographical referencing of populations and sub-populations to permit comparative analyses of population trends.
- Complete the ranking of sites, using new information collected, as more sites have been discovered and more information collected since the ranking study was conducted.
- Complete minimum viable population analyses.
- Measure soils and mycorrhizal layers.

### Research requirements

Over the past several decades, a great deal of research has been undertaken on the Eastern Prairie Fringed-orchid in the United States (where the species is federally threatened). Relatively little research has occurred on Canadian populations, however, and much remains unknown about them.

- *Effects of fire:* The Eastern Prairie Fringed-orchid adapts to disturbances, such as fire, while dormant, but damage during the growing season may affect plant survival (U.S. Fish and Wildlife Service 1999). Burning during the dormant season or in years when rainfall in the growing season is high would probably promote flowering in tallgrass prairie wetlands and possibly in fens. At the Kent County site, the Eastern Prairie Fringed-orchid appears to respond positively to early spring burning (J. Haggeman pers. comm. 2007). The beneficial effects of burning on this species should be carefully studied to determine the significance and correct timing of such burns, as well as their impact on other species.
- *Role of disturbance:* Disturbance appears to play a significant role in the establishment of Eastern Prairie Fringed-orchid seedlings by creating open areas with reduced competition (U.S. Fish & Wildlife Service 1999). The role of disturbance should be investigated to guide the development of management prescriptions for maintaining adequate quantities of suitable habitat.
- *Role of fluctuation of the water table:* Some Eastern Prairie Fringed-orchid populations are found in fens or wet prairies, which have a history of short or longer term fluctuation of the water table; other populations appear to be in wetlands (usually fens) with relatively stable water tables. The role of water levels needs to be investigated and quantified. Water-level monitoring gauges should be installed in wetlands containing significant populations of this orchid.
- *Role of pollinators:* Pollination by night-flying hawkmoths is imperative to the long-term survival of Eastern Prairie Fringed-orchids. Although hawkmoth studies have been completed in the United States, the hawkmoth species that visit Canadian populations of the Eastern Prairie Fringed-orchid are unknown. Such

information can help predict Eastern Prairie Fringed-orchid population trends, and allow recovery efforts to be focused where pollinators are present.

- *Genetic variation:* Genetic variation among populations of the Eastern Prairie Fringed-orchid has been studied in Michigan, Ohio and Illinois (Wallace 2002, Havens & Bradford 2001, Havens & Buerkle 1999). The distance separating populations in Ontario may result in colonies that are strongly differentiated genetically.
- *Nutrient enrichment at fen sites:* Permanent plots and photographic plots should be established at fen sites so that vegetation change can be examined over time. To assist in determining future vegetation trends, photographs taken over the past 55 years should be analyzed and used to map changes in vegetation that have occurred in and around fen sites during that time.

## 2.0 RECOVERY

### 2.1 Recovery Goal

The recovery goal for the Eastern Prairie Fringed-orchid is to prevent any further loss of populations and habitat and habitat functionality, to reverse the declining population trends at extant locations and to restore occurrences at historic sites, where appropriate, within the species' Canadian range.

### 2.2 Protection and Recovery Objectives

The recovery goal requires that populations of the Eastern Prairie Fringed-orchid be maintained throughout the species' currently known Canadian range – that is, at all 21 sites where it is believed to be extant. Since stem counts of this orchid may vary widely between years, even at the same site, specific numerical population objectives have not been suggested. Insufficient data exists to suggest total population numbers that would be meaningful or reliable.

Table 2. Protection and recovery objectives

No.	Protection or Recovery Objective
1.	Protect Eastern Prairie Fringed-orchid populations, habitat and habitat functionality at all extant locations.
2.	Report regularly on the status of this species, using the best available scientific information.
3.	Reduce or eliminate threats at extant sites.
4.	Conduct research on Canadian populations of this species to address knowledge gaps.
5.	Restore habitat and reintroduce the Eastern Prairie Fringed-orchid where appropriate and feasible.

## 2.3 Approaches to Recovery

Table 3. Approaches to recovery of the Eastern Prairie Fringed-orchid in Ontario

Priority	Objective Number	Recovery Theme	Approach to Recovery	Threats Addressed
High	1	Habitat protection	<p>Identify high-priority private sites and secure them through conservation easements, stewardship agreements or land acquisition</p> <ul style="list-style-type: none"> <li>• Prioritize sites according to urgency</li> <li>• Identify and contact private landowners.</li> <li>• Determine the ideal protection strategy (easement, acquisition, stewardship) for each site</li> </ul>	Habitat loss
Medium	1	Habitat protection	<p>Work with municipalities and other planning agencies to protect habitat and populations through municipal land use planning processes and the Conservation Land Tax Incentive Program (CLTIP), or other land incentive programs</p> <ul style="list-style-type: none"> <li>• Update or complete wetland evaluations and prairie community assessments to determine their significance and the potential for protection under the Provincial Policy Statement (PPS)</li> <li>• Provide habitat mapping and/or wetland and prairie community maps to municipalities and other planning agencies</li> <li>• Work with municipalities to adopt protection in official plans, other planning documents and municipal plan review processes</li> <li>• Work with municipalities to assist in preserving wetlands and in protecting lands adjacent to them</li> <li>• Work with CLTIP and municipalities to identify sites eligible for CLTIP, and encourage landowners to participate in the program</li> <li>• Explore the use of other land incentives such as sacrament/easement options, ecogifts programs, etc.</li> </ul>	Habitat loss
Medium	1	Habitat protection	<p>Work with municipalities to create awareness of and protect populations on municipal road allowances through changes to maintenance schedules</p>	Habitat loss
High	1	Habitat protection	<p>Encourage the OMNR to undertake the legal protection of this species and its habitat</p> <ul style="list-style-type: none"> <li>• Regulate species habitat under the provincial <i>Endangered Species Act, 2007</i> (ESA 2007)</li> <li>• Develop and apply habitat mapping guidelines to identify, describe and delineate habitat for protection</li> </ul>	Habitat loss

Recovery Strategy for the Eastern Prairie Fringed-orchid in Ontario

Priority	Objective Number	Recovery Theme	Approach to Recovery	Threats Addressed
High	3	Threat clarification  Management	Develop and implement management actions to maintain or increase populations at extant locations <ul style="list-style-type: none"> <li>• Identify and assess known threats at all extant sites</li> <li>• Work with owners/managers to develop site-specific management plans to address threats through management (e.g., prescribed burns, invasive species control)</li> <li>• Monitor sites to assess the effects of actions</li> <li>• Adapt management in response to monitoring results</li> <li>• Report on management actions and outcomes</li> </ul>	All threats, especially invasive species, succession, use of recreational vehicles, trampling, herbivory
Low	1,3	Habitat protection	Ensure that protection and recovery approaches are identified in management plans for all federal, provincial and municipal lands <ul style="list-style-type: none"> <li>• Identify appropriate zoning and activities in national and provincial park management and resource stewardship plans</li> <li>• Incorporate management into NWA management plans</li> </ul>	Habitat loss, invasive species, use of recreational vehicles, trampling
High	1, 5	Habitat protection	Work together with the Walpole Island Recovery Team to assist in managing and recovering populations on Walpole First Nations lands	All threats
High	2,3	Surveying and monitoring	Develop and implement a monitoring program to assess changes in populations and habitats over time <ul style="list-style-type: none"> <li>• Adopt a monitoring protocol</li> <li>• Complete monitoring at sites and at intervals as prescribed by the monitoring protocol</li> <li>• Report monitoring results annually, and assess trends in populations, area of occupancy and habitat condition (threats) every five years</li> <li>• Submit all data to the NHIC</li> </ul>	All threats
Medium	2	Surveying and monitoring	Conduct surveys to locate new populations <ul style="list-style-type: none"> <li>• Use current knowledge of habitat to develop a GIS model of predicted occurrences in the historical range</li> <li>• Work with First Nations communities to survey known areas of potential habitat to determine the presence or absence of the species and locate new populations</li> <li>• Conduct field surveys in target areas over at least two field seasons to determine whether the species is present</li> <li>• Document any new occurrences of the species and submit all data to the NHIC</li> <li>• Use the findings of research on habitat requirements to refine the model</li> </ul>	All threats

Recovery Strategy for the Eastern Prairie Fringed-orchid in Ontario

Priority	Objective Number	Recovery Theme	Approach to Recovery	Threats Addressed
High	4	Applied research	<p>Assess and summarize existing knowledge of the species and identify research needs for Ontario populations to inform recovery efforts and support adaptive management approaches</p> <ul style="list-style-type: none"> <li>• Complete a literature review</li> <li>• Identify top research priorities</li> <li>• Support funding applications as opportunities arise</li> </ul>	All threats, especially those that represent knowledge gaps
Medium	5	Restoration	<ul style="list-style-type: none"> <li>• Identify sites with potential for habitat restoration (especially prescribed burns)</li> <li>• Where feasible, conduct restoration, carefully monitor results and share information</li> </ul>	All threats
Low	5	Reintroduction	<p>Investigate the feasibility of reintroducing populations to historic habitats</p> <ul style="list-style-type: none"> <li>• Assess the need for reintroductions and identify targets as appropriate (e.g., is the species extant in all ecodistricts and habitat types in which it occurred historically?)</li> <li>• Develop site-specific criteria (e.g., ownership, threats, habitat type and condition, size, costs) for assessing the feasibility of historic sites for reintroductions</li> <li>• Prioritize historic sites for reintroductions</li> <li>• Develop site-specific reintroduction strategies, including identification of research needs (e.g., propagation techniques)</li> <li>• Implement reintroduction strategies at high-priority sites</li> </ul>	All threats
Low	5	Communication	<p>Provide information to stakeholders to increase awareness of this orchid</p> <ul style="list-style-type: none"> <li>• Identify audiences with the most potential for conservation (e.g., landowners) and gauge their awareness and information needs</li> <li>• Identify appropriate means of communicating with target audiences (e.g., workshops, newsletters, public meetings)</li> </ul>	All threats

## 2.4 Performance Measures

Evaluation should include the extent to which goals and objectives have been met. Specific measures are detailed in table 4 below.

Table 4. Performance measures for evaluating recovery success

Approach	Evaluation
Population data and habitat mapping	Updated population information collected for all extant sites by 2010.
Habitat monitoring and reporting	Standard monitoring methods implemented by 2010. Each population assessed for threats by 2010. Historic sites revisited by 2011 to confirm habitat suitability. Recovery potential of historic sites assessed by 2010.
Condition of populations	Surveys carried out to demonstrate no losses of populations and no net decrease in the number of plants at priority sites. (Because of the year-to-year variability in the emergence and flowering of this species, surveys must extend over two or more seasons.)
Effectiveness of habitat protection measures	At least one additional population (either newly identified or a restored historical site) "protected" through stewardship, management or acquisition by 2011.
Stewardship efforts and communication	Municipalities and affected landowners become aware of Eastern Prairie Fringed-orchid habitat. Outreach material developed and delivered by 2010.

## 2.5 Area for Consideration in Developing a Habitat Regulation

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

In Ontario, the Eastern Prairie Fringed-orchid has very narrow habitat preferences and consequently only limited areas are suitable. This orchid's microhabitat has been described in Ontario as existing in three general areas: fens, tallgrass prairie and moist old fields (S. Brinker pers. comm. 2008). The habitat characteristics within these major habitat types differ throughout the species' range in the province. The following descriptions summarize the habitat characteristics that have been documented from currently occupied sites. It is recommended that areas with current or historic occurrences where appropriate habitat of the Eastern Prairie fringed-orchid remains be considered in the development of a habitat regulation. The specific boundaries of each of these areas should be determined at a site-specific level on the basis of one of these descriptions.

It is also recommended that the habitat regulation be written so that it is flexible enough to immediately protect newly discovered occurrences, using a similar site-specific approach for habitat delineation.

### Fens

- Open bedrock mineral shoreline fen dominated by Fresh Water Cordgrass (*Spartina pectinata*), Twig Rush (*Cladium mariscoides*), Switch Grass (*Panicum virgatum*), Kalm St. John's-wort (*Hypericum kalmianum*), Shrubby Cinquefoil (*Potentilla fruticosa*), Tufted Hairgrass (*Deschampsia cespitosa*), Little Green Sedge (*Carex viridula*), Lindheimer's Panic Grass (*Panicum acuminatum* var. *lindheimeri*), Richardson Rush (*Juncus alpinoarticulatus*), Swamp Birch (*Betula pumila*), Kalm's Lobelia (*Lobelia kalmii*), Four-flowered Loosestrife (*Lysimachia quadriflora*), Bird's-eye Primrose (*Primula mistassinica*), Balsam Ragweed (*Senecio pauperculus*), Common Sneezeweed (*Helenium autumnale*), Prairie Goldenrod (*Solidago ptarmicoides*) and Northern Bugleweed (*Lycopus uniflorus*).
- Open Northern White Cedar (*Thuja occidentalis*)–Tamarack (*Larix laricina*) peatland fens with sedges (*Carex* spp.), particularly Wire Sedge (*C. lasiocarpa*), and Livid Sedge (*C. livida*), sphagnum mosses (*Sphagnum* spp.), low ericaceous shrubs and willows (*Salix* spp.).
- Deep peat-based organic soils in open graminoid fens with the following associated species: Wire Sedge, Yellow Sedge (*Carex flava*), Common Reed (*Phragmites australis* ssp. *americanus*), sphagnum mosses, Sweet Gale (*Myrica gale*), Small Purple-fringed Orchid, the hybrid fringed-orchid (*Platanthera* x. *reznicekii*), Northern Pitcher-plant (*Sarracenia purpurea*), Bog Buckbean (*Menyanthes trifoliata*), Royal Fern (*Osmunda regalis*), Twig Rush, cottongrass (*Eriophorum* spp.), Dragon's Mouth (*Arethusa bulbosa*), Rose Pogonia (*Pogonia ophioglossoides*), Spotted Joe-pye Weed (*Eupatorium maculatum*), Boneset (*Eupatorium perfoliatum*), Labrador Tea (*Ledum groenlandicum*), Leatherleaf (*Chamaedaphne calyculata*), Narrow-leaved Meadow-sweet (*Spiraea alba*), Bog Goldenrod (*Solidago uliginosa*), Rough Goldenrod (*Solidago rugosa*), Red-osier Dogwood (*Cornus stolonifera*), Bog Rosemary (*Andromeda polifolia*), Marsh Bellflower (*Campanula aparinoides*), Tamarack and Northern White Cedar.
- Deep peat-based organic soils in open graminoid fen dominated by sphagnum mosses, Wire Sedge, Coast Sedge (*Carex exilis*), Swamp Birch, Leatherleaf and Tamarack. Other less common associates include Sweet Gale, Northern Pitcher-plant, Bog Buckbean, Bog Rosemary, Sheep-laurel (*Kalmia polifolia*), Royal Fern, Twig Rush, cottongrass, Dragon's Mouth, Rose Pogonia, Spotted Joe-pye Weed, Boneset, Labrador Tea, Narrow-leaved Meadow-sweet, Bog Goldenrod, Rough Goldenrod, Red-osier Dogwood, Marsh Bellflower, blueberry (*Vaccinium* spp.), Hoary Willow (*Salix candida*) and Grass-pink (*Calopogon tuberosus*).

- Open Wire Sedge fen dominated by Sweet Gale and Marsh Fern (*Thelypteris palustris*), with the following associates: Bog Willow (*Salix pedicellaris*), Red-osier Dogwood, Narrow-leaved Meadow-sweet, Swamp Birch, Royal Fern, Bog Goldenrod, Marsh St. John's-wort (*Triadenum fraseri*), Marsh Cinquefoil (*Potentilla palustris*), Blue-joint Reedgrass (*Calamagrostis canadensis*), Water Sedge (*Carex aquatilis*), Water Horsetail (*Equisetum fluviatile*), Northern Reedgrass (*Calamagrostis stricta* ssp. *inexpansa*), Blueflag (*Iris versicolor*), Rough Bentgrass (*Agrostis scabra*), Marsh Bellflower and Marsh Vetchling (*Lathyrus palustris*).
- Shallow peat and marl deposits over bedrock in open graminoid fen dominated by Fresh Water Cordgrass, Twig Rush, Switch Grass, Tufted Hairgrass, Little Green Sedge, Bald Spikerush (*Eleocharis erythropoda*), Common Sneezeweed, Silverweed (*Potentilla anserina*), Four-flowered Loosestrife, Rush Aster (*Symphyotrichum boreale*), Hooded Ladies'-tresses (*Spiranthes romanzoffiana*) and Blueflag.
- Open graminoid fen dominated by Common Reed with sedges and other vegetation such as Marsh Fern, Marsh Marigold (*Caltha palustris*), Bog Buckbean, Water Horsetail, Swamp Milkweed (*Asclepias incarnata*), Spotted Joe-pye Weed, Hooded Skullcap (*Scutellaria galericulata*), Northern Bugleweed (*Lycopus uniflorus*), Marsh Bedstraw (*Galium palustre*), Royal Fern, Swamp Rose (*Rosa palustris*) and Blueflag.

#### Tallgrass Prairie

- Moist to wet tallgrass prairie dominated by Big Bluestem (*Andropogon gerardii*) and Little Bluestem (*Schizachyrium scoparium*).
- Fresh-moist tallgrass prairie with combinations of the following species: Big Bluestem, Little Bluestem, Indian Grass (*Sorghastrum nutans*), Fresh Water Cordgrass, Stiff Goldenrod (*Solidago rigida*), Riddell's Goldenrod (*S. riddellii*), other goldenrods (*Solidago* spp.), asters (*Aster* spp.), panic grasses (*Panicum* spp.), Holy Grass (*Hierochloa odorata*), Whorled Loosestrife (*Lysimachia quadrifolia*), Culver's-root (*Veronicastrum virginicum*), Ironweed (*Vernonia missurica*), Eastern Yellow Star Grass (*Hypoxis hirsuta*), Slender-leaved Agalinis (*Agalinis tenuifolia*), Skinner's Purple False Foxglove (*A. skinneriana*), Gattinger's False Foxglove (*A. gattingeri*), Sullivant's Milkweed (*Asclepias sullivantii*), Small White Lady's-slipper (*Cypripedium candidum*), Small Yellow Lady's-slipper (*C. calceolus* var. *parviflorum*), blue-eyed-grasses (*Sisyrinchium* spp.), Ohio Spiderwort (*Tradescantia ohioensis*), Low Nutrush (*Scleria verticillata*), Great Plains Ladies'-tresses (*Spiranthes magnicamporum*), Colicroot (*Aletris farinosa*), Showy Tick-trefoil (*Desmodium canadense*), Winged Loosestrife (*Lythrum alatum*), Spiked Blazing Star (*Liatris spicata*), Black-eyed Susan (*Rudbeckia hirta*), Wild Bergamot (*Monarda fistulosa*) and Blue-joint Reedgrass.
- Fresh-moist tallgrass prairie dominated by Fresh Water Cordgrass, Indian Grass, Big Bluestem, mountain-mints (*Pycnanthemum* spp.) and goldenrods, along with

the following secondary species: Sullivant's Milkweed, Bushy Aster (*Symphyotrichum dumosum*), Field Thistle (*Cirsium discolor*), Eastern Yellow Star Grass, Four-flowered Loosestrife, Riddell's Goldenrod, Stiff Goldenrod and numerous other prairie indicator species.

- Fresh-moist tallgrass prairie/cattail organic shallow marsh dominated by goldenrods, cattails, bulrushes (*Scirpus* spp.), Reed Canary Grass (*Phalaris arundinacea*) and goldenrod (*Euthamia* spp.).
- Mesic tallgrass prairie over fine or loamy sand with a combination of species such as Prairie Dock (*Silphium terebinthinaceum*), bentgrass (*Agrostis* spp.), Stiff Goldenrod and other more common goldenrods, Blue-joint Reedgrass, Big Bluestem, Bottle Gentian (*Gentiana andrewsii*), Eastern Yellow Star Grass, loosestrife (*Lysimachia* spp.), Sullivant's Milkweed, Field Thistle, Spreading Dogbane (*Apocynum androsaemifolium*), panic grasses, Fresh Water Cordgrass, asters, Common Sneezeweed and mountain-mints.

#### Moist Old Fields

- Moist old fields dominated by Canada Bluegrass, Woolly Sedge, rushes (*Juncus* spp.) and scattered shrubs.
- Cultural dry-mesic old field meadow or cultural thicket with the following species: goldenrods, asters and exotic graminoids with Gray Dogwood (*Cornus foemina*) and Staghorn Sumac (*Rhus typhina*).
- Cultural dry-moist old field meadow with species including various exotic graminoids, goldenrods, dogwoods (*Cornus* spp.) and willows.
- Bedrock cultural thicket/swamp over sedimentary limestone with willows and dogwoods as dominants, including Meadow Willow (*Salix petiolaris*), Pussy Willow (*Salix discolor*), Red-osier Dogwood, Narrow-leaved Meadow-sweet, Purple Loosestrife, goldenrods, Common Yarrow (*Achillea millefolium*), Swamp Milkweed, St. John's-wort (*Hypericum perforatum*), Foxglove Beardtongue (*Penstemon digitalis*), Marsh Bedstraw (*Galium palustre*), Queen Anne's Lace (*Daucus carota*), Yellow Sedge, Inland Sedge (*Carex interior*), Timothy (*Phleum pratense*), spikerush (*Eleocharis* spp.) and Field Horsetail (*Equisetum arvense*).

## **2.6 Effects on Other Species**

The Eastern Prairie Fringed-orchid is associated with rare habitat types (wet prairies and fens) that are ecologically diverse. In southwestern Ontario, and especially at sites on Walpole Island, St. Clair NWA and Ojibway Prairie, the Eastern Prairie Fringed-orchid grows in close proximity to known occurrences for many species at risk. These include Small White Lady's-slipper (*Cypripedium candidum*), Pink Milkwort (*Polygala incarnata*), Skinner's Agalinis (*Agalinis skinneriana*), Gattinger's Agalinis (*Agalinis gattingeri*),

Colicroot, Dense Blazing-star (*Liatris spicata*), Climbing Prairie Rose (*Rosa setigera*), Riddell's Goldenrod, Willowleaf Aster (*Symphotrichum praealtum*), Henslow's Sparrow (*Ammodramus henslowii*), Northern Bobwhite (*Colinus virginianus*), Spotted Turtle (*Clemmys guttata*), Blanding's Turtle (*Emydoidea blandingii*), Butler's Gartersnake (*Thamnophis butleri*), Eastern Foxsnake (*Elaphe (vulpina) gloydi*), Massasauga (*Sistrurus catenatus*), Grey Fox (*Urocyon cinereoargenteus*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Yellow-breasted Chat (*Icteria virens virens*) and Monarch Butterfly (*Danaus plexippus*), as well as a variety of small mammals. An American Badger has been reported at one of the southwestern Ontario sites. Almost 20 rare (S1–S3) plant species are present where the Eastern Prairie Fringed-orchid occurs, and numerous rare insect species probably are also associated with many of the sites where it grows. In other parts of Ontario, several turtle species at risk may be associated with the fen habitat of the Eastern Prairie Fringed-orchid.

Clearly, the conservation and management of these habitats is expected to benefit many species dependent on them. Some species at risk (e.g., Riddell's Goldenrod, Willowleaf Aster) were newly recorded (in 2007) at St. Clair NWA, probably as a result of prescribed burning undertaken to restore habitat.

Some management activities, however, including prescribed burns and control of invasive species such as Common Reed using herbicides, have the potential to harm some species at risk, especially fauna, 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) to minimize effects on amphibians and reptiles. Research into the population biology, ecology and specific habitat requirements of the Eastern Prairie Fringed-orchid may also provide information to improve orchid habitat, while minimizing effects on other species.

## GLOSSARY

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

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

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

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

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

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

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

## REFERENCES

- Bowles, J.M. 2005. Walpole Island Ecosystem Recovery Strategy (Draft 8). Prepared for Walpole Island Heritage Centre, Environment Canada, and the Walpole Island Recovery Team. 43 pp.
- Bowles, M., R. Flakne, and R. Dombeck. 1992. Status and population fluctuations of the eastern prairie fringed orchid [*Platanthera leucophaea* (Nutt.) Lindl.] in Illinois. *Erigenia* 12:26-40.
- Bowles, M., K. Jacobs, L. Zettler, and T.W. Delaney. 2000. Seed Viability and Germination of the Federal Threatened Eastern Prairie Fringed Orchid *Platanthera leucophaea* (Nuttall) Lindley. Unpublished report prepared for the U.S. Fish and Wildlife Service.
- Bowles, M.L. 1983. The tallgrass prairie orchids *Platanthera leucophaea* (Nutt.) Lindl. and *Cypripedium candidum* Muhl. ex Wild.: some aspects of their status, biology, and ecology and implications toward management. *Natural Areas Journal* 3(4):14-37.
- Bowles, M.L. 1991. Some aspects of the status and ecology of seven rare wetland plant species in the Chicago region of northeastern Illinois. *Erigenia* 11:52-66.
- Bowles, M.L. 1993. Recovery Plan for the Eastern Prairie White Fringed Orchid, *Platanthera leucophaea* (Nuttall) Lindley. Recovery Plan prepared for the U.S. Fish and Wildlife Service, Region 3, Minneapolis, Minnesota. 53 pp. + appendices.
- Bowles, M.L., L. Zettler, T. Bell, and P. Kelsey. 2005. Relationships between soil characteristics, distribution and restoration potential of the federal threatened Eastern Prairie Fringed Orchid, *Platanthera leucophaea* (Nutt.) Lindl. *American Midland Naturalist* 154(2): 273-285.
- Brownell, V.R. 2002. Evaluation and Prioritization for Canadian Populations of Eastern Prairie Fringed Orchid (*Platanthera leucophaea*). 16 pp.
- Brownell, V.R., and P.M. Catling. 2000. Update Status Report on Eastern Prairie Fringed-orchid (*Platanthera leucophaea*). Funded by the Ontario Ministry of Natural Resources. 32 pp.
- Case, F.W. Jr. 1987. Orchids of the western Great Lakes Region, 2nd edition. Cranbrook Institute of Science. Bulletin 48. Bloomfield Hills, Michigan. 251 pp.
- Catling, P.M., and V.R. Brownell. 1999. *Platanthera lacera x leucophaea*, a new cryptic natural hybrid, and a key to northeastern North American fringed-orchids. *Canadian Journal of Botany* 77:1144-1149.
- Catling, P.M., V.R. Brownell, and G. Allen. 1999. A new natural hybrid fringed-orchid from Ontario. *Lindleyana* 14(2):77-86.

- Chang, C., Y.C. Chen, and H.F. Yen. 2005. Protocorm or rhizome? The morphology of seed germination in *Cymbidium dayanum* Reichb. Botanical Bulletin of Academia Sinica 46:71-74. <http://ejournal.sinica.edu.tw/bbas/content/2005/1/Bot461-09.pdf>. Accessed February 8, 2007.
- COSEWIC. 2003. COSEWIC assessment and update status report on the eastern prairie fringed-orchid *Platanthera leucophaea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 27 pp.
- Crosson, A.E., J.C. Dunford, and D.K. Young. 1999. Pollination and other insect interactions of the Eastern Prairie Fringed Orchid (*Platanthera leucophaea* (Nuttall) Lindl.) in Wisconsin. Report to the U.S. Fish and Wildlife Service.
- Cuthrell, D.L., P.J. Higman, and M.R. Penskar. 1999. The pollinators of Ohio and Michigan populations of Eastern Prairie Fringed orchid (*Platanthera leucophaea*). Michigan Natural Features Inventory, Lansing, Michigan. 20 pp.
- Environment Canada. 2006. Species at Risk: Eastern Prairie Fringed-orchid [http://www.sararegistry.gc.ca/species/speciesDetails\\_e.cfm?sid=248](http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=248). Accessed December 20, 2006.
- Flora of North America. 2008. [http://www.efloras.org/flora\\_page.aspx?flora\\_id=1](http://www.efloras.org/flora_page.aspx?flora_id=1). Accessed January 9, 2009.
- Haggeman, J. 2004. Notes on Eastern Prairie Fringed-orchid: Biology and Response to Management. St. Clair National Wildlife Area.
- Haselmayer, J. 2005. Eastern Prairie Fringed Orchid (*Platanthera leucophaea*) Monitoring Report: Ecological Integrity Monitoring Program Report. Bruce Peninsula National Park. 6 pp.
- Havens, K., and K. Bradford. 2001. A Population Genetic Analysis of *Platanthera leucophaea* in Northern Illinois. Report to the Illinois Department of Natural Resources.
- Havens, K., and A. Buerkle. 1999. A Population Genetic Analysis of *Platanthera leucophaea* in Northeastern Illinois. Report to the U.S. Fish and Wildlife Service.
- Hunt, L. 2003. Eastern Prairie White Fringed Orchid (*Platanthera leucophaea*) Site Survey Report 2002, Ontario Ministry of Natural Resources Southcentral Region. Unpublished report.
- Keibler, J., A. Orton-Palmer, and L. Ross. 1993. Restoration of the eastern prairie fringed orchid (*Platanthera leucophaea*) by seed broadcast and management initiatives. Unpublished report to the U.S. Fish and Wildlife Service, Barrington, Illinois.
- MacDonald, E. 2004. Eastern Prairie Fringed Orchid (*Platanthera leucophaea*) Ontario Ministry of Natural Resources Southern Region Monitoring Report 2003-04.

- Ontario Ministry of Natural Resources, Kemptville, Ontario. Unpublished report, 13 pp.
- Marks, M., B. Lapin, and J. Randall. 2004. Element Stewardship Abstract for *Phragmites australis* (Common Reed). The Nature Conservancy, Arlington, Virginia.
- NHIC (Natural Heritage Information Centre). 2007. Species: *Platanthera leucophaea*. [http://nhic.mnr.gov.on.ca/MNR/nhic/elements/el\\_report.cfm?elid=39106#species](http://nhic.mnr.gov.on.ca/MNR/nhic/elements/el_report.cfm?elid=39106#species). Accessed January 24, 2007.
- NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life (web application). Version 1.8. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>. Accessed February 9, 2009.
- Oldham, M. 2000. COSSARO Candidate VTE Species Evaluation Form for Eastern Prairie Fringed Orchid (*Platanthera leucophaea*). Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough.
- Riley, J.L. 1989. Southern Ontario bogs and fens off the Canadian Shield. Pp. 355-367 in M.J. Bardecki and N. Patterson (eds.). Wetlands: inertia or momentum. Federation of Ontario Naturalists, Don Mills, Ontario. 426 pp.
- Rodger, L. 1998. Tallgrass Communities of Southern Ontario: A Recovery Plan. Prepared for World Wildlife Fund Canada and the Ontario Ministry of Natural Resources. 66 pages.
- Sharma, J., L.W. Zettler, J.W. Van Sambeek, M. Ellersieck, and C.J. Starbuck. 2003. Symbiotic seed germination and mycorrhizae of federally threatened *Platanthera praeclara*. *American Midland Naturalist* 149:104-120.
- Sieg, C.H., and R.M. King. 1995. Influence of environmental factors and preliminary demographic analyses of a threatened orchid, *Platanthera praeclara*. *American Midland Naturalist* 134:307-323.
- Thompson, M. 2005. Eastern Prairie Fringed-orchid Inventory and Monitoring Project 2004-05. Unpublished report to Ontario Ministry of Natural Resources Kemptville District.
- U.S. Fish and Wildlife Service. 1999. Eastern Prairie Fringed Orchid (*Platanthera leucophaea*) Recovery Plan. Fort Snelling, Minnesota. 62 pp.
- Wallace, L.E. 2002. Examining the effects of fragmentation on genetic variation in *Platanthera leucophaea* (Orchidaceae): inferences from allozyme and random amplified polymorphic DNA markers. *Plant Species Biology* 17:37-49.
- Wallace, L.E. 2003. The cost of inbreeding in *Platanthera leucophaea* (Orchidaceae). *American Journal of Botany* 90(2):235-242.

Zambrana Engineering Inc. 1998. Assessment of the Reintroduction Potential of Five Federally Threatened and Endangered Plant Species at Midewin National Tallgrass Prairie. Midewin National Tallgrass Prairie.  
<http://www.fs.fed.us/mntp/speciesreintro/index.htm>.

Zettler, L.W., S.L. Stewart, M.L. Bowles, and K.A. Jacobs. 2001. Mycorrhizal fungi and cold-assisted symbiotic germination of the federally threatened Eastern Prairie Fringed Orchid, *Platanthera leucophaea* (Nuttall) Lindley. American Midland Naturalist 145:168-175.

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